

**The Affordances of Online Multiplayer Games for the Social Interactions of Middle-Primary-School-Aged Students with ASD**

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### **Declaration of Original Authorship**

This thesis contains no material that has been extracted in whole or in part from a thesis that I have submitted towards the award of any other degree or diploma in any other tertiary institution. No other person's work has been used without due acknowledgment in the main text of the thesis. All research procedures reported in the thesis received the approval of the relevant Ethics/Safety Committees (where required).

Signature:

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Date: 23/08/18

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Affordances, autism spectrum disorder, at-screen social interactions, constraints, D/discourse, inclusion, inclusive education, inclusive new literacies, *Minecraft*®, multimodal, multimodal repetitiveness, New Literacy Studies, online multiplayer games, potentials, social communication, semiotic resources, and social interactions.

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## **List of Abbreviations**

ACARA	Australian Curriculum, Assessment and Reporting Authority
ASD	Autism spectrum disorder
CRPD	Committee on the Rights of Persons with Disabilities
DSM-5	Fifth Edition of the Diagnostic and Statistical Manual of Mental Disorders
NLS	New Literacy Studies
3-D	Three dimensional
RQ	Research question
UNCRPD	The United Nations Convention on the Rights of Persons with Disabilities
UNESCO	United Nations Educational, Scientific and Cultural Organisation

## Abstract

This descriptive ethnographic case study investigates the potentials and constraints of online multiplayer games for the social interactions of students with an autism spectrum disorder. *Minecraft*® was selected as the online multiplayer game platform of focus within the research context, given its popularity among primary-school students. The study also describes the multimodal forms of social communication that students with an autism spectrum disorder used as they engaged with online multiplayer games. It investigates students, parent, and teacher perspectives of the enabling and constraining features of online multiplayer games for the social interactions of students with autism spectrum disorder. This research is a response to the increasing prevalence rates in children diagnosed with autism spectrum disorder and the growing engagements of primary-school students with online multiplayer games.

The data were collected through video-recorded at-screen observations, video-recorded peer face-to-face observations, and video-recorded and audio-recorded semistructured interviews. Multimodal and D/discourse analysis of the data demonstrated that online multiplayer games supported social interactions through oral, written, visual, gestural, and audio forms of social communication, and within virtual and physical spaces. The data analysis revealed that, online multiplayer games enabled platforms to support social interactions, develop and sustain friendships, and enhance reciprocity. Regardless of these potentials and despite online multiplayer games being socially motivating platforms, social difficulties for students with autism spectrum disorder were still evident within this context. Additionally, regardless of the multimodal benefits afforded to the students, they engaged excessively with the semiotic resources of online multiplayer games and experienced difficulties in relationships. Furthermore, they experienced external constraints associated

with the games' semiotic resources, technological and network difficulties, and adult and school restrictions on online multiplayer games.

The findings have implications for providing opportunities to support social interactions in multimodal ways that social spaces in face-to-face and offline contexts do not allow. A model of inclusive new literacies is offered to support all students' capacity to engage in positive social interactions in inclusive educational settings. From this model, a framework of multimodal support to promote social interactions is created. It includes recommendations to target the potentials of online multiplayer games and support all students in inclusive, differentiated, and prosocial ways.



## Chapter One: Introduction to the Study

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Students with an autism spectrum disorder (ASD) are described as having difficulties in two domains: social communication; and fixated restricted and repetitive interests, behaviours, or activities (American Psychiatric Association, 2013).<sup>1</sup> Data released by the Centers for Disease Control and Prevention (2017), indicate that the prevalence rates in American children diagnosed with an ASD have increased over the past decade, from approximately 1 in 150 in the year 2000, to 1 in 68 in the year 2014. Similarly, the Australian Bureau of Statistics (2017) reports that, in 2015, approximately 164,000 Australians were diagnosed with an ASD, as opposed to 115,400 diagnosed in 2012. The increasing prevalence rates of ASD among primary-school students (Christensen et al., 2016), highlight the relevance of this research into the social interactions of students with an ASD within inclusive educational contexts.

The United Nations Convention on the Rights of Persons with Disabilities (UNCRPD), held on 13 December 2006 in New York, declares that all students, including those with an ASD, have the right to inclusive education (United Nations, 2018). The UNCRPD is the first legally binding, comprehensive, and instrumental human rights treaty with an explicit dimension to protect the rights and social development of persons with disabilities, within the context of inclusive education (Committee on the Rights of Persons with Disabilities, CRPD, 2016). International signatories and parties to the UNCRPD are required under the law to ensure that the human rights and social development of persons with disabilities are promoted and protected in equitable ways. A disability may result from factors such as the interactions between individuals who experience sensory,

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<sup>1</sup> The term *an ASD* in this thesis refers to previous diagnostic categories of autism that are now merged under one umbrella diagnostic classification of *autism spectrum disorder*. These diagnostic categories were previously referred to as; “Early infantile autism, childhood autism, Kanner’s autism, high-functioning autism, atypical autism, pervasive developmental disorder not otherwise specified, childhood disintegrative disorder, and Asperger’s disorder.” (American Psychiatric Association, 2013).

mental, physical, and intellectual difficulties in virtual and physical environments; and the persistent attitudinal barriers of others in society and communities that constrain individuals from fully, equitably, and effectively participating with others (CRPD, 2016; Oliver, 2013). Other factors that may contribute towards a disability are the inadequate knowledge, funding, resources, and will to promote interactions and learning (Jordan, Glenn, & McGhie-Richmond, 2010).

The CRPD is a body of independent human rights experts overseeing that the rights of the UNCRPD are implemented by international signatories and Parties to the Convention. This Committee is concerned that there continues to be challenges to the social activities and social development for students within educational contexts, including those on the autism spectrum, and has published authoritative new guidelines to inclusive education in Comment Number Four of Article 24 (CRPD, 2016). *Article 24, Comment Number Four* is a legal declaration that describes guidelines to recognising the rights of all students, including those with an ASD, to an education with equitable learning opportunities, and that is free from discrimination. Additionally, *Article 24, Comment Number Four* highlights the need for inclusive education to be understood as a fundamental human right of all learners, as well as a process in which barriers to social activities in education are illuminated. Given that the new guidelines of *Article 24, Comment Number Four* are authoritative and protected by law, all learners, including primary students with an ASD, have the right to a high-quality inclusive education that equips them with lifelong social skills regardless of their differences.

Based on the agreement at the *United Nations Convention on the Rights of Persons with Disabilities, 2006* and UNCRPD *Article 24, Comment Number Four*, support and accommodation for the social development of all Australian students is a fundamental human right and an obligation within the context of inclusive education (Australian Alliance for Inclusive Education, 2018; CRPD, 2016; United Nations, 2018). With this view, all Australian students, including those with

an ASD, should (a) be part of an education system that has inclusive practices, (b) have access to reasonable accommodation and opportunities for full participation in diverse learning spaces, and (c) have reasonable access to resources and tools that develop skills for social development and lifelong learning (CRPD, 2016; Whitburn, Moss, & O'Mara, 2017, Chapter 3). Accordingly, the entire education system, its social interaction spaces, and its social communication resources, whether physical or virtual, offline or online, must be available and accessible for students on the autism spectrum.

The Australian Bureau of Statistics (2017) recognises the school environment as a social space in which students with an ASD learn to socially interact with peers. However, it adds that students with an ASD may experience social interaction difficulties, and almost 96.7% require appropriate and additional support to develop social skills (Australian Bureau of Statistics, 2017). Many students, including those on the autism spectrum, now receive support with inclusive contexts through a recognition of individual rights, and a respectful response to diversities (Black-Hawkins, 2017, Chapter 2; Carrington, 2017, Chapter 15). The social interaction difficulties that students with an ASD face, and the obligation to provide them with support within inclusive educational contexts mean that there needs to be new understanding of how their social interactions can be supported (American Psychiatric Association, 2013; Ozuna, Mavridis, & Hott, 2015).

The importance of this study is highlighted below through discussions of the growing interest in online multiplayer games by primary-school students, including those with an ASD, and a rise in the interest of game studies. This chapter then proceeds with discussions of the significance and aims of the study, a justification of the research question and subquestions, and explanations of the key terms in the research. Embedded within these discussions are brief explanations of how the study was framed by (a) medical and social perspectives of ASD (Waltz, 2013), (b) theoretical perspectives of multimodality (Jewitt, 2017, Chapter 2) and D/discourse (Gee, 2014), and (c) the

conceptual implications of new literacies (Street, Phal, & Rowsell, 2017, Chapter 16) and inclusion (Winzer, 2009). Chapter One ends with an overview of the thesis and a conclusion section.

### **1.1 Online Multiplayer Games and Students with an ASD**

As the patterns and practices of play for 21<sup>st</sup> century students shift from physical contexts to online and digital contexts, their social interactions are broadened to virtual affinity spaces (Hayes & Duncan, 2012; Marsh, Plowman, Yamada-Rice, Bishop, & Scott, 2016; Richards & Burn, 2014). Drawing on theoretical understandings of play in the fields of learning, digital gaming, multimodality, and social development, the term *play* is defined in this research as a recreational disposition, context, and behaviour that can be observed and described in multiple forms and spaces (Beavis, 2014; Lemke, 2017, Chapter 11; Rubin, Fein, & Vandenberg, 1993). For example, the behaviours of students with an ASD have been observed as they engage in play through video games (Mazurek & Wenstrup, 2013). This type of engagement by students with an ASD is discussed further below in this section.

The genre of online multiplayer games falls under the wide category of video games that currently exists (Bainbridge & Marchionini, 2010). For the purpose of this study, online multiplayer games are considered to be online video games that have two or more players engaging simultaneously in a common virtual environment. They can be played on a worldwide scale, between players who collaboratively play day and night by the hundreds and thousands (Suárez, Thio, & Singh, 2013). From the moment they entered the market, particularly in the 1990s, the popularity of online multiplayer games has soared (Beavis, 2014; Nagygyörgy et al., 2013). Despite their newness in multimedia, online multiplayer games may be more important to gamers than other media, such as the film industry (Lemke, 2017, Chapter 11). Increasing uptake of online video games and networking has decreased engagements in single-player games (Quandt & Kröger, 2014). Hence, some students with an ASD are likely to be more interested in playing online

multiplayer games as opposed to playing offline single player games or engaging in physical play with peers (Gallup, Duff, Serianni, & Gallup, 2016; Kuo, Orsmond, Coster, & Cohn, 2014).

*Minecraft*® was selected as the online multiplayer game platform of focus within the research context, given its popularity among primary-school students (Nebel, Schneider, & Rey, 2016). It is considered by several researchers to be the fastest growing phenomena in video game history among primary-school students (Dezuanni, O'Mara, Beavis, Potter, & Gilje, 2015; Dusmann, 2013). The study by Dezuanni et al. (2015) offered insights into 8-to-9-year-old students' performative representations in and around *Minecraft*®. Engagements with *Minecraft*® provide opportunities for students to talk about, produce, and design digital creations in classroom spaces and virtual-world environments. The study did not have a multimodal focus, nor were the participants diagnosed with ASD. As a former primary-school teacher, the researcher informally observed that many middle-primary-school students with an ASD and their peers engaged in at-screen social interactions through *Minecraft*®. The term "at-screen social interactions" is used within this study to refer to social engagements and exchanges that occur between two or more individuals who use the screens of electronic or digital devices, such as a personal computer (PC), television, smartphone, or tablet. The students viewed, touched, and shared the screens. They had conversations and arguments with their peers about their at-school and at-home *Minecraft*® experiences. However, empirical descriptions within this context were lacking in the literature. The current study adds empirical descriptions about how students with an ASD socially interacted through *Minecraft*®.

Moreover, research suggests that in more recent times, students with an ASD spend approximately twice as much time per day playing video games than students without an ASD (Mazurek & Engelhardt, 2013). A small body of researchers has reported that many of these games are played online with their friends, peers, and unknown players (Gallup et al., 2016; Kuo et al.,

2014). In the study by Gallup et al. (2016), youths on the autism spectrum articulated their desire to communicate, socialise, and interact in multiplayer online gaming environments. During her professional duties in primary-school environments, the researcher informally observed students with an ASD playing online video games with their peers, and engaging in conversations with peers and adults about their online play with other gamers. These informal observations were consistent with the literature in the New Literacy Studies (NLS) that emphasises a broadened and newer way of understanding the contemporary and evolving nature of literacies, as they are influenced by digital communication and newer technologies (Mills, 2010a; Street, 2013). NLS is identified as a body of work in which there is a broadened and newer way of defining and understanding the contemporary and evolving nature of literacy (Street, 2013).

During the time of informal observations, the researcher's interest grew about online multiplayer games and their influence on the social communication and social interactions of students with an ASD. However, there is little empirical evidence to support this interest in online multiplayer gaming and its social interaction affordances for students with an ASD (Gallup et al., 2016). Given the growing presence of online multiplayer games in the lives of primary students, including those with an ASD, research that pays attention to how *Minecraft*® and other online multiplayer games influence student social interactions in school and home contexts is considered to be necessary (Nebel et al., 2016; Wernholm & Vigmo, 2015).

A body of literature across several contexts indicates a rise in the interest of game studies (Bogost, 2007; Metzger & Paxton, 2016; Wolf & Perron, 2014). Similarly, a wide range of studies have focused on five key aspects: (1) video games and literacies (Apperley & Beavis, 2013; Gee, 2007a), (2) video games and social interactions (McCreery, Vallett, & Clark, 2015; Whyte, Smyth, & Scherf, 2015), (3) video games and problem behaviours of students with an ASD (Mazurek & Engelhardt, 2013b; Wijnhoven, Creemers, Engels, & Granic, 2015), (4) video games and

multimodality (Jewitt, 2006; Vance, 2017), and (5) video games and inclusion (Admiraal et al., 2014; Malinverni et al., 2014). Given the increase in video game studies, this study was considered timely to broaden understandings of the virtual and physical social interactions of students with an ASD, within the context of online multiplayer games. Although extensive research has been carried out on video gaming, no single study exists that describes the multimodal affordances of online multiplayer games for students on the autism spectrum.

Empirical and theoretical gaming literature indicates that online multiplayer games have potentials for gamers to develop literacies skills and to develop new identities in affinity spaces (Beavis, 2014; Gee, 2015a; Greitemeyer & Cox, 2013; Marcon & Faulkner, 2016). Gamers have opportunities to engage in conversations and to establish relationships (Dezuanni et al., 2015; Eklund & Roman, 2017; Jia et al., 2015; Yee, 2014). In contrast, the literature indicates that online multiplayer games may promote antisocial behaviours and problem behaviours, such as violence and aggressive behaviours (Ewoldsen et al., 2012; Mazurek & Engelhardt, 2013b). Research suggests that they may facilitate time squandering (Gentile, 2009; Mazurek, Shattuck, Wagner, & Cooper, 2012) and conflicts in relationships (Coyne, Jensen, Smith, & Erickson, 2016; Power, 2008). Despite these findings, there is little knowledge about the potentials and constraints of online multiplayer games for the social interactions of middle-primary-school students on the autism spectrum. This chapter proceeds with a discussion of the research significance and aims of the study to broaden understandings in this context.

## **1.2 The Significance and Aims of the Study**

The topic of this research, “The affordances of online multiplayer games for the social interactions of middle-primary-school-aged students with an ASD”, is situated within two fields of education: (1) the NLS (Kalantzis & Cope, 2012; Mills, 2010a; Street, 2013), and (2) inclusive practices for supporting students with an ASD (Able, Sreckovic, Schultz, Garwood, & Sherman,

2015; Ashman, 2014; Shochet et al., 2016). Within these fields, there exists a lack of literature about the affordances of literacies practices for the social interactions of students with an ASD. In the context of describing “literacies practices”, the term *practices* refers to regularly repeated literacies activities that allow social interactions (Rogers & Street, 2012; Street, 2013). While there is information about digital and inclusive literacies practices and game studies (Beavis, O’Mara, & McNeice, 2012; Boon, Spencer, & Deshler, 2013; Price-Dennis, Holmes, & Smith, 2015), a multimodal description of how online multiplayer games influence the social interactions of students with an ASD has not been researched. This research, therefore, makes an original contribution to the fields of NLS and inclusive practices.

Theoretical differences in empirical studies about video games also contribute to the gap in understanding the social interaction affordances of online multiplayer games from multimodal perspectives (Jewitt, 2017, Chapter 2) and D/discourse perspectives (Gee & Handford, 2012). What this study adds to the body of research is a unified theoretical perspective of multimodality and D/discourses, framed within conceptualisation of “inclusive new literacies” for students with an ASD. The notion of inclusive new literacies in this research extends the notion of inclusive education to the field of NLS. It recognises the rights, literacies practices, and social needs of literacies learners, such as students with an ASD (Street, 2013, CRPD, 2016). Inclusive new literacies is about recognising and embracing the notion that new literacies provide, facilitate, or enable multimodal and differentiated support for all students within physical, virtual, online, and offline spaces, whether or not they have a medical diagnosis or disability. The notion of inclusive new literacies and the new contribution of this conceptualisation to NLS and inclusive education are discussed further in section 3.4 of Chapter Three and section 7.3 of Chapter Seven.

The aims of this study are important in two ways: first, in contributing to the body of knowledge about how online multiplayer games support or hinder the social interaction needs of



students with an ASD; and second, through unifying theoretical and conceptual perspectives and discourses of ASD, literacies, and inclusion. While there is much information about the video game engagements and the social interactions of students with an ASD (Gallup et al., 2016; Mazurek & Engelhardt, 2013a), a descriptive ethnographic case study of how online multiplayer games benefit or constrain the social interactions of middle-primary-school students with an ASD has not been conducted. Given the scientific understandings of an ASD diagnosis, an increase in its prevalence (Christensen et al., 2016), and the high interest of students on the spectrum with video games (Finke, Hickerson, & McLaughlin, 2015), this study is timely and necessary in its aim to expand understandings of social interactions for students with an ASD.

The study also aims to describe observations of students with an ASD's online interactions with *Minecraft*® and understand how their at-screen social interactions influence their face-to-face offline social interactions. In so doing, it explores multimodal aspects of the online and offline social interactions of students with an ASD that have not yet been described. The study intends to describe the multimodal forms of social communication that the students used when they engaged with online multiplayer games, and their meanings for social interactions (Kress, 2013). It aims to offer empirical evidence about student, parent, and teacher perspectives of the enabling and constraining features of online multiplayer games for the social interactions of students with an ASD. In summary, this study is important in that it offers new empirical insights into the potentials and constraints of online multiplayer games for the social interactions of students with an ASD. The following questions have been formed to achieve the aims of the research.

### **1.3 The Research Questions**

This study was designed to answer the following research question:

- What are the potentials and constraints of online multiplayer games for the social interactions of 9-to-10-year-old students with an ASD?

From the main focus question, the subquestions included

- (a) What multimodal forms of social communication do students with an ASD use when engaging with online multiplayer games?
- (b) What are parents' perspectives of the enabling and constraining features of online multiplayer games for the social interactions of children with an ASD?
- (c) What are teachers' perspectives of the enabling and constraining features of online multiplayer games for the social interactions of students with an ASD within formal educational settings?

To answer the research questions, this descriptive ethnographic case study research incorporated two geographic sites and two qualitative research methods (Hammersley, 2007; Robben & Sluka, 2015). This design included data collection and content analysis of video-recorded observations, and video-recorded and audio-recorded semi-structured interviews in the homes of three student participants and in one primary school.

**1.3.1 Explaining key terms.** The following are explanations of key terms used in the research questions and in the study: clarified here for the purpose of this research. The key terms that are defined below are affordances, ASD, constraints, multimodal, online multiplayer games, potentials, social communication, semiotic resources, and social interaction.

*Affordances*—The study describes the affordances of online multiplayer games for the social interactions of students with an ASD. From a multimodal theoretical perspective, the notion of *affordances* is understood to include not just the potentials, benefits, and rewards associated with social communication modes (Gibson, 1977, Chapter 3), but also what they constrain, limit, inhibit, or hinder (Kress, 2013). By adapting the works by Jewitt (2008) on multimodality and Woods (2017) on the social model of disability and ASD, affordances are revealed through what is possible to communicate repetitively through (a) social communication modes in physical, material, virtual,

and social ways; and (b) environmental and institutional offers that are perceived to have support or barriers for social interactions.

*ASD*—This research focuses on one group of middle-primary-school students diagnosed with an ASD. ASD is described as a neuro-developmental condition of prenatal origin (American Psychiatric Association, 2013) that is characterised by two key diagnostic characteristics; namely, persistent social communication difficulties, and restricted and repetitive patterns in behaviours, interests, or activities (American Psychiatric Association, 2013). The social interaction support and perspectives of students with an ASD within the context of inclusive education and video game research continue to be areas of research interest (Boyd et al., 2015; Humphrey & Lewis, 2008; Siggers, 2015).

*Constraints*—Drawing on the works by multimodal theorists (Jewitt, 2017, Chapter 1; Kress, 2013), medical and social model of disability theorists (Waltz, 2013; Woods, 2017), and video gaming researchers (Bainbridge & Marchionini, 2010; Beavis, 2014), the term *constraints* refers to the constraining features associated with the semiotic resources of online multiplayer games. It is used to understand how social communication modes reveal that players, with or without disabilities, are restricted from interacting with people, and the games' properties. The term *constraints* is extended to mean that personal, virtual, physical, social, historical, and cultural factors may hinder unique aspects of social interaction for gamers. The notion of semiotic resources is described below.

*Multimodal*—The current research describes the multimodal forms of social communication that students with an ASD used as they engaged with online multiplayer games. The notion of *multimodal* in this research builds on Halliday's (1978) linguistic origins of social semiotic theory of communication, and embraces Jewitt's (2017) and Kress's (2013) notions of multimodality. From these perspectives, *multimodal* is defined as the combination of resources for multiple ways

of meaning making and social communication, including written and spoken language, visual, and gestural (Cope, Kalantzis, & New London, 2000). These social communication forms give way to the use of social communication modes. Social communication modes are defined for this research as meaning making resources that are culturally and socially shaped (Kress, 2013). Image, sound, speech, and gesture are examples of modes listed in this research.

*Online multiplayer games*—This study describes how the affordances of online multiplayer games influenced the social interactions of students with an ASD. The term *online multiplayer games* refers to online digital games that require the engagement of multiple or small team of players who may be physically distant, but simultaneously interacting in the game, and who must be able to focus on or be engaged in the same activity or event with one or more social partners (Bainbridge & Marchionini, 2010; Quandt & Kröger, 2014). Online multiplayer games are described as a multimodal Discourse because they provide contextual ways for players to socially interact through a combination of language and other social communication modes, social practices, events, objects, and technologies (Gee, 2015b).

*Potentials*—One of the key aims of the study is to examine the potentials of online multiplayer games for the social interactions of students with an ASD. Several understandings of the term *potentials* are embraced and established for the purpose of the research. Drawing on Gibson (1977, Chapter 3) and Jewitt (2017), the term potentials constitutes the perceived and actual provisions, and beneficial affordances or offerings of the online or offline, physical or virtual meaning making resources of online multiplayer games. By drawing on medical and social model perspectives of ASD, the notion of potentials is extended to mean that some personal, virtual, physical, social, historical, and cultural factors may benefit unique aspects of social interactions for some gamers (Waltz, 2013; Woods, 2017).

*Semiotic resources*—Online multiplayer games are understood to have resources that contribute to meaning making (Gee, 2015b). For the purpose of this research, the notion of *semiotic resources* is defined as the discourses, social communication modes, actions, communication media, digital tools, material resources, and artefacts that are available for use, and that have communicative, representational, and interactional meanings for social events, such as social interactions (Jewitt, 2017, Chapter 1). This definition of semiotic resources enables the recognition of virtual signs and material resources for their meaning potentials about social interactions (Kress, 2012, Chapter 3). It also guides analysis of visual images and symbols (O'Halloran, 2005) and observable environmental and bodily features for meaning making (Bjorkvall, 2017). The notion of semiotic resources adds depth to interpreting communicative and representational resources in physical, material, and virtual contexts (Kress & Van Leeuwen, 2006).

*Social communication*—The current research describes the multimodal forms of social communication that students with an ASD used as they engaged with online multiplayer games. The term *social communication* for the purpose of this research is focused on the use of modes of verbal and nonverbal language and behaviour to communicate socially in social interactions (Fiedler, 2007). While engaging with one or more social partner in online multiplayer games, gamers use multimodal forms of social communication. For example, gamers engage with the audio form of social communication through the in-game sounds (Stevens, 2011). They also engage with the visual mode through images on the screens (Dezuanni et al., 2015). Some students with an ASD experience difficulties in the category of social communication, if they experience difficulties in social-emotional reciprocity, communicative behaviours, and skills in developing, sustaining and understanding relationships, which are necessary for social interactions (American Psychiatric Association, 2013).

*Social interactions*—This research examines parent and teacher perspectives of online multiplayer games for the social interactions of students with an ASD. For the purpose of this research, the term *social interaction* is described as the mutually regulated process to communicate, share, and respond to the needs, emotions, relational intentions, ideas, and meanings of others (American Psychiatric Association, 2000; Peters, Forlin, McInerney, & Maclean, 2013). Social interactions can be in a physical face-to-face context, such as in a classroom, or an online virtual context, such as an online multiplayer game. In both contexts, the individuals use a variety of semiotic resources and literacies to share information and gain meaning (Bailey, Burnette, & Merchant, 2017, Chapter 15).

The social interactions of students with an ASD can also be understood from a clinical perspective and through the perspectives of medically-based processes (Waltz, 2013). From this perspective, the social interaction difficulties that a student with an ASD experiences are understood to be innate and caused by the severity of ASD characteristics (Anagnostou, 2015). On the contrary, under the social model of disability, the assumption is that the difficulties experienced in social interactions by students with an ASD are socially created by oppression in their social contexts, physical environments, and complex forms of structural and institutional discrimination (Oliver, 2013). From this perspective, there is scepticism regarding claims to the increased prevalence of ASD, and about the use of labels that influence negative discourses and perspectives of the social interactions of students with an ASD (Graham & Cole, 2012; Richards, 2016). Given a broadened understanding of the spectrum and social interaction difficulties through medical and social perspectives (Woods, 2017), new research into the social interactions of primary-school-aged students with an ASD is therefore necessary. The definition of the key terms used in the research questions is followed by the justification of the research questions.

**1.3.2 Justification of the research questions.** The research question is justified by the identified gap in the literature about the potentials and constraints of online multiplayer games for the social interactions of students with an ASD. This question is also justified by the perspective that social interactions and literacies practices need to be observed, analysed, described, and interpreted while they are shaped and embedded within the strong common interests and social interaction spaces of individuals (Gee, 2015b; Rogers & Street, 2012). The main research question is also justified in its aim to describe engagements with online multiplayer games that are embedded within literacies and social interaction practices, in physical contexts and in offline contexts (Ferdig & De Freitas, 2012; Gee, 2007a). As Merchant, Gillen, Marsh, and Davies (2014) highlight, social interactions and literacies are situated beyond engagement with printed texts in physical environments. The main research question highlights the complexity of social interactions for students with an ASD (American Psychiatric Association, 2013). It emphasises the need for broader understandings of the social interaction potentials and benefits of online multiplayer games.

The multimodal nature of social interactions through the theoretical lens of multimodality is considered (Kress, 2013). Several available forms of social communication and other semiotic resources shape the meaning of virtual and physical social interactions (Lemke, 2017, Chapter 11). With this consideration, research subquestion 1a is justified in that it aimed to investigate (a) the multimodal forms of social communication that students with an ASD used during engagements with online multiplayer games, and (b) the affordances that those communication forms revealed for their social interactions (Jewitt, 2017, Chapter 1). This question addresses the notion that meaning can be made from multiple semiotic systems and resources, including spoken and written language, social practices, experiences, and perspectives within the participant groups (Gee, 2004).

Research subquestion 1b was built on the premise that we do not know how parents of children with an ASD see the relations between the multimodal affordances of online multiplayer

games and their children's social interactions. Students are increasingly engaging with the new literacies practices of video games, particularly in the home environment (Engelhardt, Mazurek, & Sohl, 2013; Mazurek & Engelhardt, 2013a). Gaining the perspectives of parents in this research context therefore guided the understanding of how students with an ASD engage in social interactions beyond the classroom, across different settings with different people, and in different activities. Instead of relying solely on school or clinical data about the social interactions of students with an ASD, working together with parents offered insights and access to important knowledge into students' home and online literacies practices (Bourgonjon, Valcke, Soetaert, De Wever, & Schellens, 2011).

The importance of the knowledge of teachers about the lives and literacies of students with an ASD is recognised (Carrington, Deppeler, & Moss, 2010). Given the prominent role of schools and teachers in the literacies education of students with and without an ASD (Price-Dennis et al., 2015), research subquestion 1c was formed in acknowledgement of the importance of teacher perspectives. The researcher also considers that the literature is sparse on teacher perspectives of the enabling and constraining features of online multiplayer games for the social interactions of middle-primary-school students with an ASD, within an educational setting.

Research subquestion 1c is justified for its potentials to yield data about the use of online multiplayer games as inclusive resources within formal educational environments (Admiraal et al., 2014; Jorgensen & Lowrie, 2011). It was inferred that online multiplayer games are inclusive because they support the participation and needs of a diversity of online gamers through various spaces, tools, resources, and social communication modes (Jorgensen & Lowrie, 2011; Malinverni et al., 2014). Additionally, social, economic, and physical barriers are being removed so that gamers can socially interact together in virtual affinity spaces (Gee, 2015b). Accordingly, research subquestion 1c aims to broaden understanding of how virtual contexts can support inclusive



practices and in turn promote inclusion, by demonstrating how virtual contexts can support all students regardless of the differences and disabilities that they experience, and their diverse needs, backgrounds, and capabilities (Admiraal et al., 2014; Carrington, 2017, Chapter 15; CRPD, 2016; Finke et al., 2015).

Research suggests that parent and teacher perspectives of the benefits and constraints of digital technologies can influence students' use of technologies and provide insights into how students' social interaction needs can be facilitated through digital technologies (Edwards, Henderson, Gronn, Scott, & Mirkhil, 2017). Therefore, it was anticipated that the views of parents and teachers would yield a stronger description and contribution to practical recommendations and future educational research in relation to the affordances of online multiplayer games for the social interactions of students with an ASD. As such, researching subquestions 1b and 1c, of how parents and teachers perceived online multiplayer games for social interactions was an attempt to involve knowledgeable stakeholders in the research process. Research subquestions 1b and 1c aim to access multiple audiences, and to capture, describe, and share multiple perspectives about the potentials and constraints of online multiplayer games for the social interactions of students with an ASD. The term *multiple perspectives*, in the context of the research topic and theoretical perspectives, refers to gaining rich, in-depth understanding and evidence of the research problem from different viewpoints, multiple participants, and multiple data sources in the study (Santoro, 2014; Simons, 2009).

For decades, the social interactions of students with an ASD have been frequently researched in the literature (Feinstein, 2010; Kanner, 1971), particularly in physical and virtual environments (Ferguson, Gillis, & Sevlever, 2013; Kasari, Locke, Gulsrud, & Rotheram-Fuller, 2011). Kasari et al. (2011) report findings of students on the spectrum and their social interactions in playgrounds and classrooms with friends and peers. Ferguson et al. (2013) have observed students with an ASD

during video game play and their displays of turn taking, giving compliments, and other sportsmanship skills. Similarly, during her professional role as a teacher, the researcher of this current study also observed primary-school students on the spectrum engaged in physical social interactions with their peers in classroom and playground settings. They were seen socially interacting in virtual environments through computer and *iPads*<sup>TM</sup> screens. At times there appeared to be a convergence between their physical and virtual interactions. Convergence of interactions refers to the cross-referential correlation between physical and virtual social interactions because of the connection between material and nonmaterial semiotic resources in online and offline play and social interaction activities (Edwards, 2013, 2016). Edwards (2013) argues that digital and analogue play converge and are interrelated. Her study provides insight into embracing the cross-referential correlation between physical and virtual social interactions. Likewise, research and the researcher's informal observations justify the need to describe and understand social interactions of students with an ASD across various environments instead of an emphasis on behavioural observations in physical environments (American Psychiatric Association, 2013; Feinstein, 2010; Ferguson et al., 2013; Kuo et al., 2014).

#### **1.4 Overview of the Thesis**

Chapter One briefly introduced literature that illuminated the increasing prevalence rates of ASD and the need for social interaction support in inclusive educational contexts (Christensen et al., 2016). It discussed the research significance and aim, given the increased engagements of students with an ASD with the literacies practices of online multiplayer games (Gallup et al., 2016; Kuo et al., 2014). The research questions were presented and justified, with key terms defined. Medical and social discourses, and theoretical and conceptual notions were briefly discussed to embrace a broader conceptualisation of the social interactions of students with an ASD (Waltz, 2013; Woods, 2017).

Chapter Two reviews relevant literature pertaining to the characteristics of ASD (American Psychiatric Association, 2000, 2013). Attention is drawn to the medical versus social models of ASD (Waltz, 2013). The review focuses on understanding how social interactions are influenced by the characteristics of ASD (Anagnostou, 2015; Peters et al., 2013). Chapter Two subsequently highlights pertinent literature on inclusion within the context of inclusive education and NLS (Oakley, 2017, Chapter 10; Price-Dennis et al., 2015; Whitburn et al., 2017, Chapter 3). Focus is placed on new literacies, multimodality, and online multiplayer games (Mills, 2010a; Quandt & Kröger, 2014).

Chapter Three justifies the use of theoretical perspectives of D/discourse (Gee & Handford, 2012) and multimodality (Jewitt, 2017, Chapter 1), and explains how they framed the research design and methodology. This chapter describes how both theories supported data analysis and interpretation of the social interaction affordances of online multiplayer games. It also describes the conceptual framework of inclusive new literacies. This chapter explains the integrated stance that is fused with concepts, ideas, and notions from NLS and contemporary literacies research (Bailey et al., 2017, Chapter 15; Mills, 2010a), and from inclusive education research (Whitburn & Plows, 2017, Chapter 1). Relevant aspects of the medical and social models of disability are integrated within the discussions (Waltz, 2013).

Chapter Four contextualises the study and describes the research ethnographic case study design and methodology. A pilot study is also discussed. This chapter details how the qualitative nature of an ethnographic case study was ideal to gain observable evidence of social interactions and in-depth understandings of social interactions through the multiple perspectives of the research participants (Robben & Sluka, 2015). Descriptions are given of purposefully selected research participants (Suri, 2011): three students with an ASD, five peer students without an ASD, three parents, and five teachers. The appropriateness of video-recorded observations (Pink, 2007), and

video-recorded and audio-recorded semistructured interviews (Warren & Karner, 2010), is also described. The data sets and their relevance to the study's aim, and for collecting, analysing, and interpreting the study's data are discussed in more detail in this chapter. Chapter Four ends with descriptions of the validity of the research and the ethical conduct of the study.

Due to the magnitude and richness of the data, the descriptions and discussions of the research findings are presented in two data analysis and discussion chapters. Chapter Five focuses on the potentials of online multiplayer games for the social interactions of students with an ASD. Multimodal (Jewitt, 2017, Chapter 2) and D/discourse (Gee, 2015b) analysis guided the descriptions and discussions of the social interaction support that the students received, and how the students developed and sustained friendships, and enhanced their display of reciprocity within the context of online multiplayer games. The implications of the findings for supporting the diverse social interaction needs of students with an ASD are discussed (Australian Bureau of Statistics, 2017).

Chapter Six describes and discusses the findings on the social interaction constraints of online multiplayer games, for students with an ASD. The Chapter presents descriptions and discussions of the findings that revealed social interaction constraints associated with repeated uses of social communication modes and external restrictions of online multiplayer games. The chapter also discusses relevant findings about difficulties in relationships. Implications of the findings for the social interaction support of students are discussed.

Chapter Seven begins with a summary of the research, including a discussion of the research aims and a report of the research findings. The chapter also includes a discussion of the research limitations and recommendations for future research. A proposed model of inclusive new literacies and a proposed framework for multimodal support are developed and discussed. The thesis

concludes with recommendations for educators to support the social interactions of students through the multimodal potentials of online multiplayer games.

### **1.5 Conclusion to Chapter One**

This study aims to describe and broaden understandings of the social interaction potentials and constraints of online multiplayer games, for students with an ASD. The rationale for this study is stimulated by the increase prevalence of students diagnosed with an ASD (Christensen et al., 2016) and by the growing interest in online multiplayer games among primary-school students with and without an ASD (Dezuanni et al., 2015; Hota & Derbaix, 2016; Mazurek & Engelhardt, 2013a). The aim of this research required medical and social understandings of ASD (Waltz, 2013). The ongoing philosophical tension between the discourses of the medical model and the social model of disability was acknowledged and has provided important implications to reinvigorate and broaden understandings of the social interactions of students with an ASD (Woods, 2017).

This Chapter also acknowledged that literacies and social interactions take many multimodal forms (Bailey et al., 2017, Chapter 15; Street et al., 2017, Chapter 16), and are embedded within a variety of online and offline contexts (Gee, 2015a; Street, 2013). It established that social interactions for students with an ASD extend outside of the parameters of a medical diagnosis, occurring beyond the physical walls of school environments. Social interactions extend beyond behavioural characteristics, and these interactions are typically multimodal (Nakano, Kato, & Kitazawa, 2012; Porayska-Pomsta et al., 2012). As newer concepts of social interaction are embraced, teachers are encouraged to embrace students' contemporary play experiences through a diversity of digital literacies as these may be useful in influencing pedagogical practices and student learning (Edwards, 2016).

A study such as this aims to add to the growing body of research on students with an ASD and video games, including those played online with other gamers. The importance of the study is

highlighted by its contribution to previous research that has explored how the social interactions of students with an ASD may be affected by video games. For example, the sportsmanship (Ferguson et al., 2013), physical activities (Strahan & Elder, 2015), and anxiety (Wijnhoven et al., 2015) of students with an ASD have been examined within the context of video games. However, these studies were not from a multimodal perspective (Jewitt, 2017, Chapter 2) and D/discourse perspective (Gee, 2014), neither were they explored within the context of online multiplayer games and students with an ASD.

Previous research has highlighted the relevance of student, parent, and teacher perspectives of video games for students with an ASD (Finke et al., 2015; Marino, Israel, Beecher, & Basham, 2013). Although some video games have been accepted within formal educational contexts (Bourgonjon et al., 2011; Bourgonjon, Valcke, Soetaert, & Schellens, 2010), the multimodal affordances of online multiplayer games need to be better understood before they can earn a place in supporting the social needs of students with an ASD, in formal and informal educational settings. Chapter One has highlighted the expectation that this study will contribute new understandings of the multimodal potential and constraints of online multiplayer games for the social interactions of students with an ASD. Although there is research information about the video game engagement of students with an ASD, the multimodal affordances of online gaming for students on the spectrum has not been addressed in previous research. This Chapter foregrounds the conclusion of this study that the multimodal potentials and literacies of online multiplayer games may be used as inclusive classroom resources to support the online and offline social interactions of all students, including those with an ASD.

## Chapter Two: Literature Review

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The previous chapter discussed the increasing prevalence rates of ASD, and the need for social interaction support in inclusive educational contexts (Australian Bureau of Statistics, 2017; Christensen et al., 2016). Focus was paid to the increased engagements of students with an ASD with online multiplayer games (Gallup et al., 2016; Kuo et al., 2014). The research significance, aim, questions, and the key terms were introduced. Chapter One laid the foundation to broaden understandings of social interactions by briefly highlighting medical and social discourses of disability (Waltz, 2013; Woods, 2017). It also drew on the existing literature to establish the relevance of multimodal perspectives (Jewitt, 2017, Chapter 2) and D/discourse perspectives (Gee, 2014) for rethinking the meanings of new literacies and social interactions (Peters et al., 2013; Oakley, 2017, Chapter 10). The contents of Chapter Two are now explained.

Relevant literature that pertains to the diagnostic criteria and characteristics of ASD is reviewed in Chapter Two (American Psychiatric Association, 2000, 2013). Given that there is extensive work in the social interactions of students with an ASD (Mahoney, Breitborde, Leone, & Ghuman, 2014; Watkins et al., 2015), the review in section 2.1 is required to understand how social interactions are influenced by the characteristics of ASD. Within this discussion, attention is drawn to the literature on the support that students with an ASD receive within inclusive formal educational contexts (Al-Ghani, & Al-Ghani, 2011; Aresti-Bartolome & Garcia-Zapirain, 2014; Ozuna et al., 2015). Literature of the medical and social models of disability, and their influence on the classification and diagnosis of ASD, is also reviewed (Waltz, 2013).

In sections 2.2 and 2.3 pertinent literature on inclusion (Slee, 2011), inclusive education (Plows & Whitburn, 2017, Chapter 1), and NLS (Mills, 2010a) is reviewed, including the literature on multimodality and online multiplayer games (Gee, 2015b). This review is relevant given the aim

of the research, as stated in Chapter One. It is also relevant because of the importance of students' use of literacies, social capabilities, and technology in the classroom, as highlighted by the Australian Curriculum, Assessment and Reporting Authority (ACARA) general capabilities (ACARA, 2016). With a shift to a digital turn in NLS (Mills, 2010a) and the promotion of inclusive practices within inclusive educational contexts (CRPD, 2016; Liasidou, 2015), there needs to be a parallel shift for new understandings of new literacies, online multiplayer games, and the implication to support the social interactions of students with an ASD. Chapter Two concludes with a summary in section 2.4.

Table 1 provides a summary of over 60 studies that focus on the themes that are discussed within Chapter Two. Much attention is given to research topics such as the characteristics of ASD; student physical and virtual social interactions; friendships among students; multimodal support for students with an ASD; student literacies practices, and engagement with video games, such as online multiplayer games, by individuals on the spectrum. However, no research has been found that describes the multimodal ways that students on the spectrum engage through online multiplayer games and the social interaction affordances of their engagements through online multiplayer games. This table highlights differences in methodology, research participants, and data analysis among these previous studies and the current study. The main research findings of previous studies are highlighted.



Table 1

*A Critical Review of Literature*

References and methodological design	Data sets and data analysis	Research participants	Focus and key findings
Admiraal et al. (2014)  Quasi-experimental study	Data analysis— Analyses of covariance, multilevel regression analyses	458 x 12-to-16-year-old students	Focus—Gender-inclusive game-based learning in secondary education  Key findings—Boys and girls of the game intervention group showed higher test performance than students of the control group. Girls searched the Internet to complete assignments. Boys searched to compete. Technical problems negatively influenced performance.
Atkinson (2009)  Comparative study	Data analysis— An analysis of variance covariance, simple main effects analyses, regression analyses	13 x 18-to-58-year-old with ASD  16 x 17-to-54-year-old without ASD	Focus—Impaired recognition of emotions from body movements is associated with elevated motion coherence thresholds in ASD  Key findings—The group with ASD classified less emotions correctly than the group without ASD.
Bauminger et al. (2008)  Experimental study	Data sets— Observations, self-reports  Data analysis— Multidimensional assessments	44 x 8-to-12-year-old students with ASD  38 x 8-to-12-year-old students without ASD	Focus—Children with ASD and their friends  Key findings—Friendship behaviours of students with ASD were influenced by age and verbal abilities. Friendships of students with ASD may follow a developmental trajectory and may enhance students' social interaction skills and interpersonal awareness.
Beavis, Muspratt, & Thompson (2015)  Case study	Data sets— Surveys, interviews, field notes observations,  Data analysis— Curriculum planning, blogs, video recordings, artefacts	270 x 8-to-14-year-old students	Focus—'Computer games can get your brain working': Student experience and perceptions of digital games in the classroom.  Key findings—Games and game-based learning make their way into schools through play, discussions, analysis and creation of games. Perceived benefits include student problem solving, learning, engaging, socialising, and accumulating rewards. Perceived problems included technical difficulties, differing levels of expertise among students (and teachers) and the misuse of games.
Bekele et al. (2013)  Usability study	Data sets— System	10 x 13-to-17-year-old	Focus—Understanding how adolescents with autism respond to facial expressions in virtual reality environments

	performance, observations	adolescents with ASD	Key findings—Adolescents with ASD paid significant attention to irrelevant area such as the forehead while adolescents without ASD focused more on the mouth. Adolescents with ASD paid less attention to the eye area than adolescents without ASD. Adolescents with ASD spent much more time examining faces prior to response and were often less confident in their ratings.
	Data analysis—Physiological pattern, eye tracking data, principal component	10 x 13-to-17-year-old adolescents with ASD	
Bennett & Hay (2007)	Data set—Questionnaires	212 parents of children 5-to-12 years of age with physical disabilities	Focus—The role of family in the development of social skills in children with physical disabilities.
Investigative, theoretical model research	Data analysis—Exploratory, statistical tests, structural equation modelling		Key findings—Parental involvement is significant in the social skills development of children and for children to explore their social environments. Teacher opinion towards inclusion influence social outcomes of children with physical disabilities.
Bishop et al. (2013)	Data sets—Interview, questionnaire	1825 x 4-to-18-year-old children with ASD	Focus—Subcategories of restricted and repetitive behaviors in children with ASD
Investigative genetic study	Data analysis—Mplus, statistical, exploratory using promax rotation		Key findings—The behavioral domain of restricted and repetitive behaviors and interests is comprised of at least two subcategories, repetitive sensory motor and insistence on sameness behaviors. In children with ASD, these subcategories are significantly correlated with each other, but they also exhibit different relationships with other child characteristics (e.g. age).
Boddaert et al. (2004)	Data analysis—Positron emission tomography	11 x 4-to-10-year-old children with ASD	Focus—Perception of complex sounds in autism: Abnormal auditory cortical processing in children
Investigative, activation study		6 x 3-to-9-year-old children an intellectual disability	Key findings—Less activation localized in left speech-related areas of children with ASD. Abnormal cortical auditory processing could be involved in inadequate behavioral responses to sounds and in language difficulties characteristic of ASD.
Bonanno & Kommers (2008)	Data sets—Survey	17 x 16-to-18-year-old students	Focus—Exploring the influence of gender and gaming competence on attitudes towards using instructional games
Instrumental, investigative study	Data analysis—General linear model statistical analysis, 5-point Likert scale		Key findings—The survey ‘attitude to gaming’ enabled the design of instruction, addressed different gender-related attitudinal components, served as a tool for learner/gamer analysis, can be used in collaborative settings for organising groups according to attitudinal characteristics.

Bourgonjon, Valcke, Soetaert, De Wever, & Schellens (2011)	Data sets— questionnaire  Data analysis— Exploratory, confirmatory, statistical	858 parents of secondary school students	Focus—Parental acceptance of digital game-based learning  Key findings—Fifty nine percent of the variance in parents’ preference for video games can be explained by the model comprising hypotheses about learning opportunities, subjective norm, perceived negative effects of gaming, experience with video games, personal innovativeness, and gender.
Bourgonjon, Valcke, Soetaert, & Schellens (2010)	Data sets— Survey  Data analysis— Descriptive statistics, technology acceptance model, exploratory factor	858 x 12-to- 20-year-old students	Focus—Students’ perceptions of video games use in the classroom  Key findings—Students with ASD’s reference for video games use in the classroom is affected directly by student perception of: the games’ usefulness, ease of use, learning opportunities and personal experience afforded by video games.
Boyd, Conroy, Mancil, Nakao, & Alter (2007)	Data analysis— Structural analysis	3 x 5-year-old children with ASD	Focus—Effects of circumscribed interests on the social behaviors of children with ASD  Key findings—Circumscribed interests sessions resulted in longer durations of target-child initiated social interactions compared to less preferred sessions. Latency of participants’ initial social bids to peers was decreased when circumscribed interests were present.
Boyd et al. (2015)	Data analysis— Inductive and deductive approaches	8 x 9-to-11- year-old students with ASD	Focus—Evaluating a collaborative iPad game's impact on social relationships for children with ASD  Key findings—Video gaming technology and features can support friendships, memberships, and partnerships of children with ASD.
Braddock & Hilton (2016)	Data sets—Video- recorded observations  Data analysis— Applied behavior analysis	8 x 29-to-43- month-old children with symptoms of ASD	Focus—Arm and hand movement in children suspected of ASD  Key findings—Mean proportional use of arm and hand movement types were generally stable between time points. Two of 17 coded arm and hand movements significantly changed over the 6-week developmental period for appropriate actions on objects and the “give” meaningful communicative act. Aided augmentative and alternative communication was inconsistently used.
Buote, Wood, & Pratt (2009)	Data sets—Online and offline surveys	141 x 18-to19- year-old university students	Focus—Exploring similarities and differences between online and offline friendships: The role of attachment style  Key findings—The extent to which individuals sought out online friends did not differ as a function of attachment

Quasi-experimental design	Data analysis— Relationship questionnaire measure, intimacy scale, inventory, analysis of covariance		style. Friendship quality differed as function of attachment style, while differences among attachment styles for other friendship characteristics resulted only when context (online versus offline) was simultaneously considered.
Calder, Hill, & Pellicano (2013)  Systematic investigation	Data sets— Interview, observations, social network methods  Data analysis— Correlational, thematic	12 x 9-to-11-year-old students with ASD  11 peers  11 mothers  8 teachers	Focus—Sometimes I want to play by myself: Understanding what friendship means to children with ASD in primary schools  Key findings—Children with ASD reported satisfaction with their friendships, no child was socially isolated, the degree of inclusion in friendship networks varied widely. Children’s social motivation may determine the nature and extent of their friendships. Adults’ perception of children’s friendships may conflict with what children want.
Carrington et al. (2017)  Investigative report	Data set— Interviews  Data analysis— Nvivo 10	10 x 11-to-16-year-old students with ASD	Focus—Recommendations of students with ASD and their parents in regard to bullying and cyberbullying prevention and intervention  Key findings—Students and parents made recommendations to increase awareness of bullying; improve policies and procedures that can be communicated to students, teachers and parents; and support programs and strategies that develop communication and relationships within families and in schools. Parents called for schools to give harsher penalties for offenders.
Chamberlain, Kasari, & Rotheram-Fuller (2007)  Explorative, investigative study	Data sets— Survey, questionnaire,  Data analysis— Top 3 reciprocal calculations, loneliness and friendship qualities scales	398 x 2 <sup>nd</sup> -to-5 <sup>th</sup> -grade students, including 17 students with ASD	Focus—Involvement or isolation? The social networks of children with autism in regular classrooms  Key findings—Children reported on friendship qualities, peer acceptance, loneliness, and classroom social networks. Despite involvement in networks, children with autism experienced lower centrality, acceptance, companionship, and reciprocity; yet they did not report greater loneliness.
Chen & Tsai (2016)  Experimental case study	Data sets— Butterworth low pass filter, customized force plate  Data analysis— Statistical, an	16 x 11-year-old students with ASD  16 x 10-year-old-students without ASD	Focus—A light fingertip touch reduces postural sway in children with ASD  Key findings—Light touch reduced sway in children with and without ASD whether the eyes were open or closed, related sway decrease was stronger in the autistic group. The effects of a light fingertip touch on reducing postural

	analysis of covariance		sway appeared more efficient in children with ASD compared with children without ASD.
Cihak, Fahrenkrog, Ayres, & Smith (2010)	Data sets— Observation, video modeling,	4 x 6-to-8-year-old students with ASD	Focus—The use of video modeling via a video iPod and a system of least prompts to improve transitional behaviors for students with ASD in the general education classroom
Experimental	Data analysis— Intervention rating profile—15, statistical, interobserver agreement		Key findings—Four students with autism learned to manipulate a handheld device to watch video models, began transitioning more independently after the intervention was introduced and that their performance decreased with withdrawal of intervention. A portable video delivery system can aid students who spend considerable portions of their day in general education settings where traditional means of delivering video models may not be as accessible.
Coyne, Jensen, Smith, & Erickson (2016)	Data analysis— Sibling relationship inventory, hierarchical ordinary least squares analyses	508 x 16-year-old-adolescents with ASD	Focus—Super Mario™ brothers and sisters: Associations between co-playing video games and sibling conflict and affection
Longitudinal study			Key findings—Playing video games with a sibling was associated with higher levels of sibling affection for both boys and girls, but higher levels of conflict for boys only. Playing a violent video game with a brother was associated with lower levels of conflict in the sibling relationship.
Daniel & Billingsley (2010)	Data sets— Interviews, report cards, individualized education plans, physicians' reports	7 x 10-to-14-year-old boys with ASD	Focus—What boys with an ASD say about establishing and maintaining friendships
Interpretive phenomenology	Data analysis— Hyperresearch™		Key findings—All of the boys had friends. Establishing friendships was difficult aspect because of limited desire to initiate contact, intention to avoid violating school's social hierarchy, and concerns about being exploited or being a nuisance. One student preferred friendships within his family. Shared interests were critical to maintaining friendships. Friendships were maintained across distances and transitions.
Deckers, Roelofs, Muris, & Rinck (2014)	Data sets—Self-report	63 x 8-to-12-year-old children with ASD	Focus—Desire for social interaction in children with ASD
Experimental, clinical study	Data analysis— Wish for Social Interaction Scale, an analysis of covariance	69 x 7-to-12-year-old children without ASD	Key findings—Children with ASD showed a decreased explicit desire for social interaction, and an increased implicit approach tendency towards social as well as non-social stimuli, than children without ASD. Children with ASD showed a stronger tendency to pull social and non-social stimuli towards them.
Delano (2007)	Data sets—Video self-modeling	3 x 13-to-18-year-old	Focus—Improving written language performance of adolescents with ASD

Exploratory study, intervention, multiple baseline design	Data analysis— Interobserver agreement	students with ASD	Key findings—Students demonstrated gains in the number of words written and number of functional essay elements.
Depape, Hall, Tillmann, & Trainor (2012)	Data sets—tests across speech and music	54 x 11-to-18-year-old adolescent with ASD	Focus—Auditory processing in high-functioning adolescents with ASD  Key findings—Students showed poorer filtering, less audio-visual integration, less specialization for native phonemic and metrical categories, and a higher instance of absolute pitch. Early auditory remediation supports good communication and social functioning.
Experimental study	Data analysis— An analysis of covariance		
Dezuanni, O'Mara, Beavis, Potter, & Gilje (2015)	Data sets— photographic records, written accounts gameplay, interviews	8 x 8-to-9-year-old students	Focus—'Redstone is like electricity': Children's performative representations in and around <i>Minecraft</i> ®  Key findings—Engagement with <i>Minecraft</i> ® provide opportunities for students to socially interact, and to talk about, produce and design digital creations in classroom and virtual world spaces.
Investigative study	Data analysis— Notion of 'learning lives', curatorship in digital contexts, theories of performativity and recognition		
Doody & Bull (2013)	Data set— nonverbal and verbal tasks	20 students with ASD and 20 controls	Focus—Asperger's syndrome and the decoding of boredom, interest, and disagreement from body posture  Key findings—Participants with ASD performed as accurately as controls at matching fear body postures, but were significantly less accurate than controls verbally identifying these same stimuli. They were aware that the fear body posture stimuli represented a distinct emotion, took significantly longer than the controls to respond to anger body posture stimuli on a matching task.
Experimental study	Data analysis—t tests, quantile-quantile plots, analysis of variance		
Eilers & Hayes (2015)	Data set— Observations	3 x 3-to-7-year-old-children with ASD	Focus—Exposure and response prevention therapy with cognitive defusion exercises to reduce repetitive and restrictive behaviors displayed by children with ASD  Key findings—Experiment 1: Participants demonstrated a decrease in problem behavior following implementation of treatment which remained at near zero during a 3-month follow-up. Experiment 2: Students displayed larger and quicker decreases in problem behavior during the
Experimental study	Data analysis— Interobserver agreement, exact count-per-interval method		

			cognitive defusion exercise condition compared to the control exercise condition.
Eklund & Roman (2017)	Data set— Questionnaire	115 x 16-to-18-year-old students	Focus—Do adolescent gamers make friends offline? Identity and friendship formation in school
Longitudinal social network approach	Data analysis— Stochastic actor-oriented model		Key findings—Identifying as a gamer at the later part of the school year makes a friendship 1.5 times more likely. Shared identities related to digital gaming influence individuals' offline, everyday social relationships. Digital gaming motivates friendship formation.
Ferguson, Gillis, & Seveler (2013)	Data set— Observation	6 x 7-to-11-year-old children with ASD	Focus—A brief group intervention using video games to teach sportsmanship skills to children with ASD
Multiple baseline design, behavioral skills training approach	Data analysis— Inferential statistics, Wilcoxon signed rank test		Key findings—Teaching sportsmanship skills through video games and video-gaming technology may facilitate social learning for children with ASD.
Finke, Hickerson, & McLaughlin (2015)	Data set— Online survey	152 parents of children with ASD 8-to-12 years of age	Focus —Parental intention to support video game play by children with ASD: An application of the theory of planned behavior
Online survey	Data analysis— Statistical, regression analyses, planned behavior models		Key findings—Parents of children with ASD had positive attitudes about video game play, appeared to support video game play, and indicated that video game play had a positive impact on their child's development.
Finke, Wilkinson, & Hickerson (2016)	Data analysis— Statistical	11 individuals with ASD	Focus—Social referencing gaze behavior during a videogame task: Eye tracking evidence from children with and without an ASD
Investigative		8 individuals without ASD, 8-to-17 years of age	Key findings—Participants visually attended to the videogame stimulus similarly, with the possible exception of the written dialog box. Participants with ASD referenced the face of the videogame player with equal duration of fixation as their peers without ASD.
Fox & Tang (2014)	Data sets— Survey	301 x 18-to-44-year-old men and women	Focus—Sexism in online video games: The role of conformity to masculine norms and social dominance orientation
Online survey	Data analysis— Video game sexism scale, exploratory, regression		Key findings—Social dominance orientation and conformity to some types of masculine norms (e.g. desire for power over women and the need for heterosexual self-presentation).

Funabiki, Murai, & Toichi (2012) Investigative study	Data sets—Near-infrared spectroscopy, recall test  Data analysis—Analysis of variance, t-tests	11 x 16-year-old children with ASD 12 x 14-year-old children without ASD	Focus—Cortical activation during attention to sound in ASD  Key findings—The auditory cortex in children with ASD responds to sounds fully during attention. Unawareness to sounds in ASD could be due to inattention rather than dysfunction of the auditory cortex. Difficulties in attention control may account for the contrary behaviors of hypersensitivity and unawareness to sound in ASD.
Fuster, Carbonell, Chamorro, & Oberst (2013) Investigative study	Data sets—Online questionnaire  Data analysis—Analysis of variance, motivations scale	430 x 16-to-45-year-old online games players	Focus—Interaction with the game and motivation among players of massively multiplayer online role-playing games  Key findings—Gamers are motivated by opportunities to socialise, explore with other players, and achieve rewards and prestige through the games, and escape from reality. Massively multiplayer online role-playing games offer an attractive environment for a broad spectrum of people.
Gallup, Duff, Serianni, & Gallup (2016) Phenomenological study	Data sets—Interview  Data analysis—Emergent coding	3 x 16-to-21-year-old adolescents with ASD	Focus—An exploration of friendships and socialization for adolescents with autism engaged in massively multiplayer online role-playing games  Key findings—Youths with ASD articulated the desire to socialize, interact, and communicate in virtual environments; issues with being misunderstood; difficulties with identification and perceptions of friends; and awareness of rules in face-to-face and virtual contexts.
Gentile (2009) National study	Data sets—Survey, questionnaire  Data analysis—Scatter plots, gaming scale, adult involvement in media scale	1,178 x 8-to-18-youths	Focus—Pathological video-game use among youth ages 8 to 18  Key findings—About 8% of video-game players exhibited pathological patterns of play, pathological gamers spent twice as much time playing as nonpathological gamers and received poorer grades in school; pathological gaming showed comorbidity with attention problems. Pathological status significantly predicted poorer school performance even after controlling for sex, age, and weekly amount of video-game play.
Greitemeyer (2013) Empirical, quantitative study	Data sets—Survey  Data analysis—Meta-analysis	Study 1: 109 university students  Study 2: 85 university students	Focus—Playing video games cooperatively increases empathic concern  Key findings—Cooperative team-play ameliorated negative effects of violent video game play on empathy. Cooperative teamplay fostered consideration for others. Playing a neutral video game cooperatively in a team increased empathy



Greitemeyer & Cox (2013)	Data analysis— Mediation analysis	52 university students	Focus—There's no “I” in team: Effects of cooperative video games on cooperative behavior
Experimental design			Key findings—Cooperatively playing a video game increased cooperation in a mixed-motive decision dilemma task. Cooperative team play promoted feelings of cohesion, which activated trust
Greitemeyer & Mügge (2014)	Data sets—Data from 98 independent studies	36,965 participants	Focus—Video games do affect social outcomes: A Meta- Analytic Review of the Effects of Violent and Prosocial Video Game Play
Literature search	Data analysis— Meta-analytical test		Key findings—Video games may affect social outcomes. Violent video games increased aggression and aggression- related variables and decreased prosocial outcomes. Prosocial video games had the opposite effects. Video game exposure causally affected social outcomes in both short term and long term.
Herrera (2008)	Data sets— observation, questionnaire, interview	2 x 8-to-15- year-old students with ASD	Focus—Development of symbolic play through virtual reality tools in children with autistic spectrum disorders: Two case studies
Case studies	Data analysis— inter-observer		Key findings—Using a virtual reality tool may advance pretend play abilities after the intervention period in students with ASD, and a high degree of generalization of the acquired teaching in one of them.
Hobson, Lee, & Hobson (2009)	Data sets—Video- recorded observations	16 x 9-year- old-children with ASD	Focus—Qualities of symbolic play among children with autism: A social-developmental perspective
Cross-sectional study	Data analysis— Exploratory analysis, a group by task analysis	16 x 10-year- old children with learning difficulties or developmental delays.	Key findings—Children were similar in the mechanics of play, for example in making one thing stand for another and using materials flexibly. Children with ASD were rated as showing less playful pretend involving self- conscious awareness of pretending, investment in the symbolic meanings given to play materials, creativity, and fun.
Hopkins et al. (2011)	Data sets— photographs, schematic drawings, Benton Facial Recognition Test,	49 x 6-to-15- year-old children with ASD	Focus—Avatar assistant: Improving social skills in students with an ASD through a computer-based intervention
Randomized controlled, 2 (training) × 2 (group) × 2 (time) mixed factorial design			Key findings—Providing children with opportunities to practice attending to eye gaze, discriminating facial expressions and recognizing faces and emotions in Facesay’s structured environment with interactive, realistic avatar assistants improved their social skills abilities, emotion recognition, and social interactions.

Hota & Derbaix (2016)	Data sets—Focus groups, interviews	20 x 8-to-12-year-old children	Focus—A real child in a virtual world: Exploring whether children’s participation in massively multiplayer online role-playing games transforms them into virtual retail shoppers
Expository study	Data analysis—Hermeneutical process		Key findings—Children’s online play and participation in massively multiplayer online role-playing games communities is leading to the development of virtual retail shopping motivations and behaviour through the purchase of virtual tools and accessories by all children using virtual in-game money. Boys engage in virtual retail shopping because they need in-game progress and power gains, while girls engage because they need social status enhancement.
Howard & Patti Ducoff (2008)	Data sets—Survey, questionnaire	89 families with at least one child under 18 years old diagnosed with ASD	Focus—Electronic screen media for persons with ASD: Results of a survey
Clinical investigation	Data analysis—Statistical		Key findings—Children with ASD spent more time engaged with electronic screen media than any other leisure activity. Animated programs were more highly preferred.
Hughes et al. (2013)	Data sets—Observation	6 x 16-18-year-old students with ASD	Focus—Increasing conversational interactions between verbal high school students with autism and their peers without disabilities
Experimental study	Data analysis—Percentage of intervals, interobserver agreement		Key findings—The communication book package was associated with increased conversational interactions for all participants with their general education peers.
Ito et al. (2009)	Data sets—Questionnaires, interviews, diary studies, observations	Focus group interviews with 67 participants in total	Focus—Living and learning with new media: Summary of findings from the digital youth project
Ethnographic study	Data analysis—Content analyses of media sites, profiles, interpretive analysis	Digital kids questionnaire completed by 402 participants	Key findings—Participation in the digital age means to access online information and culture and the ability to participate in social and recreational activities online. Youth encounter economic barriers, institutional, social, and cultural constraints to online participation. Networked publics provide a context for youth to develop social norms in negotiation with their peers.
Locke, Shih, Kretzmann, & Kasari (2016)	Data sets—observation, survey, social network centrality	51 x 5-to-12-year-old-students with ASD	Focus—Examining playground engagement between elementary school children with and without ASD
Observational study		51 x 5-to-12-year-old-	Key findings—Students with ASD spent approximately 30% of their recess time engaged in solitary activities, whereas their classmates only spent approximately 9% of recess unengaged. Students with ASD spent about 40% of

	Data analysis— analysis of covariance	students without ASD	the recess period jointly engaged with peers in a reciprocal activity, conversation, or game as compared to 70% for matched classmates.
Malinverni et al. (2014)	Data sets— Observations	4 x 9-to-10- year-old students with ASD	Focus—An inclusive design approach for developing video games for children with ASD
Exploratory study	Data analysis— Autism diagnostic observation schedule, autism diagnostic interview revised		Key findings—Children with ASD found the game’s elements and mechanics appealing, positively accepted the game and displayed social interaction behaviours, such as social smiling, visual contact, vocalization directed toward people or the game character, and descriptive gestures.
Mazurek & Engelhardt (2013a)	Data sets— Questionnaires	Parents of 56 x 8-to-18-year old boys with ASD	Focus—Video game use in boys with ASD, ADHD, or typical development
Longitudinal study	Data analysis— Analysis of covariance, problem video game playing test, rating scale, questionnaire	44 x 8-to-18- year old boys with attention- deficit/hyperac- tivity disorder  41 x 8-to-18- year old boys without ASD and attention- deficit/hyperac- tivity disorder	Key findings—Boys with ASD spent more time than did boys without ASD playing video games (2.1 vs 1.2 h/d) and had greater in-room video game access and greater problematic video game use than those without ASD.
Mazurek & Engelhardt (2013b)	Data set— Questionnaire	Parents of 169 x 56 x 8-to- 18-year old boys with ASD	Focus—Video game use and problem behaviors in boys with ASD
Longitudinal study	Data analysis— Problem video game playing test, rating scale		Key findings—Parents of children with ASD reported that assessing video game use is important for them. Boys with ASD who played Role-Playing games had higher levels of both problematic game use and oppositional behavior, even when controlling for age and amount of time spent playing video games.
Mazurek, Engelhardt, & Clark (2015)	Data set— Interviews	58 x 17-to-25- year-old adults with ASD	Focus—Video games from the perspective of adults with ASD
Longitudinal study	Data analysis— Iterative and collaborative process		Key findings—Game play motives for adults with ASD included enjoying achievement, creativity, story, and game graphics, experiencing stress relief, and social connection. Addiction and negative social interactions, game violence, sexual content, and game design problems were identified as negative game aspects.

Mazurek, Shattuck, Wagner, & Cooper (2012)	Data sets— interviewing, questionnaire	Sample from 11, 000 x 13- to-17-year old youths	Focus—Prevalence and correlates of screen-based media use among youths with ASD
Longitudinal transition study	Data analysis— Logistic regressions with dummy indicators, Stata 11	920 participants with ASD from parents’ data  2,590 youths without ASD	Key findings—The majority of youths with ASD (64.2%) spent most of their free time using non-social media playing video games.
Mazurek & Wenstrup (2013)	Data sets— Survey	202 x 8-to-18- year-old children and adolescents with ASD	Focus—Television, video game and social media use among children with an ASD and typically developing siblings
Longitudinal study	Data analysis— Problem video game playing test, descriptive, analysis of covariance	179 x 8-to-18- year-old siblings without ASD	Key findings—Children with ASD spent approximately 62 % more time watching television and playing video games than in all non-screen activities combined. Compared with siblings without ASD, children with ASD spent more hours per day playing video games (2.4 vs. 1.6 for boys, and 1.8 vs. 0.8 for girls), and had higher levels of problematic video game use. Children with ASD spent little time using social media or socially interactive video games.
Mitchell, Parsons, & Leonard (2007)	Data sets—Video- recorded virtual reality experiences, video measures  Data analysis— Analysis of covariance, t-tests	6 x 14-to-15- year-old adolescents with ASD	Focus—Using virtual environments for teaching social understanding to 6 adolescents with ASD  Key findings—There were several instances of significant improvement in judgments. Virtual reality has potential for teaching social skills, such as judgments and reasoning.
Nikken & Jansz (2006)	Data set—Internet survey	536 parent- child dyads (children—8- to-18 years old)	Focus—Parental mediation of children’s videogame playing: A comparison of the reports by parents and children
Survey	Data analysis— Factor analyses		Key findings—Parental mediation of videogaming was predicted by the child's age and parents’ game behavior. Parents applied more restrictive and active mediation when they feared negative behavioral effects and more often co-played with their children when they expected positive social-emotional effects of gaming.
Orsmond & Kuo (2011)	Data sets— Survey, interview, time diaries	Mothers of 103 x 12-to- 21-year-old	Focus—The daily lives of adolescents with an ASD: Discretionary time use and activity partners

Longitudinal study	Data analysis— Scores from the autism diagnostic interview-revised, standardized algorithms, non-parametric	adolescents with ASD	Key findings—Adolescents with an ASD spent considerable time in discretionary activities, such as watching television, using a computer spending time alone or with their mothers. They spent little time engaged in conversations or doing activities with peers. Age, gender, the presence of intellectual disability, severity of autism symptoms and maladaptive behaviors, the number of siblings, maternal education, marital status, and family income were associated with adolescent time use.
Peters, Forlin, mcinerney, & Maclean (2013)	Data sets— Activity-plans, interviews, email updates	12 x 5-to-7-year-old children with ASD	Focus—Social interaction and cooperative activities: Drawing plans as a means of increasing engagement for children with an ASD
Experimental study	Data analysis— Thematic approach		Key findings—Children's illustrations portrayed their concepts of play with others, communication, conflict, and humour, as well as eventually the inclusion of others in constructive activities.
Peterson, Slaughter, & Brownell (2015)	Data analysis— Shapiro–Wilk tests, body-emotion scores, theory of mind scores, Wilcoxon tests, and Spearman correlations	Study 1: 34 children with ASD, 41 controls without ASD  Study 2: 33 children with ASD, 31 controls without ASD	Focus—Children with ASD are skilled at reading emotion body language  Key findings—Children with ASD performed as well as their peers on the Body-Emotion test. Children without ASD outperformed the ASD group on theory of mind. Recognizing emotions from body posture was correlated with theory of mind, especially for children with ASD. Reading emotions from body posture was easier than reading emotions from eyes for both groups.
Petrina, Carter, & Stephenson (2017)	Data sets— survey, face-to-face interviews	54 teachers of Kindergarten-to-Year 3 students with ASD	Focus—Teacher perception of the importance of friendship and other outcome priorities in children with ASD
Investigative study	Data analysis—5-point ranking scale, rating approaches		Key findings—Teachers rated student friendships of similar importance to social skills and emotional development. Physical skill and motor development, and creativity were rated of lower importance than friendship. Special class teachers assigned higher ranks to learning outcomes that relate to the core deficits of ASD, namely social skills, friendship, and emotional development, as compared to mainstream class teachers. Teachers prioritized friendship according to student levels of autistic symptomatology.
Potts (2015)	Data sets—63 YouTube gameplay videos, 217,916	YouTube videos featured interactions between	Focus—‘Love you guys (no homo)’: How gamers and fans play with sexuality, gender, and <i>Minecraft</i> ® on YouTube
Triangulated study			Key findings—The production of nonheteronormative discourses by prominent gamers online has contributed to

	comments, interview	heterosexual males	the formation of a self-policing fan community that advocates acceptance and rejects bigotry.
	Data analysis— Sketch engine		
Strahan & Elder (2015)	Data analysis— Stress survey schedule, behavior assessment system, therapy attitude inventory	1 x 15-year- old student with ASD	Focus—Video game playing effects on obesity in an adolescent with ASD  Key findings—Active video game playing slowed and/or reduced weight and BMI with minimal changes to waist- to-hip ratios, triceps skinfolds, and stress and anxiety.
Case study			

The list presented in Table 1 supports the position of the thesis as being different from previous research in terms of its methodological rigor, analytical approach, and focus. This is the first study to describe the multimodal potential and constraints of online multiplayer games for the social interactions of students on the spectrum.

## 2.1 Medical versus Social Model of ASD

Primary-school students diagnosed with an ASD were selected as research participants. The review below discusses diagnostic criteria related to ASD and how these criteria are reflected in the characteristics of ASD (American Psychiatric Association, 2000, 2013). Attempts have been made over the past decades to categorise the differences the learning styles of students with an ASD and to provide diagnostic criteria for researchers and practitioners to support reliable identification of this group of students (Volkmar, 2014). Inherent to the clinical diagnosis of ASD are criteria that outline characteristics of ASD and the processes by which students can be identified, verified, and classified (Waltz, 2013). As a result, ASD is identified within educational, medical, and scientific communities as a neurobiological developmental condition that is behaviourally represented (Patel, Preedy, & Martin, 2014). Controversy exists, however, about the medicalised production of diagnostic classifications and categories of individual differences (Oliver, 2013). Several authors suggest that use of classification systems and lists of characteristics, including those for ASD, may

lead to a distortion and misunderstanding of their social interactions, depersonalisation, and dismissal of individual needs and uniqueness (Graham & Cole, 2012; Manago, Davis, & Goar, 2017). There is also the argument that important unique social interaction abilities and skills of students with an ASD can be buried and discarded if their characteristics are measured and categorised by what is considered to be the norm (Waltz, 2013).

From a social model perspective of disability individuals have a right to belong and feel valued (Newbold, 2012). Focus is on building on the individuals' strengths and abilities (Waltz, 2013). Hence, there is opposition to a medical model perspective of disability, the diagnostic criteria of ASD, and the perspective that the characteristics of ASD result from a developmental neurological condition that is intrinsic to the individual (American Psychiatric Association, 2013; Durell, 2014; Patel et al., 2014). The literature indicates that there are potentials for more neurodivergent labels that may positively influence understandings of ASD through a social model of disability (Levitt, 2017; Woods, 2017). This perspective is focused on enabling students, such as those who experience difficulties and challenges associated with an ASD, to receive much needed support and understanding from parents (Ozuna et al., 2015), teachers (Colvin & Sheehan, 2012), and peers (Katz & Girolametto, 2015).

The social model lens may be used to pay attention to learning and learning outcomes rather than to focus on a medical diagnosis (CRPD, 2016). By using a social model way of thinking, one may argue that the difficulties students face are not because of disorders, impairments, disabilities, or differences that they may have (Oliver, 2013). Rather, understandings of individual differences, disorders, and disabilities are embraced if the labels, discrimination, prejudices, and negative attitudes of others are transformed, and oppressions in social contexts, physical environments, and institutions are removed (Graham & Cole, 2012). Drawing on the works by Graham and Harwood (2011) and Gee (2015b), the emphasis from a social model perspective is to illuminate and

challenge the institutionally established barriers to student play in affinity spaces. A social model of thinking may include the removal of physical and social barriers to social interactions, particularly within the context of inclusive education (Booth & Ainscow, 2011). It is also important to make changes to external constraints that are embedded within physical environments and society instead of relying on medically-based solutions (Durell, 2014). The social model of disability offers a mindset of respecting, acknowledging, and valuing the strengths of students with an ASD (Woods, 2017).

The literature review continues with discussions of the importance of understanding the social interactions of students with an ASD. The discussion then draws on literature about the characteristics of ASD including social communication, and restricted and repetitive patterns of behaviours, interest, and activities (American Psychiatric Association, 2013). Perspectives of both the medical and social model of disability are integrated throughout the discussion (Waltz, 2013). This is possibly the first study to draw together medical and social perspectives of ASD to describe the social interactions affordances of online multiplayer games for students on the spectrum.

## **2.2 The Characteristics of ASD and their Implications for Social Interactions**

This section reviews literature on ways that the characteristics of ASD have been understood by researchers. Researchers continue to search for new understandings of the social interactions of students with an ASD as it relates to social communication, and restrictive and repetitive behaviours, activities, and interests (American Psychiatric Association, 2013). Success in social interactions is critical for students with an ASD to navigate engagement and play with others, achieving academic success, and functioning in day-to-day activities (Erickson, Miltenberger, & Charlop, 2014, Chapter 17).

The understanding of social interactions is significant because research indicates that some students with an ASD face social interaction difficulties (Deckers, Roelofs, Muris, & Rinck, 2014).



Studies show that, unless students with an ASD develop appropriate social interaction skills and competence, they may experience rejection, isolation, self-esteem, and low self-concept (Chamberlain, Kasari, & Rotheram-Fuller, 2007; Dean, Adams, & Kasari, 2013). Difficulties in social interactions for students with an ASD are associated with behavioural problems and proneness to receiving discipline unnecessarily (Erickson et al., 2014, Chapter 17; Humphrey & Symes, 2010b). Additional social interaction difficulties are discussed below in the literature review of social communication difficulties, and restricted and repetitive behaviours, interests, and activities.

To describe the affordances of online multiplayer games for the social interactions of students with an ASD, it is important first to draw on existing literature that offers understandings of the needs of students with ASD (Anagnostou, 2015) and how they could affect their social interactions (Scheeren, Koot, & Begeer, 2012). Additionally, for the purpose of this study, the characteristics of ASD are viewed as embedded within social interaction practices and discourses (Patel et al., 2014). A description of the characteristics of ASD is, therefore, significant to understanding students' social interactions in online contexts, such as in online multiplayer games, and in the home and school environments where literacies are a part of their daily lives (Kuo et al., 2014; Robledo, 2017). No previous study has investigated how characteristics of ASD, such as difficulties in social interactions, may be influenced in multimodal ways within the context of online multiplayer gaming. The discussion below continues with a review of the literature that focuses on the domains of (a) social communication, and (b) restricted and repetitive patterns of behaviours, interests, and activities. The subsections address the implications of these domains for the social interactions of students with an ASD and for how students with an ASD are supported to overcome social interaction difficulties.

**2.2.1 Social communication difficulties.** Students on the autism spectrum experience difficulties of social communication; first, difficulties in developing, sustaining, and understanding relationships; second, difficulties in social-emotional reciprocity; and third, difficulties in nonverbal social communication (American Psychiatric Association, 2013). For the purpose of this research, the literature review below will focus on the manifestation of social communication difficulties and how they influence social interactions.

**2.2.1.1 Difficulties in relationships.** At school, students normally interact with peers (Petrina, Carter, & Stephenson, 2014). Within this context, establishing peer relationships may be second nature to most students without an ASD (Mazurek & Kanne, 2010). In contrast, a growing body of research has suggested that although students with an ASD may be liked by some of their peers and prefer to socially interact with peers, friends, and classmates, reciprocal relationships are not often maintained over extended periods of time for them (Locke, Ishijima, Kasari, & London, 2010; Petrina, Carter, Stephenson, & Sweller, 2017; Petrina et al., 2014). Researchers have identified that some students with an ASD are often on the sideline of their social groups and may often experience difficulties forming meaningful, rich, and reciprocal relationships for their developmental age (Chamberlain et al., 2007; Kasari et al., 2011). They may also have few close peer friends, find it difficult to make friends with peers, and receive few invitations to socially interact in shared social spaces and social events with peers (Knott, Dunlop, & Mackay, 2006). The findings from Saggars (2015) indicate however that for students with an ASD, positive peer relationships are very important in enabling successful learning and for supportive social interaction experiences within inclusive educational contexts.

Research has shown that although students with an ASD may feel supported by their peers they may also require support to cope with peer teasing and bullying (Carrington et al., 2017; Saggars, 2015). Research indicates that they may more often be bullied and teased than their peers

without an ASD because of social interaction difficulties that they experience (Chen & Schwartz, 2012; Humphrey & Symes, 2010a, 2010b). The findings from the study by Carrington et al. (2017) indicate that 90% of students with an ASD experience bullying. Students with an ASD who described their experiences of being bullied by their peers explained that some of their peers refused to listen to them speak, because of their ASD diagnosis (Cridland, Jones, Caputi, & Magee, 2014). Parents and teachers have reported that their students were targeted, teased, and ridiculed by their peers when their behaviours were perceived as odd and seemed to display difficulties with social understanding and social communication skills (Taneja Johansson, 2014). Drawing together the theoretical works by Carpendale and Lewis (2006), Hughes (2011), and Jewitt (2017, Chapter 2), the term *social understanding* in this study broadly refers to learning about the social world and social relationships, and that understanding that within home, school, virtual, and physical social interactions people have different thoughts, beliefs, and feelings that can be developed and expressed in multimodal ways, such as through spoken and written language, touch, and gesture. Along with these difficulties, classroom constructions and discourses within school environments that have an emphasis on deficits, can also create barriers to the friendships of students with an ASD (MacArthur, Higgins, & Quinlivan, 2012, Chapter 10).

Due to the considerable amount of time that students with an ASD spend in school, their friendships are important to their achievement of positive social interactions (Daniel & Billingsley, 2010). A *friendship* is described as a meaningful relationship in which individuals establish a bond with acquaintances, share mutual interests, and have a liking for one another (Boyd et al., 2015; Hruschka, 2010). The ability to form, establish, and build friendships with their peers, and participate in friendship-driven activities with them, particularly in the long-term, is a progressive step to sustaining lasting relationships (Al-Ghani & Al-Ghani, 2011; Degges-White & Borzumato-

Gainey, 2011; Ito et al., 2009). Calder, Hill, and Pellicano (2013) and Petrina et al. (2017) report that some students with an ASD are satisfied with their friendships.

The literature reveals that parents and teachers may be actively involved in the friendships of students with an ASD. Parents have contributed to research on relationships of their children with an ASD (Daniel & Billingsley, 2010; Kuo, Orsmond, Cohn, & Coster, 2013). They have participated in parent-assisted friendship training for students with an ASD (Frankel et al., 2010). Parents of children with an ASD are usually aware of the age and gender of their children's friends, and how their friendships are established and maintained (Bauminger, Solomon, Aviezer, Heung, Gazit et al., 2008). Teachers may often play a significant role in the development and sustaining of the friendships of students with an ASD. Hence, their perspectives on this topic have been embraced in recent research (Petrina et al., 2017). Teachers have been encouraged to have access to resources for social skills training and for the explicit teaching of rules that may be required to support the friendships of students with an ASD (Le Messurier, 2010). Likewise, the teaching of social skills may strengthen the bridge that is necessary to develop and maintain students' friendships and improve the quality of friendships (Milner & Haslam, 2013). Parent and teacher perspectives about the friendships of students with an ASD may differ from that of students about their own friendships (Calder et al., 2013).

A body of research reviewed indicates that the quality and degree of relationships, friendships, and friendship network for students with an ASD varies across virtual and physical spaces (Calder et al., 2013; Kasari et al., 2011; Kuo et al., 2013). Research also shows that, regardless of the difficulties that students with an ASD may face in their social interactions, and despite their desire to play alone at times, they may still be motivated to develop and sustain friendships (Calder et al., 2013). Youths with an ASD have shared, through interviews, how online multiplayer games help to positively shape their friendships and desires to socially interact with

some of their friends (Gallup et al., 2016; Kuo et al., 2013). Online multiplayer games provide opportunities for gamers to develop social relationships that may be formed through their initiatives and personal efforts to engage with others, as well as through passive online engagements with other players (Jia et al., 2015). They may prefer to seek the companionships of their peers who are in those virtual networks (Fuster, Carbonell, Chamarro, & Oberst, 2013).

Despite these findings, studies have rarely examined how students with an ASD socially interact in virtual spaces and how the correlation between their social interactions and their positive or adversarial play influences their relationships with other online players (Kuo et al., 2014; Mazurek & Engelhardt, 2013b). As Jia et al. (2015) explains, gamers share winnings and losses that may influence their attitudes, and their potential to be part of an online team. By researching the engagements of students with an ASD in online contexts, new insight will be provided about their interactions and social relationships, such as their friendships. The literature highlights the need to broaden understandings of perspectives of students with an ASD, their parents, and teachers on student friendships within the context of online multiplayer games.

**2.2.1.2 Difficulties in reciprocal social interactions.** Researchers have recognised that another core characteristic of ASD is a persistent difficulty with reciprocal displays during social interactions (Leach & LaRocque, 2011; Shochet et al., 2016). Students with an ASD are described as experiencing difficulties in displaying reciprocity when they display difficulties with the use of verbal and nonverbal social communication modes in conversations and through sharing back-and-forth engagements, and initiations and responses (Bang, Burns, & Nadig, 2013; Leach & LaRocque, 2011). Oral language, speech, and conversational reciprocity are important in communicating meanings and sustaining reciprocal social interactions (Paul, Orlovski, Marcinko, & Volkmar, 2009), and are visible indicators of balanced turn taking and empathy (Leach & LaRocque, 2011). The literature indicates that students who possess reciprocity demonstrate it through showing

motivation to socially engage with others, by displaying an awareness of other individuals' interpersonal and emotional cues, and through appropriately interpreting and responding to the interpreted cues (Constantino et al., 2003; Zamzow et al., 2016). According to Leach and LaRocque (2011), students who have these skills can engage with others in extended back-and-forth social interactions across a range of contexts.

However, these are often areas of difficulty experienced by students with an ASD (Lanter & Watson, 2008). Studies have demonstrated that during conversations students with an ASD may demonstrate difficulties in turn-taking skills, and in displaying emotional reciprocity and empathy for the listeners (Paul, Orlovski, Marcinko, & Volkmar, 2009; Scheeren, Koot, Mundy, Mous, & Begeer, 2013). Some students with an ASD also may engage in lengthy talks that cause them to neglect the listener and be a bore, and may use hypervocal speech, advanced, extensive vocabularies, and pedantic speaking styles (Dean et al., 2013). Research reveals that some students with an ASD have difficulties in turn taking in conversational contexts because (a) they could be guided by their passion and preference to share facts about their special interest with others, and (b) may not be conversant with the voice of another speaker and may tend to talk at the listener about their own interests (Plimley & Bowen, 2007).

Difficulties inferring meanings during conversations may also be because of a need for skills to understand ambiguous and complex language, and pragmatics of language (Arciuli, 2014). Likewise, difficulties with interpreting figurative language, in understanding the paralinguistics of language, and with reading and sending nonverbal messages could exasperate the reciprocal difficulties that students may face during social interactions (Whyte & Nelson, 2015). Researchers suggest that students with an ASD better understand explicit, precise, simple language, and short sentences when they receive instructions or are given directions (Kluth & Marcus, 2010; Westby, 2011).

Investigators have examined the ability of students with an ASD to infer the thoughts, feelings, intentions, interests, and motivations of others (Baron-Cohen, Tager-Flusberg, & Lombardo, 2013; Turner-Brown, Perry, Dichter, Bodfish, & Penn, 2008). Likewise, previous studies have suggested that some students with an ASD may often present as being inconsiderate of other's perspectives, desires, and beliefs, and may seem lacking desire to share intention (Broekhof et al., 2015; Kimhi, Shoam-Kugelmas, Agam Ben-Artzi, Ben-Moshe, & Bauminger-Zviely, 2014). They may seem disconnected emotionally from the emotions of others because they may often have difficulties in knowing and understanding what other people think (Cassidy, Ropar, Mitchell, & Chapman, 2014; Jones, Happe, Gilbert, Burnett, & Viding, 2010). Moreover, in reviewing the literature, it seems that if some individuals become confused about the emotions and perceptions of others they may give inappropriate social and emotional responses while interacting with their peers or potential friends, and may fail to reciprocate appropriate social and emotional responses while interacting with others (Dean et al., 2013; Moran et al., 2011; Paul et al., 2009).

Given the difficulties that some students with an ASD may face with reciprocal engagements, researchers have employed self-management strategies and peer-training strategies to target improvements in reciprocity for students with an ASD (Bang et al., 2013; Koegel, Park, & Koegel, 2014; Owen-DeSchryver, Carr, Cale, & Blakeley-Smith, 2008). Peer training intervention was used to enhance the social interaction initiations and responses of students with an ASD (Owen-DeSchryver et al., 2008). Similarly, strategies such as *iPod Touch*<sup>TM</sup> have increased initiations and responses in conversations between some students with an ASD and their peers (Mancil, Lorah, & Whitby, 2016). Pharmacological interventions have also been shown to improve the verbal reciprocity of adolescents and adults (Zamzow et al., 2016). It was inferred by Kimhi (2014) that students with an ASD may display better reciprocity with enhanced verbal abilities and if theory of mind skills are supported through multimodal and sociocognitive interventions. The existing

research suggests that students with an ASD have a high affinity in digital video game play (Mazurek & Wenstrup, 2013), and that there is a correlation between reciprocity and video gaming (Velez, Greitemeyer, Whitaker, Ewoldsen, & Bushman, 2016). So far, however, there has been little discussion about how engagements with online multiplayer games influence the reciprocal skills of students with an ASD- which is explored in the current study.

**2.2.1.3 Difficulties with nonverbal communicative behaviours.** Previous studies have documented that some students with an ASD often need skills to receive, understand, and produce nonverbal modes of social communication during social interactions (Grossman & Tager-Flusberg, 2012). The study by Peterson, Slaughter, and Brownell (2015) has shown that some students with an ASD may demonstrate their understanding of body language. In contrast, other studies have revealed that some students may have difficulties responding appropriately to nonverbal communication and understanding aspects of nonverbal communication. For example, students with an ASD may have difficulties making meanings from gestures, facial expressions, eye contact, and social gaze (Bekele et al., 2013; Kaartinen et al., 2012). Researchers have agreed that social gaze is required to understand social cues and conversational space (Spezio, Huang, Castelli, & Adolphs, 2007; Swanson & Siller, 2013). Students with an ASD may also have difficulties responding to the body language and emotions, and body posture of others (Atkinson, 2009; Doody & Bull, 2013). The ability to understand and use nonverbal social communication is a critical aspect of social interaction, particularly between peers and friends (Nurmsoo, Einav, & Hood, 2012).

Research of eye contact, suggests that some students with an ASD may display difficulties in sustaining eye contact during conversations and nonverbal interaction (Tanaka & Sung, 2016). However, forced eye contact with students with an ASD is reported to cause discomfort and resistance to social interactions (Joseph, Ehrman, McNally, & Keehn, 2008). Difficulty sustaining eye contact, social gaze, and understanding other aspects of nonverbal communication may students



with an ASD from noticing signs of boredom in social interactions (Doody & Bull, 2011). For example, during a face-to-face conversation, the listener may use prosody by producing gestures to hint a desire to part from the speaker, and making eye contact and facial expressions to indicate boredom (Folstein, 2006). However, an individual with an ASD may not make meaning from these nonverbal signals.

Research has also shown that the nonverbal difficulties experienced by some students with an ASD may be manifested during social interactions, through problem behaviours such as fears, physical aggression, and noncompliance (Kluth & Marcus, 2010). These social communicative behaviours of students with an ASD may cause difficulties for themselves and those with whom they engage. Injury and safety may be an issue for them as well as for others (Matson, Mahan, Hess, Fodstad, & Neal, 2010). Bear (2010) discusses that students' display of nonverbal misbehaviours, and disciplinary problems, which affect social interactions, may be blamed on not only the students, but also on their teachers, peers, factors in their homes and society, and the influence of technology and electronic media. This acknowledgement of innate and external barriers to prosocial nonverbal behaviours embraces elements of the medical model and social model of disability (Waltz, 2013).

Researchers have searched for ways to support and develop the nonverbal communication skills of students with an ASD. For instance, in the study by Bekele et al. (2013), the researchers developed a system to monitor gaze and facial expressions in students with an ASD and their peers not diagnosed with an ASD, as they engaged in virtual worlds. Video-based interventions have been used to improve social behaviour and limit behavioural difficulties (Rayner, Denholm, & Sigafos, 2009). Additionally, studies have been carried out to determine how avatar assistance through computer-based strategies can assist students with an ASD to have greater eye gaze behaviour, eye-tracking, facial recognition, and understandings of expression and emotions (Hopkins et al., 2011; Martineau, Hernandez, Roché, Andersson, & Bonnet-Brilhault, 2010). Moreover, virtual

environments have been used to help students with an ASD to competently self-regulate their social interactions, and to develop their social understandings in virtual and physical contexts (Mitchell, Parsons, & Leonard, 2007).

The literature reviewed has shown that students with an ASD may experience social communication difficulties that could negatively affect their social interactions. Social communication difficulties may lead to difficulties in the life of students with an ASD and their families (Gomes, Lima, Bueno, Araújo, & Souza, 2015). Conversely, a body of literature encourages appropriate interventions and the involvement of stakeholders in accommodating and supporting the need for social communication success in online and offline contexts, within formal and informal educational settings, and in relationships (Able et al., 2015; Finke et al., 2015; Sansosti, 2010; Wolfberg, DeWitt, Young, & Nguyen, 2015).

Considering these difficulties, this research argues the need to add new knowledge about the verbal and nonverbal forms of social communication that students with an ASD use during their engagements with online multiplayer games, and the affordances for social interactions. The review of literature continues with a discussion of the second domain of the characteristics of ASD. It focuses on the influence of restricted and repetitive patterns of behaviour, interests, or activities on social interactions of students with an ASD and the support for this domain (American Psychiatric Association, 2013).

**2.2.3 Restricted and repetitive patterns of behaviour, interests, and activities.** A key diagnostic criterion of ASD is associated to fixed interests and repetitive behaviours (American Psychiatric Association, 2013). This criterion is displayed by four key characteristics. These characteristics include (a) restricted, abnormal, unusual, or intense patterns of interests, and focus that preoccupies and consumes an unusual amount of time and attention; (b) apparent inflexibility in routines and rituals, with a preference for sameness of speech and behaviour; (c) repetitive or

stereotyped patterns of play engagement with objects or motor movements; and (d) diverse response to sensory input or sensory aspects. These difficulties in restrictive and repetitive behaviours, interests, or activities are variable. The validity of this domain in being part of the ASD diagnosis has been questioned in the past (Lord & Bishop, 2010). Nevertheless, empirical evidence is reviewed below to understand how the characteristic of restricted and repetitive patterns of behaviour, interests, or activities affect the social interactions of students with an ASD.

A growing body of research highlights the diverse, yet restricted, time consuming special interests that students with an ASD may exhibit (Boyd, Conroy, Mancil, Nakao, & Alter, 2007; McDuffie, Lieberman, & Yoder, 2012; Troyb et al., 2016). Research suggests that insistence on sameness through repetitiveness and resistance to change by students with an ASD may function for adaptive reasons, including to soothe oneself, to block-out unwanted stimuli, and to reduce anxiety associated with change (Bogdashina, 2003; Spataro, 2016; Troyb et al., 2016). Students with an ASD may become easily distracted from group and individual tasks, because of high interest in activities or objects (Marks et al., 2003). Research has shown that, during restricted and repetitive engagements with special interests, students with an ASD may require social interaction support through strategies for instance reinforcing and fading prompts, and interventions such as pretend play in social games (Jung & Sainato, 2015; Kryzak & Jones, 2015).

Moreover, the literature revealed that, at times, students with an ASD may experience difficulties with attentional flexibility and may experience difficulties disengaging their attention from visually interesting stimuli (Landry & Bryson, 2004; Mostert-Kerckhoffs, Staal, Houben, & de Jonge, 2015). Research indicates that students with an ASD may often be described as displaying social avoidance, experiencing challenges during interactions with peers, and having difficulties with showing interest in people (Anagnostou, 2015; Mandell, Walrath, Manteuffel, Sgro, & Pinto-Martin, 2005). In addition, they may seem aloof and withdrawn from the surrounding physical

environment (LeGoff, 2004). As discussed in Chapter One, the intense engagement of some students with an ASD in video-game activities is possibly associated with repetitive and stereotyped interests (Mazurek et al., 2012). Furthermore, research by Howard and Patti Ducoff (2008) revealed that as some students with an ASD engage with electronic screen media, they have tendencies to reduce their responses to other modal elements or perceived distractions that may be in their physical environments. Although studies such as these exist, what is not yet clear are the social interaction potentials and constraints for students with ASD through repetitive play in online multiplayer gaming contexts, which is explored in this thesis.

Within the context of gaming, ASD, and social development, there are different theoretical understandings of what constitutes the notion of play (Edwards, 2016; Goldstein, 2011, Chapter 24; Hobson, Lee, & Hobson, 2009; Hughes, 2002). However, a commonly used definition of play as a nonliteral, freely chosen observable behaviour (Rubin et al., 1993) may be used as a basis for suggesting that the play patterns of some students with an ASD tend to be uncreative, predictable, uninventive, unimaginative, and ritualistic (American Psychiatric Association, 2000, 2013). From this perspective, the function of toys and other objects of play can often be perceived for their concrete and literal functions (Wong & Kasari, 2012). Therefore, one obstacle in the social interactions of some students with an ASD may often be the development and sustainment of symbolic and representational play (Freeman, Gulsrud, & Kasari, 2015). Moreover, some students may display less consciousness of pretend play in group activities, games, and creative play that are considered appropriate to their age group (Hobson et al., 2009). Instead of engaging in regular patterns of play, some students with an ASD may have the tendency to exhibit modes of interaction that may be described as stereotyped and ritualistic (Cunningham & Schreibman, 2008; Gomot & Wicker, 2012).

The literature has suggested some students with an ASD may have difficulties with diverse types of transitional behaviours (Cihak, Fahrenkrog, Ayres, & Smith, 2010). They may not like surprises and may be overwhelmed by unexpected changes within daily activities (Yoshida, Sanders, Hirano, & Sato, 2012). Likewise, they may find new social interaction experiences extremely distressing, meaningless, unpredictable, and unfavourable across various contexts (Sansosti, 2010). Strategies such as cues from picture cards and oral warnings to signal the steps in a task or between activities have been used as transitional methods to help students with an ASD cope with unexpected changes (Yoshida et al., 2012).

The literature associated with characteristics of strong attachments to objects or activities has indicated how the social interactions of students with an ASD are affected (American Psychiatric Association, 2000, 2013; Winter-Messiers, 2007). Some students with an ASD may show abnormal interests: in smells of objects; about details of objects and toys; and while engaging in repetitive movements, such as touching, spinning, tapping, and banging objects and flapping hands (Harrop, McConachie, Emsley, Leadbitter, & Green, 2014; Troyb et al., 2016). They may reduce their engagement and participation in daily activities with others (Attwood, 2006; Richler, Huerta, Bishop, & Lord, 2010). Some students may lack attention to the world around them. Repetitive engagements, narrowness of focus, and perseverance in interests and activities may result in delays and functioning in social interactions (Leekam, Prior, & Uljarevic, 2011).

Other key characteristics of ASD include hyper- or hypo-reactivity to sensory input, or unusual interests in sensory stimuli of environments as a new criterion for the diagnosis of ASD (American Psychiatric Association, 2013). The sensory characteristics of ASD may make the social interaction experiences of students with an ASD overwhelming and painful (William, 2016). In this regard, the individual senses of sight, hearing, taste, touch and smell are unusually oversensitive or undersensitive. Research has indicated that some students with an ASD may display indifference to

pain, unusual response to specific textures and sounds, excessive touching of people and objects, unusual smelling of objects, and visual fascination with movement (Funabiki, Murai, & Toichi, 2012; Riquelme, Hatem, & Montoya, 2016). Stewart, Russo, Banks, Miller, and Burack (2009) note that some students with an ASD display behaviours of both hypersensitivity and hyposensitivity, and may find it difficult to process information from multiple sensory modes and to combine sensory modes.

Previous research has shown that some students with an ASD display repetitive behaviours and exhibit sensory processing abnormalities in relation to auditory hyperresponsiveness (Chen, Rodgers, & McConachie, 2009), and respond with hypersensitivity to sounds that they attend to (Funabiki et al., 2012). For example, by examining auditory processing in adolescents with an ASD DePape, Hall, Tillmann, and Trainor (2012) found evidence of difficulty in audio-visual integration and filtering irrelevant sounds. Other researchers have also found that there is an association between the cortical response to sounds in students with an ASD and inadequate behavioural responses (Boddaert et al., 2004). While students without an ASD often outgrow sensory sensitivities, it is noted that over time sensitivity to modes of communication may decrease for students with an ASD (Stewart et al., 2009). In summary, research has shown that there is a correlation between repetitive behaviours and sensory features in students with an ASD (Boyd, McBee, Holtzclaw, Baranek, & Bodfish, 2009), and that students with repetitive sensory motor behaviours may exhibit difficulties in displaying skills for socialisation and adaptive communication (Troyb et al., 2016). This study provides an opportunity to advance our knowledge of the repetitive patterns of behaviour, interests, and activities of student on the spectrum, and to enhance our understanding of students' sensory affordances within the context of online multiplayer gaming.

**2.2.4 Conclusion to section 2.2.** Previous research has provided some insight into the conceptualisation and measurement of social communication difficulties (Ingersoll & Wainer, 2013), and repetitive behaviours, interests, and activities of students with an ASD (Leekam et al., 2011). The literature enhances understandings that the social interactions of students with an ASD are influenced by these characteristics as specified by the Fifth Edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5, American Psychiatric Association, 2013).

The literature reviewed provided understandings that difficulties in the domains of social communication skills, and restricted and repetitive patterns of behaviour, interests, or activities, can lead to feelings of frustration and anxiety during social interactions (Pugliese, White, White, & Ollendick, 2013). The difficulties in social communication may be reflected through conversations, reciprocal engagements, and relationships such as friendships (Paul et al., 2009; Rossetti, 2015; Scheeren et al., 2013). Research has also shown that the characteristics of ASD may be manifested during social interactions, through unsafe problem behaviours and noncompliance in physical and virtual contexts (Matson et al., 2010; Mazurek & Engelhardt, 2013b). Some students with an ASD may become inattentive, energetic, and impulsive (Jang et al., 2013; Newsom, Weitlauf, Taylor, & Warren, 2012). They may display some signs of inhibitory control to visual stimuli and distractions (Christ, Kester, Bodner, & Miles, 2011). Additionally, research suggests that some students with an ASD may engage in restrictive and repetitive behaviour because coping without sameness and control of the environment is uncertain, bewildering, and overwhelming (Lord & Bishop, 2010).

Within the context of inclusive education, the medical model has been rejected for breeding deficit models of social interaction and for evoking misunderstandings, attitudes of fear, stereotypes, discrimination, and pity based on clinical assumption (Waltz, 2013). Several studies that have investigated the social interaction difficulties experienced by students with an ASD seemed to be guided by discourses of the medical model of disability (Solomon, Heritage, Yin,

Maynard, & Bauman, 2016; Waltz, 2013). From a medical lens, the understanding is that the quality of students' social interactions may be constrained because of the individuals, and the problems and difficulties that are associated with a diagnosis of ASD (American Psychiatric Association, 2013; Grahame et al., 2015). It is inferred that a deficit view of the term *social interaction* may be restricted to discourses such as (a) personal limitations, verbal exchange, and pharmacological interventions (Zamzow et al., 2016); (b) innate difficulties or sensitivities with direct human contact (Riquelme et al., 2016); (c) treating individual challenges in physical face-to-face play (Prelock & McCauley, 2012); and (d) individual blame for limited participation between a person and other individuals such as peers and adults, in physical contexts (Peters et al., 2013).

Given that the number of students diagnosed with an ASD has increased over the past two decades and that students with an ASD may often engage with online multiplayer games, teachers may continually search for empirical ways to support students with an ASD in initiating and sustaining social interactions, particularly with their peers (Christensen et al., 2016; Ozuna et al., 2015; Watkins et al., 2015). They seek newer ways to support students with an ASD to develop and sustain friendships and enhance reciprocal skills (Petrina et al., 2017; Stillman, Anderson, & Struthers, 2014). The literature also indicates that teachers may draw on social model perspectives to remove external barriers and constraints to the social interactions of students with an ASD (Woods, 2017).

Through the social model of disability perspectives, teachers may acknowledge individual uniqueness, strengths, competence and successes in social interactions and may remove external restrictions to meet individual and diverse needs within inclusive settings (Ashman, 2014; Larson, 2006; Ruble, 2012). Likewise, they may embrace diverse virtual and physical interests instead of subjecting students to a common physical way of socially interacting (Aresti-Bartolome & Garcia-



Zapirain, 2014). Teachers may target the potentials of students' digital practices with new media that foster independent learning and inclusion (Ito et al., 2009).

The challenges and constraints that students with an ASD face in social interactions, learning, and participation may be many (Saggers, Hwang, & Mercer, 2011). Hence, classroom teachers may often require additional support from specialist teachers and allied health professionals to provide participation and successful learning outcomes for students (Carrington, 2017, Chapter 15).

Building on this notion, Graham and Harwood (2011) suggest that, in addition to enhancing the capabilities of students, the capabilities and professional development of teachers needs to be enhanced. By doing so teachers may facilitate students' access to the conditions that are necessary for success. The literature review provided understandings of the social interactions of students with an ASD. It expands knowledge about how students' social interactions are influenced by social communication difficulties, and restricted and repetitive behaviours, activities, and interests. The review also highlighted that to date, the social interactions and repetitive engagements associated with online multiplayer games have not been studied adequately, particularly with respect to students on the autism spectrum. A study such as this one is warranted to draw together social and medical understandings on the social communication, and restricted, repetitive, and stereotyped patterns of interests, behaviours, and activities of students with an ASD (American Psychiatric Association, 2013), within the virtual context. The following section discusses the notion of inclusion within the context of inclusive education and literacy education.

### **2.3 Inclusion: Inclusive Education and Literacy Education**

The literature review has shown that new understandings of the affordances of online multiplayer games for students with ASD are needed within the fields of inclusive education and NLS. Section 2.3 aims to analyse literature that contributes to understandings of these affordances and the notion of *inclusion*. It discusses research that shows the close link between historical and

educational developments in international contexts, Australian educational reforms, and inclusive education and NLS. Given that the UNCRPD *Article 24, General Comment Number Four* is the first legally binding document that is used as a reference to the notion of quality and equitable inclusive education (CRPD, 2016), it will be used as a reference point throughout this discussion. Additionally, with the development of gaming literacies (Beavis, 2014; Garcia, 2017, Chapter 16), analysis of the literature is linked to the discussion of student rights, support, and barriers within inclusive education and literacy education.

**2.3.1 The notion of inclusion for students with an ASD.** As mentioned in the previous chapter, inclusion is an important notion within the research context. The concept of inclusion is the nondiscriminatory culture of the school based on the philosophy of respect and value of all stakeholders, and of social justice and community involvement (Carrington, 2017, Chapter 15; Frideres, 2012). The existing research has indicated that the notion of inclusion is embedded within the fields of inclusive education (Plows & Whitburn, 2017, Chapter 1) and NLS (Price-Dennis et al., 2015). For example, this notion has contextualised new and old perspectives of inclusive education (Mitchell, 2004). Accordingly, inclusive education has experienced a policy and publishing boom (Slee, 2011). The move towards inclusion aims to illuminate and reduce barriers, constraints, and exclusive practices from within formal educational settings (Armstrong, Armstrong, & Spandagou, 2010; Mihai, 2017).

Several reforms have helped us to move towards understanding inclusion. Inclusive education has progressed from periods of exclusion, segregation, and integration of students to the inclusion of students (Leite, 2012). The CRPD has clarified the difference between exclusion, segregation, integration, and inclusion in the UNCRPD *Article 24, General Comment Number Four* (CRPD, 2016). The term *exclusion* refers to the process by which students are restricted from accessing or participating in any form of education or learning opportunity within an educational program or

institution that may contribute to their development and that of their community (CRPD, 2016; United Nations Educational, Scientific and Cultural Organisation, UNESCO, 2017a). The notion of *segregation* is defined as when students with disabilities are provided with education in separate learning environments that are designed to be isolated from other students because of the difficulties, barriers, or impairments that students may experience (CRPD, 2016). Hence, students with and without disabilities receive academic and social opportunities in separate environments.

*Integration* is described as an assimilation of students with disabilities and perceived differences into the mainstream formal educational settings, such as classrooms, providing that they can adapt to the host setting (Foreman & Arthur-Kelly, 2017; Lindsay, 2007). The notion of integration lacked the commitment to reduce all barriers to participation and learning, and to value student diversities (Keeffe-Martin & Lindsay, 2002). Inclusion within the context of inclusive education has replaced the notion of integration (Frideres, 2012). Integration is very different from inclusion. Inclusion involves a process within educational contexts that embodies modifications of, and changes to curriculum content, teaching strategies, learning approaches, and organisational structures to illuminate and overcome barriers so that all students are provided with appropriate learning experiences, resources, and environments that best meet their needs and preferences (CRPD, 2016).

The progress from integration to inclusive education has attracted critique. For example, Graham (2006) argues that inclusion within educational contexts has lost its meaning about meeting students' needs. However, Carrington (2017, Chapter 15) explains that the notion of inclusion within the context of inclusive education has a broader focus than the support of students with disabilities. Inclusion within this context also focuses on diversity and inclusive practices as the norm among students instead of a focusing on disability (Beamish & Saggars, 2013, Chapter 14). It challenges the discourse of 'normality'. The discussion now focuses on the close link between

historical and educational developments in international contexts, Australian educational reforms, and inclusive education and NLS.

Literature over the past two decades has shown that international policies were made towards the end of the twentieth century and more recently, to protect compulsory, equitable and quality education for all students (Hoskins, 2012; Keeffe-Martin & Lindsay, 2002; Mihai, 2017; Slee, 2011). As discussed in Chapter One, the UNCRPD *Article 24, Comment Four* is a very important and the most up to date inclusion policy that explicitly outlines the international guidelines to progressively achieve the ideal of inclusive education for learners with disabilities. The UNCRPD *Article 24, Comment Four* has advanced earlier international acts including the *1988 Education Reform Act* (CRPD, 2016; Maclure, 1988), and the *Salamanca Statement* (UNESCO, 1994).

The *1988 Education Reform Act* had major reforms in the United Kingdom and influenced inclusive education internationally and in Australia (Hoskins, 2012): of significance, was the establishment of a National Curriculum. Australia developed its first National Curriculum in December 2010. The Australian Curriculum, Assessment and Reporting Authority (ACARA, 2016a) describes the Australian National Curriculum as being inclusive of all students by being committed to having a high-quality curriculum accessible for all Australian students. ACARA promotes a curriculum with educational equity, and rigorous and engaging programs that are developed and implemented to meet students' learning needs.

Similar to the *1988 Education Reform Act*, the UNCRPD *Article 24, Comment Four* includes detailed guidelines on the right of all students, including those with an ASD, to have access to adaptable curricula in which they learn through support and methodologies that are differentiated to their diverse learning styles, strengths, and needs (CRPD, 2016). Curricular should be accessible, promote mutual respect, and value diversity. Carrington (2017, Chapter 15) agrees that curricula and pedagogy should be flexible and learner focused to meet the diverse needs of students. Rather

than a focus of a medical diagnosis or personal weakness (De Beco, 2014), the UNCRPD *Article 24, Comment Four* adds a human rights dimension to the literacies pedagogy and curricular for all students, such as those with an ASD.

The UNCRPD *Article 24, Comment Four* advances the idea to protect the right to inclusive education expressed in *UNESCO Salamanca Statement 1994* (CRPD, 2016; UNESCO, 1994). Slee (2005) describes June 1994 as a historic moment, when UNESCO met in Salamanca, Spain to make a worldwide consensus on the practices of inclusion and the direction for special need education. Australia was one of the 300 participants representing ninety-two governments and twenty-five international entities (UNESCO, 1994). Some of the key points of the *Salamanca Statement* associated with the notion of inclusion include; (a) the provision of effective opportunities for students to achieve and maintain a high level of learning, through a collaboration of teachers and specialists; (b) the provision of facilities and learning opportunities to accommodate for the diversity in students' learning styles, characteristics, interests and abilities; and (c) the creation of a welcoming environment to combat discrimination (UNESCO, 1994).

More recently, UNESCO (2017b) has added that inclusion is the process of overcoming barriers that set limits on the ability and opportunities of learners to participate, achieve success, and be present within high quality learning environments. Within these environments, students have access to spaces that facilitate their right to thrive and have their realities understood (UNESCO, 2015). These key points frame notions of belonging, technology, and relationships in inclusive education and research today (Rose & Shevlin, 2017). The UNCRPD, *Article 24, Comment Number Four* has advanced *the Salamanca Statement* (UNESCO, 1994) by (a) repeating its existing awareness of, understanding of, and provision for the right of persons with disabilities to inclusive education that were emphasised for international contexts; (b) clarifying issues about the legal

rights of students to inclusive education; and (c) monitoring the implementation of the policies regarding inclusive education principles (CRPD, 2016; De Beco, 2014; Mihai, 2017).

In Australia, the notion of inclusion has influenced acts including the *Queensland Anti-Discrimination Act 1991*, the *Disability Discrimination Act 1992*, the *Inclusive Education Statement 2005*, and more recently the *Melbourne Declaration on Educational Goals for Young Australians*, (Ministerial Council on Education, Employment, Training and Youth Affairs, MCEETYA, 2008). The *Melbourne Declaration on Educational Goals for Young Australians*' notion of inclusion is reflected in its goals to enhance high-quality and equitable education that recognises contemporary ways of learning and developing social interaction skills through sharing and using information and communication technologies (MCEETYA, 2008; Wardman, 2013). The Declaration promotes opportunities for students to be successful, confident, creative, active, and informed in their current and lifelong learning (MCEETYA, 2008).

Literature has shown that over the past decades there are several concepts and practical interpretations of the term *inclusive education* (Daniels & Garner, 1999; Liasidou, 2015). According to Whitburn and Plows (2017, Chapter 1), inclusive education is underpinned by the ideology of citizens democratically participating through teaching and learning, within organisations and institutions that reflect democracy within their cultures. The literature suggests that notions of inclusive education embrace (a) the use of inclusive practices, approaches, resources, and tools to achieve transformation within the context of education (Whitburn et al., 2017, Chapter 3); (b) recognition of and response to student diversity, and respect for educators, their skills, knowledge, experiences, and professional needs (Black-Hawkins, 2017, Chapter 2); and (c) attention to the diverse voices and perspectives of stakeholders, including students, parents, and teachers (Wong & Morton, 2017, Chapter 14). Inclusive education is also defined as the process in which educational systems are strengthened so that resources could be accessible and so that

students could be participatory (UNESCO, 2017b). See Ainscow and Sandill (2010) and Armstrong et al. (2010) for more examples of how the term *inclusive education* is extensively used by researchers and educators.

Despite the variation in understandings of inclusive education, writers have highlighted the importance of diversity as a norm within the framework of inclusive education (Ashman, 2014; Carrington, 2017, Chapter 15). Based on interpretation from the body of literature read, a comprehensive definition of inclusive education includes education that promotes a mind set and gradual process of change in the belief, structures, and culture of the school to make all students, parents, teachers, support persons, and community members part of their communities (Liasidou, 2015; Whitburn & Plows, 2017, Chapter 1). Within an inclusive education context is the recognition that despite student differences, students are given opportunities to have their rights and needs for learning, access, participation, and achievement met in virtual and physical spaces (Carrington & MacArthur, 2012; CRPD, 2016).

Students may face several barriers to their learning within inclusive educational contexts. Some barriers faced by students include school practices that hinder students' needs from being met; complex policies of student placement and funding of education; and negative perspectives, stigmas, attitude, and labels (Humphrey & Lewis, 2008; Manago et al., 2017; Slee, 2005). Another barrier to student learning may be immobilisation of funds for resources and facilities, which allow for the complexities of student support (Booth & Ainscow, 2011). The findings of the current thesis about social interaction constraints of multiplayer games for students with ASD should provide new insight into barriers that students with ASD may face within inclusive educational contexts.

**2.3.2 Inclusive literacy for students with an ASD.** In addition to the field of inclusive education, the notion of inclusion is woven into the field of NLS. The discussion continues and reviews literature on how inclusion has shifted thinking of literacy from the medical model of

disability and an autonomous model of literacy to a social-cultural perspective of literacy. It also focuses on barriers and constraints to literacy education and on literacy support within inclusive contexts. Researchers have focused on areas such as social inclusion (Warschauer & Tate, 2017, Chapter 5), particularly through literacies (Vasudevan, Rodriguez Kerr, & Gallardo, 2017). To explain, a body of literature indicates that 21<sup>st</sup> century inclusion within the context of NLS means that all students need opportunities and resources to immerse within digital spaces and develop their literacy learning and digital capabilities for social interactions, regardless of their medical diagnosis, gender, and economic, geographical, and cultural backgrounds (Oakley, 2017, Chapter 10; Price-Dennis et al., 2015). Despite this understanding, the notion of inclusion for students with an ASD is not adequately discussed in the field of NLS. This thesis addresses the research gap in the NLS about the literacies practices of students on the spectrum, within the context of social interactions through online multiplayer games. The notion of literacies is discussed below in section 2.3.

Historically, conventional literacy implied social status and education, and literacy practices were culturally defined and regulated by social institutions, and viewed as a social good and a goal for broad social groups (Janks, 2010). Gee and Hayes (2011) explain that literacy was once the ‘great-divide’ theory of social anthropologists and its distribution was based on where a person was on the social hierarchy, and therefore linked with land, health-care, and housing. Research shows that, there is still plenty of evidence that the distribution of access to literacy influences an individual’s position on the social hierarchy, however, this distribution is compounded with socioeconomic background (Luke, Dooley, & Woods, 2011; Vigdor, Ladd, & Martinez, 2014; Warschauer & Tate, 2017, Chapter 5).

Furthermore, Humphrey and Lewis (2008) seem to argue that where literacy education is heavily guided by the medical model of disability and an autonomous model of literacy, the implication is that students are sometimes ignored, segregated, or embarrassed, and subjected to



unnecessary exclusion in schools. Jordan et al. (2010) suggest that a medical perspective can frame understandings that students' literacy skills are affected by the severity of their level of ASD, as well as their personalities and intellectual abilities, patterns of strength and weaknesses, and learning style. In other words, difficulties in literacy may be viewed as limited by the learner's lack of social communication skills, reciprocity, relationship skills and understandings (American Psychiatric Association, 2013). Deficit models and understandings of literacy that are believed to be innate to students are being rejected through the lens of the social model of disability (Waltz, 2013).

Inclusive understandings of literacy have embraced the sociocultural theory of literacy (Kluth & Marcus, 2010). In this sense, the social constructions of knowledge in literacy education and development are reflected through students' social interactions and language learning (Schreiber, 2011). A sociocultural perspective of inclusive literacy implies that in designing their social futures, young students should be taught how to survey the available designs, and recreate themselves and their social world (Cope et al., 2000). As Wiseman (2003) suggests, social discourses allow students to express themselves in multiple ways and to use a variety of language forms to make meaning of their worlds. Research indicates that literacy within the context of inclusive education is no longer just for the elite, nor is it just about the ability to write letters, decode words, and answer low level questions presented by teachers. Inclusive literacy learning undoubtedly entails cognitive processes that are mediated by complex arrays of rules, social practices, cultural knowledges, narratives, and technologies (Luke et al., 2011).

Literacy from an inclusive perspective embraces online practices that provide opportunities for students to want to socialise and be motivated to continually participate through interest-driven and friendship-driven activities (Ito et al., 2009). Ito et al. (2009) revealed that although students may have the ability to participate online in social and recreational activities, they encounter constraints to online participation. Therefore, this study not only builds on previous research such as

that by Ito et al. (2009), but it also makes a major contribution to NLS by describing social interaction potentials and constraint for students with ASD, as they engage online through multiplayer games, because ASD students have not received attention in NLS video games studies.

Despite the medical and autonomous perspectives of literacy, much of the literature on literacy education has an inclusive perspective that considers student individual differences, cultural and social backgrounds, and strengths (Alvermann, 2009, Chapter 1; Comber, 2007, Chapter 9; McIntyre, Hulan, & Layne, 2011). Being welcoming of all diversities and valuing all students are valuable practices for the literacy classroom and the school community (Carrington & MacArthur, 2012; Luke et al., 2011). Embracing all diversities within a classroom environment is a fundamental contextual aspect of the future of inclusive education (Tomlinson & Imbeau, 2010). Researchers agree that teachers may be able to extract meaning from students' sociocultural contexts for learning and literacy development (Rivalland, 2004). Teachers may provide opportunities for students to learn to transfer and use their knowledge from one specific circumstance to multiple situations, and then put the things they have learned into practice in a new context (Cope et al., 2000) They are encouraged to consider a pool of experiences and knowledge and so build on the language that students bring from their homes and communities (Martini & Sénéchal, 2012).

A review of literature tells that students with an ASD may often receive interventions to support their literacy needs within inclusive classroom environments (Reynolds, Wheldall, & Madelaine, 2011; Woolley, 2016). Additionally, research suggests that literacy resources can be constructed within multiple modes, multimedia, and multiple platforms (Kress, 2013). These resources can be manipulated, reconstructed, and created to make new meaning and new experiences, from real-life practices (Luke et al., 2011). Some students with an ASD may benefit from literacy-based interventions to support positive peer social interactions (Francis, McMullen, Blue-Banning, & Haines, 2013). There is a consensus among researchers that if students have

opportunities to access home literacy resources within inclusive environments, this may ensure making-meaning, continuity in learning, and meetings of the minds that they use in the various contexts (Comber & Barnett, 2003; Martini & Sénéchal, 2012).

Despite the potential of inclusive literacy support for students with an ASD, there seems to be a prevailing sense of anxiety that is fuelled in part by the uncertainty of the best inclusive literacy support for students within inclusive educational contexts (Bearne & Marsh, 2007). Accordingly, the existing research also urges teachers to discern what out-of-school activities are appropriate for students to align with classroom literacies. Moreover, out-of-school literacies may be in competition with or conflict with those literacies of more formal learning environments, and of little value inside the classroom setting (Gee, 2007a). It is inferred that, if schools only value and promote their own views and values of literacy, then the exclusion of home literacy practices across families and communities may be a constraint to student social interactions (Feiler et al., 2017; Vigdor et al., 2014). Comber (2007, Chapter 9) explains that new forms of educational apartheid are created through various forms of disadvantage, exclusion, and inclusion.

**2.3.3 Conclusion to section 2.3.** Considering the innate or external difficulties that students may face within the context of inclusive literacy education, it may be best to embrace an approach that support them to develop a repertoire of cultural and socially diverse experiences as they engage with the discourses of home and school (Luke et al., 2011). Drawing on the works by Comber and Barnett (2003) and Gee (2015a), literacy can be described as an inclusive currency to help students socially interact within various contexts, such as home and school. Inclusion within the context of inclusive education and literacy education involves having insights into online and offline social practices of all students and remoulding the school's culture, policies, and practices to meet students' diverse needs (Booth & Ainscow, 2011; Jorgensen & Lowrie, 2011). These are several important areas in which this study makes original contributions the field of NLS. For example, it

provides new insights into online and offline social interactions of students with ASD, through the literacies perspectives of online multiplayer games.

This literature review was necessary, given the demands and desires for educational practices to be continually shifting towards better inclusive practices and newer literacies than those of past decades (Cope et al., 2000; Mills, 2015; Plows & Whitburn, 2017, Chapter 17). Importantly, with the development of new digital and gaming literacies such as online multiplayer games, and the growing engagement of students on the spectrum with online multiplayer games, there is work to be done within the field of NLS (Garcia, 2017, Chapter 16; Engelhardt et al., 2013; Mazurek & Engelhardt, 2013a). The following section reviews the multimodal aspect of new literacies practices that are built on conventional and functional literacy skills, including reading and writing (Halliday & Matthiessen, 2014). It reviews the existing literature on NLS and multimodal aspects of online multiplayer games.

#### **2.4 Literacies and Multimodal Social Interactions through Multiplayer Games**

This section reviews the literature on literacy, literacies, and multimodal social interactions, particularly through the multimodality of online multiplayer games. It highlights the significance of this research to investigate and describe how students with an ASD use literacies and multimodal forms of social communication during their engagements with online multiplayer games. The review highlights the need for to use new literacies as a lens to highlight newer understandings of the social interactions of students with an ASD. The discussion establishes the foundation for the conceptualisation that the social interactions of students with an ASD should no longer be understood according to oral and written language, nor according to the medical model of disability (Kluth & Marcus, 2010). Social interactions for students, including those with an ASD, need to be perceived through modern technologies and inclusive multimodal worlds that students engage with (Aresti-Bartolome & Garcia-Zapirain, 2014; Oakley, 2017, Chapter 10).

Literacy theorists, Gee and Hayes (2011) and Janks (2010), contend that the autonomous model of literacy focused on a discrete set of decontextualised, isolated, individual, and social cognitive abilities to decode and read words. Importance was placed on the ability of elite and privileged persons to read and write letters from the alphabet system (Gee & Hayes, 2011; Janks, 2010). Such a test of functional literacy was a sign of social eliteness, human intellect, and creativity (Alvermann, 2009, Chapter 1). Functional literacy was held in more esteem than oral communication. It may still often be held in more esteem than a focus on human social interaction, and be understood as absent of focus on human social interaction, and interaction with texts and contexts where literacy is practised (Halliday & Matthiessen, 2014).

Developments in the field of NLS have influenced a shift from a conventional view of literacy (Tompkins, 2014), to a renewed interest in all aspects of literacies teaching and literacies education (Street, 2013). More broadly, in recent years understandings of *literacy* have changed, with an emergence of new literacies (Mills, 2010b): technology literacies (Thomas, 2011), digital literacies (Jones, 2012), virtual literacies (Merchant et al., 2014), global literacies (Yoon, 2016), visual literacies (Gitsaki, 2015), and information literacies (Mackey & Jacobson, 2008). These literacies suggest that the mechanics, characters, and consequences of literacies are situated, and are different in across each context (Gee & Hayes, 2011; Gregory et al., 2004). However, far too little attention has been paid to how these literacies, within the context of online multiplayer gaming, influence the social interactions of students on the autism spectrum. Inclusive understandings of the emergent literacies practices of students on the spectrum is lacking in the NLS.

These new literacies are found in contemporary digital practices, and have contributed to the shift from passively decoding texts, reading and writing, and a reliance of adult directed literacy instructions based on didactic printed text (Axford, Harders, & Wise, 2009). Moreover, literature from Gee and Hayes (2011), Mills (2010a), and Street (2013) is used to strengthen the argument

that the term *literacies* is not single, monolithic, or autonomous. Indeed, literacies is plural. In common with the newer understanding that literacy is best described as comprising a number of different literacies, this study from here on adopts the term literacies.

Currently in the 21<sup>st</sup> century, newer definitions of literacies for students have less emphasis placed on aspects of the autonomous model of literacy (Gee & Hayes, 2011; Janks, 2010). Literacies for students have been reinvigorated and now means the integration of a broad and flexible group of skills, abilities, strategies, and competencies that motivate students to independently, collaboratively, and appropriately read, view, write, design, speak, listen, and construct meaning from traditional and electronic texts as well as information and communication technologies (Baynard, 2010). The *new* in NLS for students acknowledges their abilities to critically think and use information that is closely linked to a range of contexts and purposes (Mills & Levido, 2011).

Within the context of NLS, writers stress the importance of remembering that definitions and practices of literacies evolve over time, and that contemporary literacies practices have been dictated and mediated in accordance with the developments of technology and changing expectations within social, cultural, and historical contexts. As Janks (2010) explains, we have progressed, in ascending order, from using technologies such as papyrus, parchment, quills, pencils, paper, pens, and typewriters to using computers. Access to literacies through a variety of digital technologies is now instantaneous and technology has facilitated the assimilation of literacies skills to an unprecedented scope. Information and computer technologies have become faster, cheaper and more powerful, thus, altering the literacies education of students, including those with an ASD (Gee & Hayes, 2011). The turn in the nature of new literacies for students is evident in their shift from the use of pen on paper to engagements with a variety of multimodal literacies texts (Mills &

Levido, 2011). Beavis (2012, p xvi) implies that teachers may view this “technological shift” as confronting.

Attention to NLS has been shown to link students’ online literacies practices to their development in social interactions (Merchant et al., 2014). Therefore, the contexts and definitions of social interaction are changing in unprecedented ways. In the past, difficulties with social interaction skills in students with an ASD have been manifested in physical contexts. Although social interaction may be referred to as verbal exchange and physical face-to-face play between peers (Peters et al., 2013), in recent times, the discourses for social interactions extend deeper than words and physical contact among peers for enjoyment (Gee, 2015; Prensky, 2001). To explain, due to the development of new technological literacies, newer perspectives of social interaction include not only physical environments and contexts, but also situated literacies practices in online virtual settings (Mills, 2010a; Quandt & Kröger, 2014).

Contemporary students are exposed to new and alternate modes of communication, and new types of digital technologies to engage socially. Therefore, social interactions are more multimodal than they used to be. The fabric of 21<sup>st</sup> century social interaction of students is permeated by new interests, and therefore students are shifting their play patterns beyond the boundaries of physical spaces, to online activities and digital contexts (Marsh et al., 2016; Richards & Burn, 2014). This research does not deny or reject the medical diagnosis of ASD but rather argues that the social interactions of students with an ASD need to be understood better (American Psychiatric Association, 2013). To look only at the clinical assumptions about the social interactions of students with an ASD in physical contexts may be partial and inhibited (Waltz, 2013). A partial view ignores the fact that students on the autism spectrum do spend quite a lot of time engaged with video games such as online multiplayer games, and that physical contexts do not represent their recent online social interactions (Gallup et al., 2016). Research findings by Mazurek, Engelhardt, and Clark

(2015) suggest that interests in video gaming may continue to adulthood because game play motives may include enjoying achievement, creativity, story, and game graphics. It was inferred that students may also experience stress relief, social connection with other gamers, as well as social interaction difficulties and game violence. Descriptions of social interactions must, therefore, integrate aspects of online social interactions instead of a sole emphasis on behavioural observations in physical spaces (Quandt & Kröger, 2014). This study embraces this perspective given the lack of focus on students with ASD within the NLS. It contributes new descriptive evidence about the multimodal social interactions affordances of online multiplayer games for students with ASD, to this field of education.

For the purpose of this research, the term social interaction is expanded from the notion of direct human contact with others (Chen & Tsai, 2016), verbal exchange (Hughes et al., 2013), and physical face-to-face play (Locke, Shih, Kretzmann, & Kasari, 2016). Social interaction includes what a learner can or cannot do during physical or online play and verbal conversations with other people as well as the semiotic resources of the multiplayer games (Gee, 2015b). Social interaction is a form of literacy practice, such as in video gaming (Garcia, 2017, Chapter 16), in which there is mutual and active participation between a person and other individuals, for example peers, other students, and adults (Peters et al., 2013). Social interactions in digital and virtual spaces (Ito et al., 2009), and through digital and screen-based literacies texts and electronic networks are increasing and expanding (Mills & Levido 2011). Therefore, students are now actively involved in the social learning process (Beavis, 2014), as opposed to being passively taught that they need to use social interaction skills in physical settings, such as the classroom and playground (Locke et al., 2016).

Newer concepts of literacies have become attached to the theory of multimodality and multimodal practices (Mills, 2015). Multimodal is defined as the combination of resources for multiple semiotic resources of meaning making and communication (Kress, 2017, Chapter 4). A



21<sup>st</sup> century description of literacies, as used in the field of NLS, acknowledges and embraces the ability to use modes of communication in a variety of contextual forms for social interactions and a personal, contextual, and social transformation (Tompkins, 2014). Research indicates that new literacies encompass (a) face-to-face acts of social interaction that combine speech, gaze, sound, gesture, facial expression, intonation, and body positioning, and (b) additional approaches to multimodality, allowing students to gain meaning and communicate in the widest sense through—visual, oral, gestural, linguistic, musical, kinaesthetic, and digital ways (Alvermann, 2009, Chapter 1).

Researchers have continued to seek multimodal ways to understand the social interactions of students with an ASD, for example through speech (Katz & Girolametto, 2015), writing (Caron, 2016), gesture (Dindar, Korkiakangas, Laitila, & Kärnä, 2016), touch (Gentry, Kriner, Sima, McDonough, & Wehman, 2015), sound (Russo, Zecker, Trommer, Chen, & Kraus, 2009), and image (Rogers, 2013). Some students with an ASD may often experience writing difficulties (Asaro-Saddler, 2014). They may have difficulty initiating and sustaining social interactions through the written mode (Geither & Meeks, 2014) and expressive uses of written texts can be a challenge for many students with an ASD (Griswold, Barnhill, Myles, Hagiwara, & Simpson, 2002). A body of literature in the fields of inclusive education and NLS encourages appropriate interventions and the involvement of stakeholders in accommodating and supporting the literacies and social interaction needs of students with an ASD (Ozuna et al., 2015; Sansosti, 2010). Additionally, the use of multimodal interventions is encouraged to develop the social understandings of students with an ASD (Kimhi, 2014).

The literature reviewed above on literacies practices and social interactions of students with an ASD highlights the relevance of this study to research the affordances of online multiplayer games for the social interactions of students with an ASD. Despite the growing awareness that

modern day technologies allow students to socially interact through literacies in a variety of formats and modes that pen and paper cannot (Janks, 2010), little is known about how the literacies and multimodality of online multiplayer games facilitate social interaction potentials or constraints. It is not clear what students, parents, and teachers think about the social interaction affordances of online multiplayer games for students with an ASD. This section is expanded below with a discussion on multimodality and online multiplayer games.

**2.4.1 The multimodality of online multiplayer games.** The genre of online multiplayer games was introduced in Chapter One as games in which multiple gamers can engage in play simultaneously in the same online virtual space (Jia et al., 2015). Engagement with online multiplayer games is described as a high interest activity for some youths and students with an ASD (Gallup et al., 2016). Given the popularity of *Minecraft*® among primary-school students (Dusmann, 2013), *Minecraft*® was introduced and described as the online multiplayer game of focus, within the context of this research. In Chapter Three, online multiplayer games are theoretically framed as Discourses that combine language, social practices, multimodal semiotic resources, and affinity spaces (Gee, 2015b).

Drawing on Gee (2007b), online multiplayer games exemplify why a definition of contemporary literacies extends beyond conventional print forms. These games are not only considered to be multimodal literacies texts, but are also sophisticated literacies practices that are part of the popular culture of primary-school students (Beavis, 2014). Researchers have argued for the literacies of *Minecraft*® to be embedded within the school curriculum and to be used to motivate student engagements in other literacies (Marcon, 2013; Marcon & Faulkner, 2016). Students engage with online multiplayer games through PCs, *Xboxes*™, laptops, *Wii*s™, or other various kinds of mobile devices (Bainbridge & Marchionini, 2010). Various types of online

multiplayer games will come and go; therefore, the focus is not on the name of any game, but on each game as a socially situated practice (Jia et al., 2015).

An expansion of gaming information, gaming technologies, and increasingly globalised societies means that students are developing sophisticated multimodal abilities to socially interact with others through online multiplayer games as multimodal texts (Garcia, 2017, Chapter 16). The multimodal elements of video games have been discussed at length as new multimodal systems and new media for social interaction (Beavis, 2014; Fromme & Unger, 2012; Jewitt, 2006; Vance, 2017). Social interaction in this context means that players compete and win with each other (Jia et al., 2015), as they cumulatively immerse themselves in communication and interaction over extended timescales, through spoken words, written texts, images, in-game and vocally produced sound, and body movement (Lemke, 2017, Chapter 11). Players are expected to be conscious of the modes of social communication that they use as they are engaging online with each other (Gee, 2007a). They are expected to simultaneously interpret a variety of semiotic systems, such as colour, sound, words, and images (Beavis, 2014). Online multiplayer games represent a variety of ways for players to interact with each other, with the games, and within their multimodal worlds (Gee, 2015b). Although online multiplayer games are considered to be embodied in the realm of many literacies and modes for social interactions, there is still much to be learnt about their affordances for social interactions and literacies learning (Beavis et al., 2012; Garcia, 2017, Chapter 16).

The literature discussed below is drawn on to discuss the multimodality of online multiplayer games. Attention is drawn to modal elements such as speech, writing, images, and gestures, within virtual and physical contexts. A bidirectional and communicative connection between a person and digital technologies facilitates the individual's ability to have dialogues, listen, recognise speech, and use speech to share information (Peres et al., 2008, Chapter 5). Likewise, research suggests that online multiplayer games facilitate social communication between players, through conversational

speech (Jia et al., 2015). Social communication may be exemplified as conversational speech, talk, or chatting. Kuznekoff and Rose (2013) discuss that in online multiplayer gaming players can socially communicate in verbal ways with each other, particularly through their own voices in real-time. Accordingly, online multiplayer games facilitate oral platforms from which gamers can exchange cues orally with others. Yee (2014) adds to the discussion and argues that despite the stereotype that online gamers are unconventionally reclusive and antisocial, most online gamers play simultaneously and speak with family members, romantic partners, and friends they know in the physical world. The author adds that online multiplayer games provide gamers with platforms to socialise verbally as they keep connected and share physical spaces with friends and family, they engage in conversations about their online gaming experiences (Yee, 2014).

A growing number of researchers and writers are paying attention to the fact that gamers can engage in voice communication with other online players who may be in the same online environments (Schmierbach, Xu, Oeldorf-Hirsch, & Dardis, 2012). A detailed guide to parents highlights the potentials of *Minecraft*® to enable students to use programs for voice or video calls between two or more people (Dusmann, 2013). There are suggestions about the benefits of semiotic resources, such as headphones and microphones, to facilitate speaker-to-speaker conversations between gamers while they are in separate physical spaces, and to balance conversational speech and in-game sounds. Dusmann (2013) warns that social interaction difficulties may be experienced if, for example the microphone fails to capture the sound of a player's voice, or transmit interfering environmental sounds from the physical environment.

Similarly, Gee (2015b) suggests that conversations in the context of online multiplayer games involve designing speech in the anticipation of responses, and that the construction of conversations requires turn taking, collaboration, coconstruction and codesigning of language. He implies that a conversation during engagement with online multiplayer games is therefore not produced solely by

the individual, nor is it not about the “I”, rather it is about the “us”. Gee (2015b) further argues that the games are considered to be new worlds that players create for themselves, where they can socially interact through conversations with the world, with other players, and with the games they play. From the perspective of Gee (2015b) the games offer new opportunities to achieve goals of being speakers and listeners, and to perform actions, such as anticipating responses and making responses appropriately.

Although research indicates that students with an ASD may experience social communication difficulties with turn taking in conversations, oral communication, and complex speech (Murdock & Hobbs, 2011; Paul et al., 2009; Whyte, Nelson, & Scherf, 2014), little is known about the oral potentials and constraints of online multiplayer games for their social interactions. It seems that few studies have reported empirical evidence about how students with an ASD engage in voice talk with other online gamers, while engaging with online multiplayer games (Gallup et al., 2016). In the study reported by Gallup et al. (2016), adolescents with an ASD reported that they disliked engaging in face-to-face conversations with people and that they preferred the ease with which they could talk with other gamers through virtual medium that facilitated communication. This study aims to contribute to this knowledge by describing the affordances of the games for virtual and physical interactions with others.

Researchers suggest that in addition to the modal potential to use speech, that gamers enjoy social interactions with others through the written mode. Written text in online multiplayer games might be perceived as having the potentials to facilitate virtual chat rooms through which gamers can meet other people, and can chat with multiple persons through written text (Dusmann, 2013). Grammatical units such as words, sentences, and clauses may enable the visualisation of the names on friends list and may support exchange of help for planning and completing quests (Schmierbach et al., 2012). Elements of the written mode may facilitate opportunities for gamers to share advice

about the use of resources as well as to narrate stories about online gaming experiences (McNiece, Smith, & Robison, 2012, Chapter 3; Yee, 2014). Writing in online multiplayer games may also shape reciprocal interactions among players and characters in the games, by giving voices and exchangeable expressions to players, virtual characters, and the screen (Jewitt, 2005). As players progress through various levels within a video game, their repetitive access to the writing on a screen often functions to give meaning about what is required, valuable, achievable, and prohibited in the game.

Gamers may experience social interaction difficulties through the written mode, which may be associated with verbal and sexual harassment, swearing, racism, put-downs, technical difficulties, navigation options, servers, bandwidth, and network settings (Dusmann, 2013; Fox & Tang, 2014; Lynch, 2015). Given that these behaviours are not tolerated on some servers, the consequence to gamers' social interactions may be that they are kicked from engaging with others in those virtual spaces and are banned from accessing them in the future. Research indicates that textual element of online videogames may impact on ways that students relate to other gamers (Dusmann, 2013), their peers in face-to-face contexts (Ferretti, 2012, Chapter 9), and how they participate in interest-driven and friendship-driven activities in online environments (Ito et al., 2009). It was inferred from the studies by Boyd et al. (2015) and Gallup et al. (2016) that students on the spectrum may use video gaming technologies and written features in video games to communicate in virtual environments. However, there has been little qualitative analysis of the enabling and constraining written features of online multiplayer games for the social interactions of students with an ASD. Newer understandings may have implications for supporting students who have difficulties socially communicating through the written mode (Asaro-Saddler, 2016a).

In online multiplayer games, players operate and interact with each other through the meaning potentials of images (Twining, 2010). To demonstrate, the images in videogames, such as

*Minecraft*®, have the potential for engaging gamers and their friends in games, in which they take turns (Richardson, 2015). *Minecraft*® players can spawn images of items and blocks repetitively to help them construct and create things with others (Cordeiro & Nelson, 2014). In a game, such as *Minecraft*®, students may engage in enjoyable, interactive, and educational activities that are considered to be family friendly (Gupta, 2015). Although this may be so, violent images are also linked with online multiplayer games (Anderson et al., 2010). For example, *Minecraft*® images may reflect evidence of violence in antisocial virtual activities, such as killing other players, destroying their villages and structures, and stealing their resources (Dusmann, 2013).

In a general sense, violence may be communicated through virtual shooting, killing, and fighting among players, or between players and game characters (Ybarra & Boyd, 2015). Gamers are likely to use violent discourses if their motive is primarily to win competitions by using violent strategies, as opposed to using nonviolent strategies and elements of the game for cooperative play with other gamers (Schmierbach, 2010). Previous research has indicated that conflicts can be resolved in virtual and online contexts and in online and offline relationships (Buote, Wood, & Pratt, 2009; Ishii, 2010). However, the literature suggests that individual conflict may arise in online social interactions, even among friends (Amichai-Hamburger, Kingsbury, & Schneider, 2013).

In the context of online multiplayer games, visual designs, images of resources, and creations that players dedicated their time to build are often destroyed and stolen through trolls and griefers, who show no respect for other players (Rubin & Camm, 2013). Griefers are players who deliberately and unfairly provoke and harass other gamers (Kowalski, Agatston, & Limber, 2008). A griefer is less focused on social interactions and prosocial behaviours than he or she is about scheming and visually ruining the enjoyment and visible progress of other players (Ladanyi & Doyle-Portillo, 2017). Empowerment through antisocial behaviours, such as those demonstrated by griefers, imply that some players on online gaming servers may take advantage of anonymity in

online and virtual gaming interactions to engage in antisocial behaviours (Kowalski, Limber, & Agatston, 2008).

Images of online multiplayer games may be criticised for facilitating virtual images of unhealthy competition, hostility, and violence among players (Eastin, 2007). Some images of antisocial behaviours that may be seen during video game play include aggression, excessive violence, and killing (Anderson et al., 2010; Schmierbach, 2010; Velez et al., 2016). Recent evidence suggests that certain images in some online multiplayer games are associated with images of sexual overtures and sexism (Fox & Tang, 2014). Despite the research interest on the meaning potentials of virtual images, so far, there has been little discussion about how images of online multiplayer games influence the social interactions of students on the autism spectrum. Attention to visual affordances is important because some students with ASD may display expertise in making meaning from visual elements when they engage with objects, and in activities, and may demonstrate strong attachments to images (Foss-Feig et al., 2016; Martineau, Hernandez, Roche, Andersson, & Bonnet-Brilhault, 2010). Furthermore, visual strategies have been used to understand the visual potentials of students with an ASD (Trembath, Vivanti, Iacono, & Dissanayake, 2015), and to address the social communicational and social interaction difficulties of students with an ASD (Shane et al., 2012).

Gestures have potentials to reinforce the meanings of spoken and written words, and images (Colletta & Guidetti, 2012; Bezemer, 2017, Chapter 25). Within the virtual context, they facilitate skills, for example, compromising, reciprocity, and helpfulness (Ishii, 2010; Velez & Ewoldsen, 2013). Virtual gestures of online multiplayer games could also be useful for focusing on values needed to build quality in friendships, such as empathy, turn taking, and respecting others (Gallup et al., 2016). The provision of contextualised learning may scaffold difficult behaviours and may teach self-reflection skills in conjunction with video games (Whyte et al., 2015). Online multiplayer



games have facilitated the ability to convey human gestures and actions through avatars (Coleman, 2011). Nagygyörgy et al. (2013) add that, in online multiplayer games, players select avatars that offer affordances to represent themselves and allow them to act out roles, operate, and interact with others. The players control avatars as three-dimensional (3-D) representations of themselves, and use avatars to gesture or act things that cannot be performed safely in the virtual world (Lemke, 2017, Chapter 11).

Through avatars gamers can demolish structures, destroy virtual properties, dangerously jump from high buildings, break objects while being physically safe, and kill things and people. Players also become empowered with virtual gestures to (a) overtly contest adult domination and authority; (b) develop skills to ignore, resist, and reshape rules imposed by organisations and structures in society; and (c) try out alternatives to adult and society sanctioned rules that could be considered illegal and unsafe in the real world (Sanford & Madill, 2006). Vorderer and Bryant (2006) contribute the notion that multiplayer games enable an escape into a virtual world where players make gestural meanings and decisions that are answerable only to the consequences related to the games, other players, and themselves. As Gee (2015b) warns, a failure to understand the gestures of other players' avatars could result in the death of one's avatar. Social interactions may therefore be constrained through the death of avatars because avatars are visually 3-D representations of gamers in 3-D worlds (Lemke, 2017, Chapter 11).

The audio signals of online multiplayer games are regarded as interactive, realistic, and consistent with information communicated through the visual mode (Lake, 2010). Stevens (2011) explains that mono, 3-D, and stereo sounds in virtual contexts function to describe spaces that players engage in. They provide valuable information regarding the proximity of characters, players, and resources within the virtual environment. The sounds within a virtual environment may offer cues that could convey information about how obstacles may be avoided, and thus enhance a

gamer's progress and success (Oren, Harding, Gilbert, & Hopkins, 2008). For example, Dusmann (2013) explains that in-game *Minecraft*® sounds, such as the hissing sounds made by creepers, signal a warning that a player may need to react before the creeper explodes. A gamer who is without a protective armour may be detonated by the explosion of a creeper if the player does not make meanings about the audio cues, and about the potential attacks. One's ability to use the potentials from in-game sounds could be a matter of survival or virtual death (Stevens, 2011). The impact of virtual destruction and death may lead to frustration and a need for more resilience to rebuild. Given the probability of these challenges, coupled with the difficulties that some students with an ASD may experience with surprises, changes in environments, and daily activities (Yoshida et al., 2012), far too little is known about how their virtual engagements with sounds influence their social interactions. This knowledge is important given that some students with ASD may be sensitive to sounds, and their audio processing may influence their awareness of audio cues, behavioural responses to sounds, and their social interactions (Attwood, 2006; Boddaert et al., 2004; Bogdashina, 2003; Funabiki et al., 2012).

**2.4.2 Conclusion to section 2.4.** Research suggests that students engage with many literacies and multimodalities (Boche & Henning, 2015; Jewitt, 2008; Stein, 2008). Student social interactions have expanded from physical contexts to virtual contexts, and from a reliance on language to using multimodal digital tools, game engines, and virtual worlds that are created by game designers (Gee, 2015b). According to Gee (2015b), a multimodal view of multiplayer games implies that players use several modalities of the games to contribute towards the making of meaning for their social interactions. Players' responses are triggered by the modes created by

multiple players, words printed on screens, images and actions viewed, and music, sounds, and sound effects heard (Lemke, 2017, Chapter 11).

The review of literature on the new literacies and multimodality of online multiplayer games provides the theoretical framework for understanding how students with an ASD draw on the many possible literacies and modalities of multiplayer games for their social interactions. Commentaries of theorists have discussed multimodal aspects of online multiplayer games and their possible affordances for the social interactions of digital natives (Gee, 2015b; Prensky, 2007). However, there has been little empirical research that focuses on describing the modes of social communication that students with an ASD use while they are engaging with online multiplayer games. With these considerations, the difficulties that students with an ASD may face in social interactions and their interest in online multiplayer games (American Psychiatric Association, 2000, 2013; Gallup et al., 2016), it is important to have a better understanding of the affordances of the games' multimodalities for the social interactions of students with an ASD.

## **2.5 Summary of Chapter Two**

Chapter Two reviewed the relevant literature that pertains to the characteristics of ASD and inclusion within the context of inclusive education and NLS. It discussed research about literacies and the multimodality of online multiplayer games. The existing research highlights students with an ASD may experience social interaction difficulties. Several researchers and educators have focused on providing support in the areas of social communication (Mancil et al., 2016; Wolfberg et al., 2015), and restricted and repetitive behaviours, activities, and interests (Grahame et al., 2015; Jung & Sainato, 2015).

Perspectives of the medical and social models of disability were embedded within the discussions. These perspectives were considered relevant to understanding the social interactions of students with an ASD, and the social interaction support that they may require within virtual and

physical contexts. Moreover, educational reforms at an international, national, and local level, have proven relevant to the fields of inclusive education and NLS, and the inclusive literacy education of students with an ASD. The *UNESCO Salamanca Statement* (UNESCO, 2004), the Convention on the Rights of Persons with Disabilities (CRPD, 2016), and the *Melbourne Declaration on Educational Goals for Young Australians* (MCEETYA, 2008) are some notable examples.

Research shows that, literacies are no longer defined by printed texts, nor behavioural acts, but rather by multimodal social practices across various online and offline contexts (Mills 2010a). The findings of a study conducted by Genlott and Grönlund (2013) wraps up understandings of newer literacies for all 21<sup>st</sup> century students, including those with an ASD. Although the study has focused on developing students' literacies skills through an emphasis on the basic skills of reading and writing, the researchers have found that the improvement in literacies was due to the use of technologies, such as online computer activities, and the opportunities that the students had to socially interact with each other through a variety of modes.

Within the literacies bundle are the conjoint factors from students' school lives and private lives. This includes multiple modes of communication for meaning-making. In other words, the notion of literacies acknowledges the various forms of literacy practices that students need to develop their home, community, and school participation (Barrat-Pugh, 2000; Cope et al., 2000). Researchers in the field of NLS draw attention to the effective, widespread, complex and holistic nature of literacies practices in ethnographic studies that are conducted in the home environments, with families of various cultures and social groups (Rogers & Street, 2012). Ethnographic studies have also investigated literacies in school (Chong & Hung, 2017) and in virtual contexts (Heyes, 2017). What this means is that by embracing a newer definition of literacies, the term is not independent of social contexts, culture, space, time, and technologies (Thomas, 2011). An investigation of literacies also means that all students, including those diagnosed with an ASD have

a personal, social, and cultural identity and thus meaning in literacies is shaped by personal, social, and cultural factors in their lives (Gee, 2015b).

Despite the review of literature, so far, there has been no descriptive ethnographic case study design research to describe the affordances of online multiplayer games for the social interactions of students with an ASD. Chapter Three elaborates on the use of multimodality (Jewitt, 2017, Chapter 2) and D/discourse (Gee, 2015b) as theories that frame the research ethnographic case study design. The study's conceptual framework of inclusive new literacies is also presented and discussed.

## Chapter Three: Theoretical Framework

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In Chapter One, the main goal of this study to describe the social interaction affordances of online multiplayer games for students with an ASD was discussed. Chapter Two established the foundation for building the theoretical and conceptual frameworks of the study. It presented literature on the characteristics of ASD. The medical and social models of ASD, inclusion, inclusive education, and inclusive literacy practices. New literacies, multimodality, and online multiplayer games were also discussed.

Chapter Three describes the theoretical and conceptual frameworks that structured the study. The theoretical framework consisted of theoretical perspectives of D/discourse (Gee, 2015b) and multimodality (Jewitt, 2017, Chapter 2), and is highlighted below in Figure 1. These perspectives were integrated and interrelated within the contexts of online multiplayer games and the social interactions of students with an ASD. The theoretical framework from which the research methodology and analysis were drawn and justified is described below.

Chapter Three begins with section 3.1 to justify the use of theories of D/discourse (Gee & Handford, 2012) and multimodality (Jewitt, 2017, Chapter 2), and to explain how they were used to frame the research design and methodology. Section 3.2 describes and justifies the theoretical framework for analysing and describing the students' use of multimodal forms of social communication. Section 3.3 explains how the theoretical framework supported understandings of the social interaction affordances of semiotic resources, within the context of online multiplayer games.

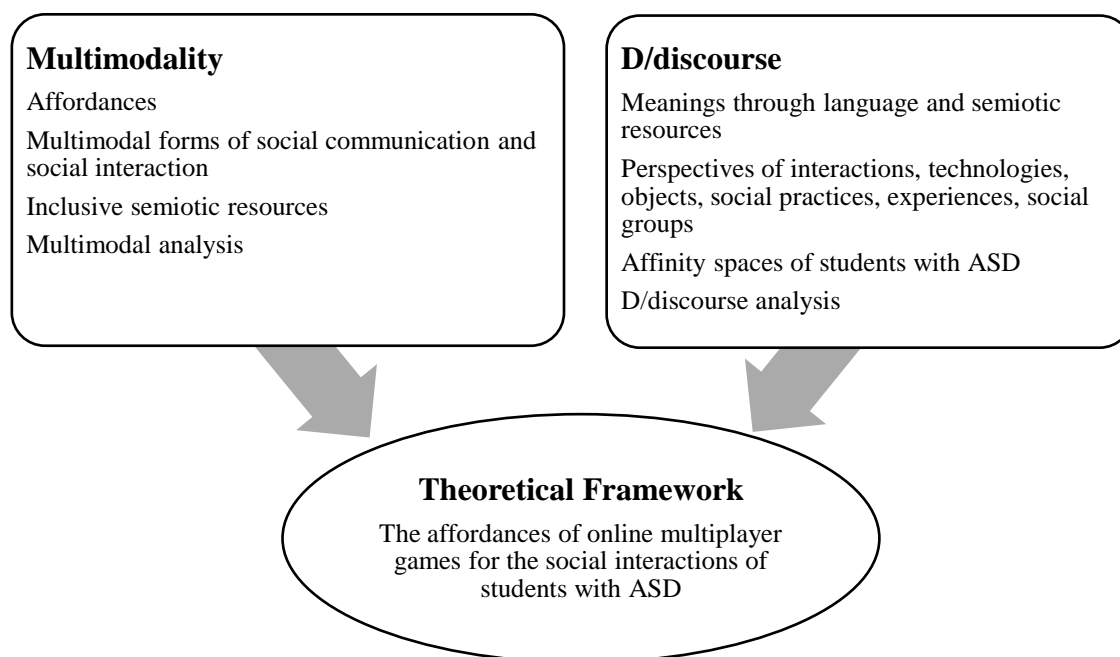


Figure 1. Concept web of the study's theoretical framework.

Figure 1 shows how the theoretical perspectives of D/discourse and multimodality were fused to draw on theoretical notions, including affordances (Kress, 2013), multimodal forms of communication (New London Group, 1996), semiotic resources (Jewitt, 2017, Chapter 2), big 'D' Discourse (Gee, 2014), and affinity space (Gee, 2004). These notions were defined in Chapter One and will be addressed below.

Section 3.4 discusses the conceptual framework (see Figure 2 below in section 3.4). This framework represents an integrated stance that was fused with ideas, concepts, and theoretical assumptions from NLS and contemporary literacies research (Street et al., 2017, Chapter 16) as well as from inclusive education research (Whitburn & Plows, 2017, Chapter 1). The conceptual motivations for defining online multiplayer games as inclusive new literacies are discussed in more details in section 3.4. This upcoming section justifies the integration of key concepts from NLS and inclusive education. Insights from these fields were embraced for their contribution to understanding the social interactions of students with an ASD within the context of the research.

Importantly, there are discussions within the general literature that students' contemporary social interactions are being transformed by existing and emerging literacies (Merchant et al., 2014; Mills, 2010b)

Section 3.4 highlights that, within the field of inclusive education, aspects of the medical and social models of disability were integrated (Waltz, 2013). Their integration reinforced the necessity to recognise the personal experiences of students, to meet their individual needs, and to provide sensitivity and ethical awareness that is needed for the research participants (Ravet, 2011). Chapter Three concludes in section 3.5. The following section presents an overview of how the theoretical framework supports the research design.

### **3.1 D/discourse, Multimodality, and the Research Design**

The following subsections discuss how the theoretical framework was essential to unify notions of and approaches to D/discourse (Gee, 2015b) and multimodality (Jewitt, 2017, Chapter 2). They show that this framework was required to broaden understandings of the potentials and constraints of online multiplayer games, for the social interactions of students with an ASD. The framework grounds the design within the fields of NLS and inclusive education.

**3.1.1 D/discourse theory and the research design.** Subsection 3.1.1 justifies the use of D/discourse theory (Gee, 2004) for the research design. This research required a theoretical model that supported the combination of language in use with social practices, social groups, interactions, objects, and technologies (Gee, 2015a). It also required a theoretical framework that would facilitate the context and aims of this ethnographic case study. As Gee (2014) explains, different approaches use unique analytical and descriptive tools, and research terminologies that are better suited for particular issues, research questions, and reaching empirically based conclusions.

Gee (2004) distinguishes “discourses” from “Discourses”, and holds that “discourse” denoted by a lower-case ‘d’ refers to the social communication modes of spoken and written language,



which include talk and printed text. Gee (2015b) argues that there are other systems of meaning making for social interactions other than the social communication modes of spoken and written language. Gee (2014) adds that, within big ‘D’ “Discourses”, language combines with other social communication modes and represents situated meanings, social practices, experiences, and perspectives within particular groups and enable people to enact various identities. In a broader sense, the use of upper case D “Discourse” following Gee’s distinction of D/discourse, expresses multiple ways to enact and gain meaning for social interactions. Gee’s (2015b) theoretical perspective of unified D/discourse analysis, parallels more recent understandings of the configuration of semiotic resources for meaning making in social interactions (Jewitt, 2017, Chapter 1). The notion of semiotic resources is elaborated below.

The literature indicates that discourse theory provides a framework for analysing structures of knowledge, activities, social actions, interactions, and insights into truths about social change and social groups, and interactions and relationships with others within our worlds (Bazerman, 2012). From a linguistic perspective, *discourse* is defined as spoken and written language in use for communicative purposes and meaning making (Gee, 2014). Little ‘d’ discourse is embedded in social institutions, for example, schools and homes (Kress, 2012, Chapter 3). A research area that may be well suited to discourse analysis includes uncovering narrated information about interactional experiences and contextualised medical issues of students with an ASD (Solomon et al., 2016). Discourse analysis may also be suitable to conduct scientific research associated with ASD, and to investigate structures that are embedded within and that function in the worlds of students with an ASD (O’Reilly, Lester, & Muskett, 2016). However, discourse analysis, with its emphasis on the mode of linguistics (Simpson, 2010), was inadequate to effectively facilitate theorisation and analysis of the multimodal, virtual and physical engagements of students with an ASD within authentic contexts.

For the purpose of this research, the notion of a “Big ‘D’ Discourse” perspective enabled a larger context for a descriptive ethnographic case study design (Gee, 2015a). The literature seemed to have supported the view that aspects of D/discourses were applicable to structure qualitative research methodologies that focus on some metafunctional meanings in the context of online gaming, learning institutions, and identity formation such as friendships (Gee, 2004, 2007a, 2007b, 2014, 2015a, 2015b; Gee & Handford, 2012). Elements of D/discourse also had implications for framing this research across the disciplines of NLS and education (Gee, 2012a, Chapter 26; Hyland, 2012, Chapter 29). Gee (2015b) presents video games as a Discourse that is associated with gamers, conversations, objects, characters, events, and virtual and physical places. The theoretical framework drew relevant aspects from this notion and structured this study to interpret data associated with the Discourse of online multiplayer games. It enabled descriptive interpretations of the affordances of online multiplayer games for the social interactions of students with an ASD. The theoretical lens of D/discourse was drawn on to guide the data analysis, descriptions, and discussions.

**3.1.1.1 Affinity spaces of online multiplayer games.** From an inclusive education perspective, students with an ASD have the right to access learning spaces in which their social interaction realities are recognised and understood (UNESCO, 2017). Likewise, peer groups and friendships are recognised (CRPD, 2016). The provision of social interaction support for students with an ASD require that social interaction difficulties that arise from aspects of learning environments be understood and evaluated. It was, therefore, necessary to build on the works by Gee (2004, 2015a) about affinity spaces within a Discourse.

D/discourse theory (Gee, 2014) evokes the notion that students can be identified as members of various Discourses because of situated contexts, situated uses of language, and integrated, shared, and common affinities. In this regard, the affinity space theory (Gee, 2004, 2007a) was used

to make sense that students with an ASD belonged to more than one Discourse in which there are affinity spaces. For example, they belonged to a classroom Discourse in which students shared affinities with their peers (Locke et al., 2016). Importantly, following Gee (2015b), the students with an ASD were also identified as gamers who belonged to the online multiplayer game Discourse. There is evidence from previous studies to suggest that students with an ASD are drawn together with other people to engage in a shared interest or common affinity, such as online multiplayer games (Gallup et al., 2016; Kuo et al., 2014). In a general sense, gamers are often drawn together with other gamers in the affinity spaces of online multiplayer games (Hayes & Duncan, 2012).

However, evidence from previous studies from the general population indicates that, as gamers interact within the affinity spaces of online multiplayer games, they may experience social interaction difficulties, such as conflicts in online relationships (Ishii, 2010), and an increase in reciprocated violent and aggressive behaviours (Velez et al., 2016). With these considerations, the notion of affinity spaces within the Discourse of online multiplayer games (Hayes & Duncan, 2012), was relevant to broaden understandings of social interaction difficulties of students with an ASD across various contexts (American Psychiatric Association, 2013), and their restricted and repetitive interests, behaviours, and activities (Troyb et al., 2016). The D/discourse theory (Gee, 2014) evokes the notion that students can be identified as members of various Discourses because of situated contexts, situated uses of language, and shared and common affinities.

Overall, Gee's (2007) notion of affinity spaces is central to a recognition that online multiplayer games provide virtual and physical spaces that allow social interactions through interest-driven activities; participation with friends; and reciprocal involvement with other online players (Ito et al., 2009; Hainey, Connolly, Stansfield, & Boyle, 2011; Schmierbach et al., 2012). As Potts (2015) adds, within this Discourse there are discourses, identities, and a social network that

gamers are exposed to that extend beyond their physical social interaction environments. This perspective also structured the study's approach to document and describe the students' daily interactions as they socially interacted as gamers, peers, children, and friends. To conclude, the gaming communities of online multiplayer games were understood to be affinity spaces, which afforded players the abilities to (a) contribute to the virtual social interactions and participation of the affinity group; (b) evaluate, develop, and sustain their relationships while in that domain; and (c) engage and participate in reciprocal team-based projects (Gee, 2007b).

**3.1.1.2 D/discourse: Online multiplayer games.** Gee's (2004) D/discourse theory reinforces the notion that meanings in social interactions are situated. In other words, students' social interaction experiences are subjective to the Discourses within which they socially interact. Therefore, the theoretical framing of social interactions within the theory of D/discourse (Gee, 2004) provided insight into the situated nature of social interactions. The existing research shows that, discourses such as social interaction support (Losup, van de Bovenkamp, Shen, Jia, & Kuipers, 2014), relationships (Coyne et al., 2016), reciprocity (Wohn, 2017), and repetitiveness (Mazurek et al., 2012), are situated within the social context of online multiplayer games. As Mills (2010a) explains, social interactions are no longer facilitated only by face-to-face linguistic exchanges in physical contexts.

Following Gee's (2015) views, online multiplayer games were theoretically described as a multimodal Discourse because they provide situated contextual ways for players to engage in social communication and social interactions through several social communication modes, such as image, words, gesture, and sound. Understandings of D/discourse theory as a framework (Gee, 2004) was also fused with the works by Unsworth and colleagues (2008) and Jewitt and colleagues (2017). This integration helped to explain that the social functions of social communication modes are not fixed in time nor space but rather are influenced by and realised through their social uses in

different social contexts. Additionally, they are transformed by the social, contextual, and regular social interactions of their users (Kress, 2013), and are used differently as meaning making resources, within the affinity spaces. The D/discourse theory (Gee & Handford, 2012) strengthened previous understandings that the authentic context in which digital game play socially took place, shaped potentials for social interactions (Beavis & Apperley, 2012, Chapter 2).

Gee (2014) suggests that a Discourse is a dance that is embedded within changing patterns of resources, communicative events, beliefs, places, and times. People can master the patterns of the dance by manipulating and contesting the boundaries of Discourses. Drawing on this notion, the students' social interactions were understood to be embedded with integrated and situated unique patterns of shared interests, speaking, listening, writing, viewing, acting, thinking, and feeling. This perspective also evoked the theorisation of multimodality at play (Norris, 2017, Chapter 6). Under the guidance of D/discourse perspectives, analysis focused on how the students summoned language in conversations, and in addition to various nonverbal modal systems that conveyed meanings for social interactions in unique ways. Overall, Gee's (2015) D/discourse theory enabled the understanding of social interactions within the Discourse of online multiplayer games.

To conclude, the research design integrated elements of D/discourse from the works by James Gee (Gee, 2004, 2007a, 2014, 2015a, 2015b; Gee & Handford, 2012). Ideally, this integration designed the research to illuminate and describe the potentials and constraints associated with online multiplayer games Discourse. D/discourse theory is useful to describe authentic social interactions within virtual and physical affinity spaces, across home and school contexts. Following D/discourse perspective, the interest of this ethnographic case study lies in describing and understanding benefits and risks of real engagements with online multiplayer games, and in understanding social interaction strengths and needs of students with an ASD.

In addition to D/discourse perspectives (Gee, 2015b), focus within this research was drawn to multimodal aspects of interaction, communication, and representation (Kress & Van Leeuwen, 2006). Multimodal perspectives enabled a way to illustrate the verbal and nonverbal fractions of the multimodal whole, and to show the forms of social communication used in human interactions (Scallon & Scallon, 2017, Chapter 14), particularly within the Discourse of online multiplayer games (Gee, 2015b). The following subsection justifies the use of multimodality within the research design.

**3.1.2 Multimodality and the research design.** This descriptive ethnographic case study followed Jewitt and colleagues (2017), to embrace *multimodality* as a theory and field of study that extends meaning making beyond the scope of D/discourse perspectives. Equally important, understandings of ASD were based on a configuration of characteristics associated with social communication and social interaction, and restrictive and repetitive behaviours, interests, and activities (American Psychiatric Association, 2013). These characteristics were understood in multimodal ways. such as through speech (So, Wong, Lui, & Yip, 2015), visual-spatial abilities (Alvino, 2008), and gestural behaviours (Medeiros & Winsler, 2014).

Drawing on ethnographic and multimodal perspectives (Street et al., 2017), multimodality was embraced within this ethnographic case study design. Multimodality was used to support the descriptions of authentic participation of a group of students with an ASD in online gaming environments and in peer face-to-face interactions, as well as the perspective of the students, and their parents and teachers about the social interaction affordances of online multiplayer games for students with an ASD. The term “peer face-to-face interactions” is used within this study to refer to physical and offline social engagements and exchanges that occur between students and their peers. The students viewed, touched, and shared the screens. Multimodality was considered suitable for

this ethnographic case study design because it enabled a multimodal focus on a specific issue, and the use of participants to illuminate the research issue in multimodal ways.

There are three common multimodal approaches that were embraced for the purpose of this study: (1) multimodal interactional approach, (2) social semiotic multimodal approach, and (3) multimodal discourse approach (Jewitt, 2017, Chapter 2). A multimodal interactional approach emphasises the notions of contextual and situated interactions, and communicative moments when an individual sends a message and another individual receives it (Norris, 2017, Chapter 6). A social semiotic multimodal approach focuses on the correlation between how people use modal resources and the social context (Kress, 2013). A multimodal discourse approach, is concerned with theorising, analysing, and describing the meaning potentials of discourses and social communication modes, and the interaction of multimodal texts in various contexts, such as educational research and media studies (O'Halloran, 2004). The theoretical framework synthesised these multimodal approaches within a descriptive ethnographic case study design because of their theoretical, methodological, and analytical applications to provide broader insights into the potentials and constraints of online multiplayer games for students with an ASD.

A fusion of these perspectives, along with D/discourse perspectives (Gee, 2004), also enabled the study to embrace several interconnected concepts and notions that shape distinct approaches to multimodal research (Jewitt, 2017, Chapter 1). These concepts and notions include *discourse*, *affordance*, and *semiotic resource*. For example, expanding on the works by Kress (2012, Chapter 3) and Gee (2015b), a discourse is conceptualised as a variety of ways of enacting and discursively achieving meanings from multimodal forms of social communication including oral and written language, within the Discourse of online multiplayer games.

Theoretical understandings of multimodality supported the methodology for data collection within the research design (Jewitt, 2017, Chapter 2). Following Jewitt (2006) and Pink (2007), the

use of video-recorded observation and video-recorded and audio-recorded semistructured interview approaches were selected instead of handwritten field notes and audio-recorded interviews. A multimodal approach to video recording did not limit the data collection to only what was heard but enabled active viewing and listening to multiple meaning making resources, such as written text, images, and gestures (Bezemer, 2017, Chapter 25; Kress, 2013). For example, building on the D/discourse theory (Gee, 2014) and aligning with Gee's (2015) line of thought on video games, multimodal semiotics guided the comprehensive analysis of observations and conversations, and broadened insights into perceived truths of how social interactions were influenced within the context of online multiplayer games. Within the context of inclusive education, discussions and observations within inclusive learning environments are considered to be starting points for supporting the social interaction needs of students (Mortier, Van Hove, & De Schauwer, 2010).

Approaches to multimodality are often constituted differently depending on the research focus, research questions, distinctive methodological tools, and data that are addressed (Kress, 2012, Chapter 3). For example, multimodal perspectives inform disciplines and guide fields of work including language studies, NLS (Street et al., 2017), media studies (Chouliaraki, 2017, Chapter 18), and interactional analysis (Luff, Heath, & Pitsch, 2017, Chapter 22). In this way, this study contributes to an existing body of research that has drawn on theoretical notions and perspectives of multimodality. The following sections and subsections elaborate how multimodal perspectives (Jewitt, 2017, Chapter 2) and a multimodal design (New London Group, 1996) helped to reveal multimodal forms of social communications and communicative meanings about social interaction affordances associated with the Discourse of online multiplayer games.

### **3.2 Framing Social Communication within the Discourse of Multiplayer Games**

This thesis examines and describes the multimodal forms of social communication that the students with an ASD used as they engaged with online multiplayer games, such as *Minecraft*®.



Previous understandings of the characteristics of ASD have a focus on the integration of verbal and nonverbal forms of social communication (American Psychiatric Association, 2013). Similarly, recent studies have paid attention to the use and understanding of verbal elements of social communication, such as speech (Kissine et al., 2015; O'Reilly et al., 2016), particularly in conversations (Zamzow et al., 2016). Recent studies on the use of gestures, such as eye contact, and body movements, by children with an ASD have provided insight into their use of nonverbal communicative behaviours (Braddock & Hilton, 2016; Kaartinen et al., 2012).

Multimodality is used to recognise that there are multiple verbal and nonverbal forms of communicating and transmitting meaning, in social contexts, including the spoken, written, visual, and gestural modes (New London Group, 1996). These forms of social communication can be considered as 'used' if they function to facilitate the performing of a social activity or social behaviour (Halliday & Matthiessen, 2014). Available modes and modal resources are drawn on, taken up, shaped, reconstructed, repeated, shared, accessed, observed, described, and interpreted for meaning making (Jewitt, 2017, Chapter 1).

These perspectives facilitated a starting point to analyse and describe the multimodal forms of social communication that the students with an ASD selected, orchestrated, and designed within the context of online multiplayer games. Additionally, multimodality guided the recognition that interactions, communication, meaning making, and representations were comprised of multiple social communication forms that were copresent and central to the students' social interactions (Jewitt, 2017, Chapter 1). It provided a theoretical framework to understand that online and offline interactions have verbal and nonverbal meaningful multimodal features (Norris, 2017, Chapter 6). This theory extended the works by Halliday and Matthiessen (2014) and Kress (2013), with the understanding that, in addition to verbal communication forms, a multiplicity of nonverbal

communication forms can be used in the meaning making process to reveal affordances, expound knowledge, report events, share experiences, and enable and regulate activities.

To conclude, multimodal discourse, interactional, and semiotic perspectives were integrated within the multimodal landscape (Jewitt, 2017, Chapter 2). These perspectives offered newer broader contexts to investigate, analyse, describe, and understand verbal and nonverbal forms of social communication that students had access to and that students used as they engaged within the Discourse of online multiplayer games (Gee, 2015b). They were essential to make sense of the social interaction affordances that were revealed as the students used verbal and nonverbal forms of social communication. Attention is now drawn to how the analysis, descriptions, and discussions of social interaction affordances were framed through multimodality and D/discourse perspectives.

### **3.3 Framing the Affordances within the Discourse of Multiplayer Games**

This section justifies the use of multimodal perspectives to describe and understand the affordances that were revealed through the students' interactions with the semiotic resources of online multiplayer games. Attention is paid to key concepts and notions within the theoretical framework such as affordances, semiotic resources, social communication modes, and multimodal repetitiveness.

**3.3.1 Affordances within Discourse of online multiplayer games.** From a multimodal theoretical perspective, the notion affordances is understood to include not just the potentials, benefits, and rewards associated with social communication modes (Gibson, 1977, Chapter 3), but also what they limit, inhibit, constrain, or hinder (Kress, 2013). Affordances may be revealed through what is possible to communicate repetitively through social communication modes in physical, material, virtual, and social ways, and through environmental offers that are perceived to have benefits and constraints for social interactions (Gibson, 1977, Chapter 3; Jewitt, 2008). These notions of affordances were adapted and embraced within the study, with a focus on analysing,

describing and discussing the social interaction potential and constraints within the Discourse of online multiplayer games (Gee, 2015b).

**3.3.1.1 Affordances of semiotic resources.** As the prevalence of an ASD diagnosis increases, online resources that provide information, intervention, services, and support for students with an ASD are being embraced (Christensen et al., 2016; Hall, Culler, & Frank-Webb, 2016). For example, material resources, including children's picture books, have been used as teaching and learning tools to support the social interactions and relationships of students with an ASD and their peers, within physical classroom environments (Sigmon, Tackett, & Azano, 2016). Within the context of online multiplayer games, multimodality offered a lens to describe and understand the enabling and constraining features of semiotic resources for the students' social interactions.

The notion of semiotic resources is associated with signs, symbols, and systems of meaning that are available for people to use, to connect, and express meanings within social contexts and during social interaction moments (O'Halloran, 2005). Semiotic resources are understood to be observable features that are embedded in meaning making processes (Bjorkvall, 2017), facilitating connections between communicative and representational resources, and how people use them (Kress & Van Leeuwen, 2006). This understanding is extended by Kress (2017, Chapter 4) who puts forward a description of semiotic resources that considers that humans live in a physical and material world, and in physical bodies. People use available semiotic systems to make signs and signify meanings for social interactions.

For the purpose of this research, the above notions of semiotic resources, along with other explanations from Jewitt and colleagues (2017), were drawn on to broadly define semiotic resources. Semiotic resources are the discourses, social communication modes, actions, communication media, digital tools, material resources, and artefacts that are available for use. They have communicative, representational, and interactional meanings for social events, such as

social interactions. This definition of semiotic resources, enabled the recognition of *Minecraft*® virtual signs and material resources for their meaning potentials about social interaction affordances (Kress, 2012, Chapter 3).

A multimodal perspective extended the notion that a Discourse has a combination of semiotic resources for meaning making and socially situated practices (Gee, 2015a). For example, the Discourse of online multiplayer games is fitted with affinity spaces (Gee, 2007b), characters, tools, symbols, strategies, and values that are inherent to meaning making and social communication during gaming activities (Bainbridge & Marchionini, 2010). A students' ability to have adequate access to these resources and opportunities to participate through these resources is considered to be an essential element of inclusion (Warschauer & Tate, 2017, Chapter 5). Moreover, considering the frequent access of students with an ASD to the Discourse of online multiplayer games (Mazurek & Engelhardt, 2013a), it was safe to assume that their social interaction landscapes and platforms were expanded through material and virtual semiotic resources (Jewitt, 2017, Chapter 1). Overall, the theoretical framework embodied an approach, and a deepened and expanded domain of enquiry to examine and describe social interaction affordances associated with the semiotic resources of online multiplayer games.

Multimodal approaches supported the research analysis to take up the concept of the metafunctional meanings from the work by Halliday and Matthiessen (2014), and apply it to make sense of the functions of all semiotic resources (Kress, 2013). *Metafunctions* from this perspective can be thought of as a higher order of meanings than those that are specific to language (Jewitt, 2017, Chapter 1). That is, what can be meant or what can be done with a particular set of semiotic resources. Multimodal discourse and social semiotic perspectives were adapted to support descriptions of how semiotic resources functioned together as communication channels to signify, represent, and reveal meanings in interpersonal, textual, and ideational ways about offline and

online interactions (Baldry & Thibault, 2006; Kress & Van Leeuwen, 2006; Unsworth, 2008).

Overall, multimodality extended D/discourse perspectives and guided interpretations of social interaction affordances that were revealed through semiotic meanings about worlds, relationships with others, and textual meaning.

**3.3.1.2 Social communication modes: Affordances.** This subsection justifies the use of multimodal perspectives as a framework to analyse the potentials and constraints that were revealed through social communication modes, such as speech, writing, images, gestures, and sounds. Theoretical understandings of the repetitive uses of social communication modes are also discussed. In Halliday's (1978) theory of language as a social semiotic, speech and writing are often considered as being the most important social communication modes to make meaning from and to understand how people engage in social communication. Speech and writing are acknowledged by other theorists for their distinct materiality and for how they uniquely influence meanings across various social contexts (Kress, 2012, Chapter 3). They are also acknowledged for their modal potentials to highlight activities that are socially practised within Discourses (Gee, 2014). However, central to multimodality are the assumptions that meaning-making is multimodal, and that specific and partial functions of each mode for meaning making should be taken seriously (Kress, 2012, Chapter 3). Several modes can be distinguished as separate systems of semiotic resources because they contribute to meaning and can be drawn on as a multimodal configuration for communication and representation (Jewitt, 2017, Chapter 1).

This research followed these perspectives. A multiplicity of social communication modes were considered central for analysing communication and representation, and for collectively and coherently revealing a broad range of social interaction affordances where social interactions occur (Kress, 2013; Unsworth, 2008). For example, images within *Minecraft*® demonstrated meaning, whereas sounds within *Minecraft*® echoed meanings. Nevertheless, both modal elements

contributed and reflected meanings about the social interaction affordances of online multiplayer games. Social communication modes such as images and gestures were considered integral to the students' interactional activities and were not described as supports or duplicate semiotic resources of speech and written text (Bezemer, 2017, Chapter 25; Lemke, 2012, Chapter 6; Jewitt, 2017, Chapter 1).

**3.3.1.3 Theoretical framework of multimodal repetitiveness.** The theoretical framework was essential to analyse and describe the students' repetitive uses of social communication modes. Previous research has found that repetitiveness in interests, behaviours, and activities in students with an ASD occurs with high frequency and that there are different types and qualities of repetitive behaviours (Leekam et al., 2011). For example, in a study conducted by Militerni, Bravaccio, Falco, Fico, and Palermo (2002) with a sample of 121 children with an ASD, the researchers found that the children displayed repetitive uses of motor behaviours, and verbal-expressive behaviours, such as the use of words and sounds, that had no apparent communication meanings. Repetitive behaviours by students with an ASD may be associated with avoiding aversive private events, such as difficult verbal events and their emotional impact (Eilers & Hayes, 2015). The restrictive and repetitive patterns of behaviours, activities, and interests of students with an ASD had significance for understanding the affordances of online multiplayer games for the social interactions of these students.

For the purpose of this research, the notion of "multimodal repetitiveness" was coined to refer to the manifestations of repetitive use of two or more social communication modes during virtual and physical social interactions and through engagements with multimodal texts, such as online multiplayer games. This notion is supported by understandings that ASD is characterised by difficulties in social communication and social interaction, and the presence of restricted and repetitive patterns of behaviours, activities, and interests (American Psychiatric Association, 2013).

This notion is also guided by the multimodal perspectives of constant attention to social communication modes and repeated use of semiotic resources (Jewitt, 2017, Chapter 2). This attention and use may be influenced by a person's levels of enjoyment, personal interest, or sensory stimulation (Kress, 2012, Chapter 3).

Multimodal repetitiveness parallels the notion of modal density (Norris, 2017, Chapter 6), which guided understandings that a student gamer can have a high level of engagement with virtual images, and pay little attention to screen-based written texts and virtual sounds. Multimodality enabled understandings of potentials and constraints that were revealed through the students' choices to repetitively use one mode for representative or communicative purposes over another. Through a multimodal perspective, one can recognise repetitive displays and discussions of interests, motivations for using social communication modes, and characteristic traits (Kress, 2013).

Multimodality provided a perspective that repetitive uses of modal elements are socially, culturally, and historically shaped, and are constantly selected, shared, or ignored across various environments because of several reasons. These reasons may include the communicative needs of individuals within institutions, personal interests and social concerns, and the interactional style of members within Discourses and affinity spaces (Gee, 2015b; Kress, 2012, Chapter 3). Assumptions were, therefore, made that the affordances revealed through social communication modes changed over time and that not all the unique affordances of online multiplayer games were realised during the data collection period of social interactions.

The theoretical framework drew on the works by theorists such as Jewitt (2017, Chapter 2) and Gee (2015b). It was used as a tool that made it possible to design this ethnographic case study. The framework supported data that were collected from video-recorded observations of at-screen and peer face-to-face interactions, and from the perspectives of multiple research participants, within virtual and physical contexts. It also guided research into how social interaction affordances

were analysed, described, and discussed within the Discourse of online multiplayer games and the context of ASD.

### 3.4 The Conceptual Framework

The conceptual framework (see Figure 2 below) represents an integrated stance that is fused with several discourses, concepts, and theoretical assumptions that informed and supported the current research. The conceptualisation of the framework was drawn from the field of NLS through concepts such as literacies (Street et al., 2017, Chapter 16), social communication modes (Jewitt, 2006), and social interactions (Peters et al., 2013). The research was also embedded within the field of inclusive education through notions such as the medical and social models of disability (Oliver, 2013), support for diversity (Loreman, Deppeler, & Harvey, 2011), relationships (Kasari et al., 2011), and reciprocity (Wohn, 2011).

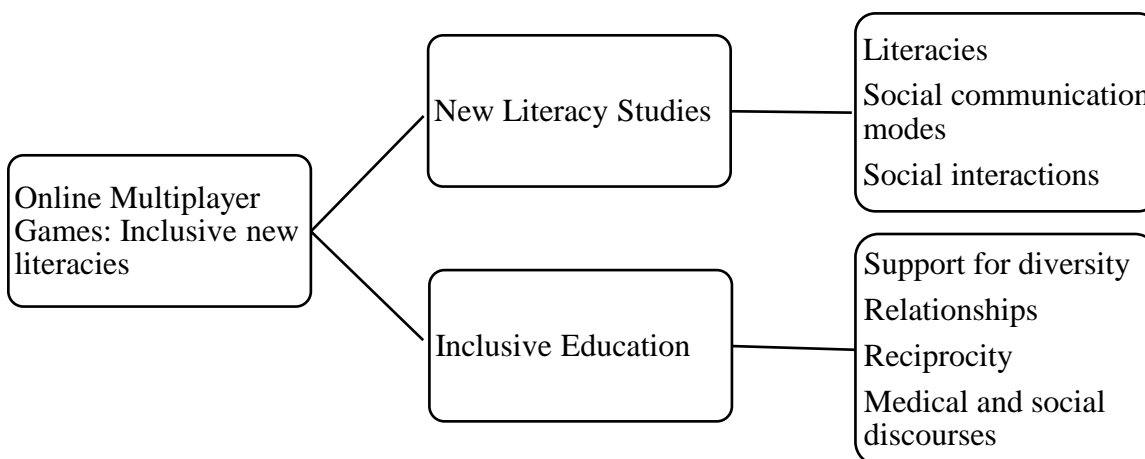


Figure 2. Concept web of the conceptual framework.

The conceptual framework fills a gap in the NLS literature to make way for a proposed model of inclusive new literacies. This model is presented in section 7.3 of Chapter Seven. Section 3.4 discusses the notion that, within NLS, accommodation needs to be made for inclusive education principles. Drawing on the guidelines of UNCRPD, *Article 24, Comment Number Four* (CRPD, 2016) and the *Melbourne Declaration on Educational Goals for Young Australians* (MCEETYA, 2008) new literacies researchers and new literacies educators need to understand and explicitly



address the following: (a) inclusive dimensions to protect the rights and social development of persons with an ASD, (b) ways to make reasonable accommodations for the literacies practices of social groups such as students with an ASD, (c) strategies by which students can be supported through the literacies of information and communication technology to meet their needs and targeted goals, and (d) ways to minimise the constraints and challenges to the social activities and social development of students with an ASD.

The subsections below explain how the conceptual framework (see Figure 2) enables understandings that the literacies of online multiplayer games are woven into the fabric of students' daily social interaction practices. The following subsections also explain how the conceptual notion of inclusive new literacies builds on the works by theorists in the field of NLS (Gee, 2015a; Kalantzis & Cope, 2012; Street, 2013), and the notion of inclusion (Carrington, 2017, Chapter 15; Loreman et al., 2011). The concept of inclusion for students with an ASD, according to the *UNCRPD Article 24, Comment Number Four* (CRPD, 2016), is used less within the NLS literature than it is within inclusive education literature. Hence, it is argued that notion of inclusive new literacies in this research is about recognising and embracing the new literacies of all students, such as those with an ASD. These new literacies provide, facilitate, or enable multimodal and differentiated support for all students within physical, virtual, online, and offline spaces, whether or not they have a medical diagnosis or disability. Online multiplayer games are discussed below as inclusive new literacies.

**3.4.1 Situating inclusive new literacies within the context of NLS.** The term literacies is embraced within this research as an inclusive way to reflect diverse social practices that are situated within different social contexts, and for different social purposes (Street et al., 2017, Chapter 16). Street (2013) adds understanding that the term literacies reflects the multimodal and diverse aspects of literacy as social practices across various communities, and the multimodal ways in which

students engage in multiple contexts of social communication. In recent years, inclusive understandings of literacies have been embraced with an emergence of new literacies: technology literacies, digital literacies, global literacies, visual literacies, and information literacies (Mills, 2010b). The literature indicates that the core to literacies research is to draw attention to issues of diversity, inequality, and interventions, and to understand real daily struggles to social inclusion and barriers in literacies that students face (Dovchin & Pennycook, 2017, Chapter 17; Warschauer & Tate, 2017, Chapter 5). Therefore, in contemporary literacies research, educators often try to build on notions of inclusive education and focus on supporting the needs of students (Ashman, 2014). Literacies are considered inclusive if they facilitate opportunities for repeated practice; reciprocal, motivational, collaborative, and cooperative learning with peers; and technology-based engagements, such as with digital texts and virtual adventures (Boon et al., 2013). Similarly, opportunities to access the potentials of semiotic resources and opportunities to fully participate within communities through new knowledge and skills in literacies evoke the notion of inclusion (Warschauer & Tate, 2017, Chapter 5).

**3.4.1.1 Social interactions through inclusive new literacies.** With the growth of new technologies and advancements in inclusive education of students with an ASD (Odom et al., 2015), the literacies, environments, and multimodal ways in which students communicate, socially interact, and are supported are changing (Kalantzis & Cope, 2012). Improvements in literacies are associated with the use of new technologies, such as online computer activities, and the opportunities that students have to socially interact with each other through a variety of social communication modes (Genlott & Grönlund, 2013). Additionally, previous evidence indicated that multimodal elements in virtual worlds may be used as realistic platforms and tools for enhancing social skills, social

understandings, and social functioning for students with an ASD, in physical world contexts (Kandalaft, Didehbani, Krawczyk, Allen, & Chapman, 2013).

Online and offline social interactions are more multimodal than they used to be (McCreery et al., 2015). Improvement in literacies are associated with the use of new technologies, such as online computer activities, and the opportunities that students have to socially interact with each other through a variety of social communication modes (Genlott & Grönlund, 2013). A 21<sup>st</sup> century description of literacies provided the knowledge that there are new types of digital technologies and new modes of instruction for contemporary students to engage socially (Jewitt, 2008). Students with an ASD use several modes of social communication in a variety of contextual forms for social interactions (Tompkins, 2014).

The researcher drew from literacies and multimodal research (Mills, 2010a, 2015), to better understand how the engagements of students with an ASD with inclusive new literacies enabled them to gain authentic meanings for social interactions, develop knowledge, communicate, and make sense of their virtual and physical worlds. Research on new literacies, such as information and communication (Keefe & Copeland, 2011), technology literacy (Oakley, 2017, Chapter 10) and digital literacy (Beavis et al., 2012), guided descriptions and understandings of how the students gained meaning for social interactions and communicated through oral, written, visual, gestural, audio, and digital ways (Alvermann, 2009, Chapter 1).

**3.4.1.2 NLS: *Online multiplayer games as inclusive new literacies.*** A growing body of evidence suggests that the fabric of 21<sup>st</sup> century social interactions of students with an ASD is permeated by new gaming interests (Mazurek & Engelhardt, 2013a; Spataro, 2016). Therefore, students with an ASD are shifting their play patterns from physical play, such as playgrounds (Locke et al., 2016), to online activities (Kuo et al., 2014). The increasing interest of students and youths with an ASD in online gaming (Gallup et al., 2016) and new literacies in virtual

environments (Merchant et al., 2014) raised important consideration for the games to be understood as inclusive new literacies. Researchers seem to support this notion by suggesting that online multiplayer games represent contemporary and inclusive ways to navigate multimodal literacy texts D/discourses and new online media for social interactions (Eklund & Roman, 2017; Gee, 2015b; Jorgensen & Lowrie, 2011).

Drawing on (Gee, 2007a, 2007b, 2015b), online multiplayer games exemplify why a definition of inclusive new literacies extends to include these games. For example, Gee's works suggest the literacies of online multiplayer games can facilitate the learning of visual literacies through avatars' actions and identities as well as the use of conversational literacies through new multimodal forms of social communication. Online multiplayer games were considered to embody several modalities, with offerings to create specific meanings and differentiated platforms for social interactions (Quandt & Kröger, 2014; Vance, 2017). Additionally, Garcia (2017, Chapter 16) implies that "gaming literacies" enable students to navigate virtual spaces, perform actions as gamers, and read communities that they are within.

Describing online multiplayer games as inclusive new literacies, within the context of NLS, broadened understandings of how bridges can be built between online and offline social contexts, school literacies, and home literacies. Making connections between literacies that are situated across virtual and physical spaces, and formal and informal learning environments, is a key focus of new literacies research (Alvermann & Robinson, 2017, Chapter 13; Feiler et al., 2007). In addition, this conceptual framework enabled a timely synthesis of knowledge and understanding about inclusive new literacies, and provided a key resource for recommendations to target the potentials of inclusive new literacies, within formal educational contexts.

The field of NLS has reflected aspects of access to inclusive literacies education for all students and has provided implications to support the social interactions of students with an ASD

through inclusive new literacies. New descriptions of literacies (Street, 2013) also guided understandings that inclusive new literacies are about welcoming a variety of ways through which learners can explore, engage with, gain meaning from, and share information about various literacies. The conceptual framework accommodated an inclusive approach to literacies by diverting from the conventional notions that literacy is a mental attribute or a mental set of abilities and skills that resides in the minds of individuals (Gee, 2007a). It supported research to embrace a broader definition of literacies and diverted focus away from literacy as an autonomous set of individualised skill (Gee & Hayes, 2011; Janks, 2010). This framework embraced the increased interests for video games and their literacies, among the population of students with an ASD (Porayska-Pomsta et al., 2012). The following subsection discusses how the notion of inclusive new literacies was situated within the context of inclusive education.

**3.4.2 Situating inclusive new literacies within inclusive education.** Inclusive education includes a mind set and a gradual process of change in which physical and economic barriers within formal learning environments are removed (Whitburn & Plows, 2017, Chapter 1). Inclusive support for students is regarded as a human right. It includes the valuing of diversity, provision of reasonable accommodations, and the removal of barriers to participation and learning in the education system (CRPD, 2016). This subsection describes how relationships, reciprocity, and social and medical discourses of ASD were understood within the context of inclusive education and inclusive new literacies.

**3.4.2.1 Understanding support through inclusive new literacies.** Drawing on the work by Foreman and Arthur-Kelly (2017), inclusion embraces the need to provide students with support in areas of their social interactions, including communication, language development, and social skills. As Sutherland (2017, Chapter 7) explains, effective communication within inclusive contexts may not always be simple for all students. He adds that students who experience difficulties and

challenges with their communication skills may require appropriate specialist support to develop these skills and to be able to participate effectively within various communities, such as school.

Within inclusive educational contexts, all students have the rights to access to learning and participation; to have access to resources, and achievements within formal educational contexts; and to have support for their diverse needs (Booth & Ainscow, 2011; CRPD, 2016; Loreman et al., 2011; Ravet, 2011). Support for diversity is a fundamental and contextual aspect of inclusive education (Ashman, 2014), and is a valuable notion in NLS and literacies research (Dovchin & Pennycook, 2017, Chapter 17; Luke et al., 2011). Inclusive education for students of all diversities is facilitated when an educational institution prides itself on the inclusion of new literacies, and students of all races, cultures, socioeconomic backgrounds, abilities, and linguistic diversities (Liasidou, 2015). Given that students have a diverse range of needs (Loreman et al., 2011), they need to be supported through a multiplicity of social communication modes, such as speech, writing, gestures, images, and sounds. The concept of inclusive new literacies is drawn from the field of inclusive education to argue that students should be afforded with equitable ways to interact and learn through literacies regardless of any differences between them and other members within their community (CRPD, 2016).

Although it may be challenging to support all diversities of learners including those diagnosed with an ASD, stakeholders in inclusive educational settings are responsible for providing (a) differentiated, exemplary literacies instructions, and resources, and (b) strategies and interventions that suit the diversity in students' learning styles, individual characteristics, needs, interests, and abilities (Saggers et al., 2011). Similarly, regardless of the personal, physical, and social constraints to social interactions within the context of inclusive education (Ainscow & Sandill, 2010), supporters for inclusive education have emphasised the importance of providing all students, including primary-school-aged students with an ASD, with environments where their diverse

situated literacies experiences and social interactions are respected (Carroll, 2015; Malinverni et al., 2014).

If inclusive education is viewed as anything less than being supportive to students (Loreman et al., 2011), it could undermine the rights and needs of each student. Likewise, this view may undermine the mandates, policies and initiatives for progress in inclusive education such as those that have been influenced by *Article 24, Comment Number Four* (CRPD, 2016). The *Melbourne Declaration on Educational Goals for Young Australians* (MCEETYA, 2008) implies that students should be supported through the literacies of information and communication technology to meet their targeted goals. The MCEETYA (2008) also implies that literacies education is fundamental to the education for young Australians, whether they have a medical diagnosis or not. Targeted support is encouraged to assist students who experience learning difficulties and disadvantages to achieve their optimum levels of educational outcomes (Boche & Henning, 2015).

With these considerations, the concept of inclusive new literacies is used to argue that literacies should have the potential to support the needs and rights of all students. The conceptual framework enables the recognition that to maximise social interactions and educational potentials, all students should have the right to inclusion in the culture of learning communities and inclusive technologies, and to be supported according to their needs (Passey, 2014). Moreover, within the study's conceptual framework is the notion that scaffolding may be necessary for students who may require support to competently complete certain tasks if they experience physical, virtual, social, cultural, and environmental difficulties with effectively engaging in activities (Axford, et al., 2009; Boche & Henning, 2015; Gibbons, 2015; Sharpe, 2006). Scaffolded support may be beneficial for some students who have limited access to external resources that are required to achieve certain tasks (Warschauer, 2007).

As discussed above, online multiplayer games are considered to be embodied in the realm of many literacies (Beavis et al., 2012). They can be described as sophisticated literacies practices which are embedded within the popular culture of primary-school students (Garcia, 2017, Chapter 16). Previous game-based research has investigated the effectiveness of video games to support the social interactions and educational needs of students with and without an ASD (Finke et al., 2015; Gallup et al., 2016; Whitton, 2013). Similarly, Oakley (2017, Chapter 10) suggests that video games have literacies that can meet the diverse needs of learners and provide opportunities for support when required. The literature suggests that scaffolded support for students could be achieved by targeting the multimodal potentials of online multiplayer games (Finke et al., 2015). As Mitchell et al. (2007) imply, scaffolded support in virtual environments might be achieved through guidance, prompts, and options for appropriate multimodal engagements.

The implication is that this support might help students with an ASD to competently self-regulate their social interactions and to develop their social understandings in virtual and physical contexts after adult, peer, technological, or virtual guidance is withdrawn. The notion of inclusive new literacies guides recommendations for targeting the multimodal potentials that the games could afford, and to provide scaffolded support as students require. For example, students' academic progress may require scaffolded support to facilitate conversations, learning, and higher-level thinking (Gibbons, 2015; Sharpe, 2006).

**3.4.2.2 *Understanding relationships through inclusive new literacies.*** A focus on relationships within the context of inclusive education has grown in importance. For example, Santos, Sardinha, and Reis (2016) examine several relationships within inclusive classroom contexts, such as teacher and teacher relationships, and teacher and student relationships. Santos et al. (2016) explain that, within an inclusive context, relationships impact on social interactions, classroom climates, and learning processes. Within the field of inclusive education, there has also



been research on the topics of friendships and social networks of students with and without an ASD, building restorative relationships, relationship-based inclusive practices within early childhood settings, and peer social relationships (Kasari et al., 2011; Koegel, Kuriakose, Singh, & Koegel, 2012; Razer, 2017; Roffman, Wanerman, & Britton, 2011). According to the DSM-5 (American Psychiatric Association, 2013), one manifestation of social interaction difficulties of students with an ASD is limited skills in developing, sustaining, and understanding relationships. Given these relationship difficulties, research within the context of inclusive education has indicated that some students with an ASD may require support to learn about developing and maintaining relationships, such as friendships and appropriate peer relationships (Al-Ghani & Al-Ghani, 2011; DiSalvo & Oswald, 2002). Some students with an ASD may need support to manage appropriate behaviours to suit diverse social contexts, such as engagement with others in imaginative and symbolic play (Colvin & Sheehan, 2012; Wolfberg et al., 2015).

Within the field of inclusive education, the development of relationships through engagements with shared video-game play and online multiplayer games has received attention (Boyd et al., 2015; Gallup et al., 2016). Boyd et al. (2015) have discussed some potentials of video games for developing friendships, partnerships, and membership, when they are played collaboratively. Similarly, Gallup et al. (2016) have explored the friendships of youths with an ASD within in online gaming contexts and found evidence of friendship development. Relationships can be framed in online gaming contexts through interest-driven activities and friendship-driven activities (Ito et al., 2009), and competitive play with gaming partners (Schmierbach et al., 2012). Overall, the conceptual framework drew on the body of research on relationships discourse within the context of inclusive education. This knowledge guided the analysis, descriptions, and understandings of the relationships of students with an ASD, within the context of online multiplayer games.

**3.4.2.3 Making sense of reciprocity through inclusive new literacies.** Reciprocity is linked with skills in problem solving, self-awareness, and relationships. It involves the ability to make meanings from the communication forms and mental states of oneself and those of other individuals (Rodrigues, Whitcomb, & Merrell, 2013, Chapter 11). It has been argued that reciprocity is the cornerstone of social relationships because it facilitates communities and cultures in which there are recognition and respect for people's needs and rights (Kolm, 2008). The importance of reciprocity from this perspective has been widely recognised within the context of inclusive education. Inclusive education embraces cultures and communities where reciprocity is echoed through collaboration, participation, shared resources, and involvement among stakeholders and students (Booth & Ainscow, 2011).

Making sense of reciprocity within the conceptualisation of inclusive new literacies, required understandings of a quality inclusive culture that encouraged shared participation in online and offline affinity spaces (Gee, 2015b), as well as mutual respect for the needs and rights of others (Kolm, 2008). The conceptual framework was guided by the *Melbourne Declaration on Educational Goals for Young Australians* (MCEETYA, 2008). The Declaration acknowledges that, as literacy learners, students need to be supported to relate well with others and develop skills through their interactions with technology. This support is described as crucial during school years and post school years.

The conceptual framework of inclusive new literacies mirrors this notion and was extended to the Discourse of online multiplayer games. Recent studies indicate that reciprocity within the context of video games, including those played online with others, is a growing area of interest (Velez et al., 2016; Wohn, 2011). Velez et al. (2016) report that playing violent video games cooperatively with others can offset the subsequent aggressive behaviours of gamers, and thus enhance reciprocity. The work by Kalantzis and Cope (2012) is drawn on to highlight inclusive

potentials of video games to promote connected gaming, participation, and collaboration with peers. Video games may also provide opportunities for students to share games within classroom and online contexts.

**3.4.2.4 Inclusive new literacies: Medical and social discourses.** The conceptual framework (see Figure 2) situated this research at an intersection between the conflicting paradigms of the medical and social discourses of disability. A medical model of disability perspective can be described as a scientific understanding of difficulties, impairments, disorders, and disabilities that are believed to be innate to an individual (Waltz, 2013). Through a medical perspective, it is assumed that students' literacies and social interaction skills are affected by the severity of students' level of ASD characteristics, and students' personalities, intellectual abilities, patterns of strength and weaknesses, and learning styles (Oliver, 2013). Research suggests that where literacy education and social interactions are heavily governed by perspectives of the medical model, the implication is that students are sometimes ignored, segregated, or embarrassed and subjected to unnecessary exclusion in schools (Humphrey & Lewis, 2008).

Conversely, under the social model of disability, the assumption is that the difficulties experienced in literacies and social interactions by students with an ASD are socially created by oppression in their social contexts, in physical environments, and in complex forms of structural and institutional discrimination (Oliver, 2013). The lens of the social model of disability is embraced within the context of inclusive education to emphasise that some of the limitations, difficulties, and differences experienced by students are not only because of their different abilities, but also because of social and physical barriers that impede participation in society, and formal and informal learning environments (Whitburn & Plows, 2017, Chapter 1).

The conceptual framework embraced elements of the social model perspective (Oliver, 2013). It enabled understandings that limitations, difficulties, and differences experienced by students with

an ASD in their social interactions were owed not only to the characteristics of ASD as described in the literature (American Psychiatric Association, 2013). Social interaction limitations, difficulties, and differences experienced by the students were also understood to be caused by external restrictions such as institutional, semiotic, parental, technical, and physical barriers to participation in virtual and physical environments (Waltz, 2013).

Through the lens of inclusive new literacies, the researcher recognised the potential for the marginalisation of individuals through labelling (Moncrieffe & Eyben, 2007). Arguments for medical categories may be subjective and guided by sets of assumptions about *normality* and be influenced by subjective cultural mindsets (Graham, 2006). The understanding of inclusive new literacies adapted for this research did not focus on labelling students, diagnostic terminologies, nor identifying deficits in learners. Rather, this framework redirected discourse from a medical diagnosis, an individual deficit of social oppression, exclusion, and discrimination. At the same time, it enabled the understanding that, within the context of inclusive education, a diagnosis of ASD may enable students to access and receive appropriate educational services and social interaction support to identify and meet their individual needs (Ravet, 2011). This understanding framed recommendations to provide scaffolded inclusive support for students' needs and for their outcome-based learning through the literacies of technologies and multimodal texts (Oakley, 2017, Chapter 10), such as online multiplayer games.

The essence of the move towards a paradigm of inclusive education is to reduce all constraints, barriers, stigmas, and exclusive practices to social interactions and literacies education in formal educational settings (Armstrong et al., 2010). Therefore, the issue of whether the social interaction constraints and barriers were innate to the learner with an ASD (American Psychiatric Association, 2013) or because of external constraints, such as curriculum policies and instructional practices (Waltz, 2013), was not the focus of this research. The notion of inclusive new literacies

was conceptualised to sustain focus on embracing social interaction potentials in the situated practices of online multiplayer games (Suárez et al., 2013). It was also conceptualised to take a stance for change against dominant social discourses of individual blame in nondiscriminatory ways (Liasidou, 2015). Additionally, the conceptual framework guided focus on the online gaming strengths of the students with an ASD (Gallup et al., 2016) and how the multimodal potentials of online multiplayer games may be targeted to support the social interactions of students with an ASD.

Similarly, the conceptualisation of inclusive new literacies within this context does not suggest an expert-dependent relationship in which the expert's goal is to cure the difficulties experienced by the dependent (Graham, 2006). It is about building awareness of what to do to support the social interactions and literacies needs of students (Armstrong et al., 2010), including those that are diagnosed with an ASD. The essence of this study is to redirect the research from a focus on the medical diagnosis of ASD (American Psychiatric Association, 2013). There is an understanding that social interaction constraints exist within the Discourse of online multiplayer games (Gee, 2015b). This understanding guides recommendations to reduce social interaction constraints by targeting potentials of online multiplayer games.

**3.4.3 Inclusive new literacies: Intersecting NLS and inclusive education.** This research contributes a conceptual framework of inclusive new literacies that integrates several discourses, concepts, and theoretical assumptions from the fields of NLS and inclusive education, such as literacies, social communication modes, and reciprocity (Kress, 2017, Chapter 4; Peters et al., 2013; Rodrigues et al., 2013, Chapter 11). Understandings of relationships, medical and social discourses, and support for social interactions and diversity are also valuable notions that are embedded within the conceptual framework (Ashman, 2014; Liasidou, 2015; Santos et al., 2016). The conceptualisation of inclusive new literacies is extended to NLS and inclusive education in an

original way in that it (a) includes students with an ASD as a social group, and literacies learners, who have a right to have their virtual and physical, online and offline literacies recognised, understood, and supported in multimodal ways, and (b) integrates several discourses, concepts, and theoretical assumptions from the fields of NLS and inclusive education. A body of literature indicates that online multiplayer games have been used in inclusive educational contexts to promote inclusion among students of different genders and cultures, and among students with and without an ASD (Admiraal et al., 2014; Charles, 2012, Chapter 15; Gallup et al., 2016; Jorgensen, & Lowrie, 2011; Malinverni et al., 2014). Therefore, the notion of inclusive new literacies enables the perspective that a range of new pathways for multimodal communication include those offered through online multiplayer games.

### **3.5 Conclusion to Chapter Three**

The goal of this descriptive ethnographic case study was to broaden understandings of the affordances of online multiplayer games for the social interactions of students with an ASD. The study's theoretical framework drew on theoretical perspectives of multimodality (Jewitt, 2017, Chapter 2; Kress, 2012, Chapter 3) and D/discourse (Gee, 2015b). The students' social interactions were conceptualised through the framework of inclusive new literacies. Together, the relationship among these frameworks informed the research questions and guided the research design in the direction of analysing, describing, and understanding social interactions affordances, within the context of the research.

The theoretical framework and the conceptual framework provided the insight that there were a variety of "philosophical perspectives" within the fields of NLS and inclusive education and the research's context. Nevertheless, the focus of the research was more relevant to the research design than confirmation of the validity of a medical diagnosis of ASD or a theoretical position.

Theoretical understandings of D/discourse (Gee, 2015b) and multimodality (Jewitt, 2017, Chapter

2), and the conceptualisation of inclusive new literacies for students with an ASD posed further concerns in that, there was no single discourse to broaden understandings of their social interactions. Therefore, the best course of action was to let the research participants' data speak by documenting their perspectives and social interactions through two qualitative ethnographic methods. The researcher understood that discourses that were used by the research participants influenced the description, analysis, and interpretation of the data.

Based on recent studies, students with an ASD may experience difficulties in social cognition and social understandings despite their efforts in tasks (Mitchell et al., 2007; Ruffman, Garnham, & Rideout, 2001; Schaller & Rauh, 2017). They may also require multimodal scaffolded support to improve their levels of performance, by targeting the potentials afforded by inclusive new literacies and to meet their learning needs within formal inclusive educational contexts (Boche & Henning, 2015; Foreman & Arthur-Kelly, 2017). Accepting that there should be more careful examination of the social interaction potentials within the conceptualisation of inclusive new literacies could be a step towards the full inclusion of students with an ASD.

With these considerations, the theoretical and conceptual frameworks provided several contexts to suggest implications and recommendations for inclusive support to meet their needs in socially meaningful ways. The findings and their implications for supporting students' needs are presented in Chapters Five and Six. A proposed model of inclusive new literacies and a proposed framework for multimodal support are presented in Chapter Seven. Recommendations are made in Chapter Seven to focus on the semiotic resources of online multiplayer games and targeting their multimodal potentials to meet students' social interaction needs. The theoretical framework and conceptual framework built a foundation from which the research methodology was derived. A discussion of the research methodology is presented in Chapter Four.

## Chapter Four: Research Methodology

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This chapter follows discussions presented in Chapter Three. Having discussed how the research design and methodology, data transcription, and analytical and descriptive tools were framed by multimodal perspectives (Jewitt, 2017, Chapter 2) and D/discourse perspectives (Gee, 2012b), Chapter Four moves on to contextualise the study and describe the research design and methodology. A pilot study is also discussed. This chapter brings together the characteristics of a descriptive ethnographic case study design, thereby (a) justifies the research design, (b) presents descriptions of the research sites and research participants, and (c) describes the methodology and qualitative methods that were employed to analyse and interpret the social interaction affordances of online multiplayer games. Chapter Four ends with descriptions of the validity of the research and the ethical conduct of the study.

The context of this study is situated within the fields of NLS and inclusive education. The context was established on the researchers' past professional experiences as a primary-school support-teacher of students, including those with an ASD. During her professional duties, the researcher became aware that some students with an ASD regularly engaged with the semiotic resources of online multiplayer games in online and offline contexts, and within home and school environments. As previous research has indicated, students with an ASD are increasingly engaging with video games (Mazurek & Engelhardt, 2013a). Similarly, previous studies have shown that youths with an ASD are particularly socially interacting with other gamers and friends in online contexts (Gallup et al., 2016; Kuo et al., 2013).

Prior to conducting this study, the researcher had also informally observed the students engaging in conversations with teachers and peers about their interest in, and engagements with, *Minecraft*® and other online multiplayer games. They shared about their online gaming experiences



at home with their peers and teachers, and interacted through printed texts and drawings of virtual images on a daily basis. Informally observed interactions through at-school online gaming engagements with peers, symbolic play in small groups with peers, and playground activities also enabled the researcher to contextualise the social interactions of students with an ASD within their existing educational settings. The students discussed that they engaged with online multiplayer games with some of their peers.

The researcher engaged in informal conversations with parents and teachers of students with an ASD. Parents spoke about their children's online gaming experiences. They spoke about how they assisted their children with school and home literacies learning and skills. The parents had shared insights, and important and unique knowledge into their children's at-home and at-school interests. Similarly, discussions were held with some colleagues about the conversations that they had with students about online multiplayer games. Although on the one hand some teachers encouraged video game discourses, others were critical of students' engagements with them.

Once ethical clearance was received for the research, the ethnographical case study was conducted in one Southeast Queensland School and three homes located within a suburb with a low socioeconomic background. Eighteen segments of 30-minute video-recorded observations and 17 segments of 30-minute semistructured interviews were conducted by the researcher. The data collection stage extended for six months, from December 2015 to May 2016. It extended across three school terms. Now that the context has been explained, the following sections describe the design of this ethnographic case study.

#### **4.1 Ethnographic Case Study**

According to Robben and Sluka (2015), the term *ethnography* can be defined as a firsthand investigative practice of discourses, people, and cultures that are studied within the local settings that they are situated. Pink (2007) describes ethnography as an approach in which knowledge is

created and represented about individuals, cultures, and societies. Ethnography enables ethnographers to experience reality that is representative of the contexts in which the experiences of and information about individuals, cultures, and societies were obtained. An ethnographic case study involves the researcher questioning the daily lives of people through methods of data collection that document and illuminate an issue that is the focus of research (Hammersley, 2007).

Over the past decades, there has been an increase in ethnographic case studies within the contexts of literacies (Rogers & Street, 2012) and ASD (De Wolfe, 2014; McCarthy, 2011). For example, across multiple contexts and participant groups, ethnographic case studies have investigated students' engagements with new digital cultures, such as online multiplayer games (Ito et al., 2009). This study aims to contribute to these growing areas of research, but with a focus on the affordances for a group of students with ASD. Following Hammersley (2007), Pink and Morgan (2013), and Robben and Sluka (2015), the design of this descriptive research is an ethnographic case study with a qualitative approach. Likewise, drawing on the work by Gee (2014), a descriptive approach enabled the insights, explanations, and understandings of how forms of social communication operated in contextual ways.

The study's ethnographic case study design drew on literacy theorists such as Heath (1983), Gee (2007b), and Street et al. (2017). In their approaches to ethnography in the NLS, they emphasise that, in telling their stories, individuals bring with them to different settings concepts that are related to events that are socially conceived. They may also bring with them contextualised ways of thinking, reading, and writing (Gee, 2015b). To demonstrate, ethnographic methods enabled Heath (1983) to record not only how children in a community were initiated into literacy and social interactions through speaking and writing but also how they experienced different home literacies within the same community. Similarly, Gee (2015a) has used ethnography in his book, *Social Linguistics and Literacies*, to examine the language practices of African American children.

Through their ethnographic work in the NLS Gee (2015a), Heath (1983), and Rogers and Street (2012) demonstrated a common focus. They have shown that ethnographic case studies can be used to access, describe, and interpret repeated literacies events, practices, and skills, which emerge and are shaped within social contexts, in multimodal ways, D/discourses, and domains of which they belong. This research is inspired by these well-known experts in the field of NLS, and has drawn on ethnographic perspectives and methodologies to describe and understand the affordances of online multiplayer games for the social interactions of students with an ASD. The methodological approach within this study's design enabled the digression from the conventional perception of literacy. An ethnographic case study design did not restrict the study exclusively to print-based conceptions of reading and writing. A discussion of the research design is presented below.

## **4.2 Research Design**

The research design is briefly explained to signpost the upcoming sections and subsections within this chapter. Following the literature on ethnographic research (Hammersley, 2007; Pink, 2007; Robben & Sluka, 2015), Table 2 below illustrates the research design and highlights (a) the research aims, (b) qualitative methods, (c) research sites, (d) research participants, and (e) nonlinear and interconnected research stages. These elements of the design are addressed further within the chapter.

Table 2

*Research Design*

Elements of the ethnographic case study design	Highlights
Aims	<ul style="list-style-type: none"> <li>• To describe potentials and constraints of online multiplayer games for the social interactions of students with an ASD</li> <li>• To describe multimodal forms of social communication students with an ASD use when engaging with online multiplayer games</li> <li>• To describe parent perspectives of enabling and constraining features of online multiplayer games for the social interactions of children with an ASD</li> <li>• To describe teacher perspectives of enabling and constraining features of online multiplayer games for the social interactions of students with an ASD within formal educational settings</li> </ul>
Qualitative methods	<ul style="list-style-type: none"> <li>• Video-recorded observations—Conducted 18 segments of 3 times 30-min of video-recorded observations</li> <li>• Semistructured and audio recorded interviews—Conducted 17 segments of 30-min video-recorded interviews</li> </ul>
Research sites	<ul style="list-style-type: none"> <li>• 1 school</li> <li>• 3 homes</li> </ul>
Research participants	<ul style="list-style-type: none"> <li>• 3 students diagnosed with an ASD</li> <li>• 5 peers without an ASD</li> <li>• 3 parents</li> <li>• 5 teachers</li> </ul>
Nonlinear and interconnected stages	<ul style="list-style-type: none"> <li>• Collected data at 1 school and 3 homes from December 2015 to May 2016</li> </ul>

- 
- Electronically and physically stored data
  - Transcribed data through multimodal and D/discourse analysis in light of research questions
  - Coded data through thematic coding in light of research questions
  - Described data in light of research questions
  - Analysed data through multimodal and D/discourse analysis
  - Achieved respondent validation of data transcripts
  - Interpretation and discussion of data
- 

As illustrated above in Table 2, this descriptive study has an ethnographic case study design (O'Reilly 2004). The approach of this research was to document and describe the students' daily interactions as they engaged online in virtual spaces, and offline in their homes and school. An ethnographic case study design was considered suitable for understanding the research phenomena in depth and within the study's context (Yuha, 2014). This design reflects that ethnographic study can be contextualised in online and virtual contexts, as well as in physical settings such as homes and schools (De Wolfe, 2014; Fielding, Lee, & Blank, 2008; Heyes, 2017; McCarthy, 2011). This descriptive ethnographic case study was conducted to explore the following research question and the subquestions:

1. What are the potentials and constraints of online multiplayer games for the social interactions of 9-to-10-year-old students with an ASD?
  - (a) What multimodal forms of social communication do students with an ASD use when engaging with online multiplayer games?
  - (b) What are parents' perspectives of the enabling and constraining features of online multiplayer games for the social interactions of children with an ASD?

- (c) What are teachers' perspectives of the enabling and constraining features of online multiplayer games for the social interactions of students with an ASD within formal educational settings?

Although the research questions were answerable and researchable, they had not been adequately addressed in the literature. The research questions provided a frame to broaden understandings of the social interactions of students with an ASD, as they pertained to newer digital literacies practices and technologies, such as within the Discourse of online multiplayer games (Kuo et al., 2014; Tunney & Ryan, 2012). Moreover, theoretical perspectives of multimodality (Jewitt, 2017, Chapter 2) and D/discourse (Gee, 2015b), and the literature on the characteristics of ASD (American Psychiatric Association, 2013) guided understandings that social interactions were shaped and influenced in contextual ways by the available modes of social communication. According to these views, the study was justified to investigate the multimodal forms of social communication that the students used as they engaged with online multiplayer games.

By gaining the perspectives of parents and teachers, the affordances of online multiplayer games for the social interactions of students with an ASD were better understood. Working together with parents offered insights and access to important knowledge about home and online literacies practices (Bourgonjon et al., 2010). The perspectives of parents and teachers broadened understanding of how students generalised, practised, and transferred essential social interaction skills beyond virtual contexts, across different settings with different people, and in different activities, until eventually they became more proficient and confident (Gee, 2015b). The significance of the research questions was further justified by the identified gap in the literature about the potentials and constraints of online multiplayer games for the social interactions of primary-school-aged students with an ASD. The research questions were also justified by the way that the researcher gained access to multiple audiences, and captured and described the multiple

perspectives of different stakeholders within inclusive educational settings (Booth & Ainscow, 2011; Santoro, 2014).

This ethnographic case study approach did not begin with testing existing themes or a specific hypothesis (Simons, 2009), but, rather, it lent itself to the research aims and the questions listed above. The approach was compatible with the research questions in that it enabled new understandings of how the affordances of online multiplayer games were influential to students with an ASD in the context of everyday social interactions. Likewise, an ethnographic case study design was considered suitable to the research questions because this design allowed the use of a case to focus on a specific issue, and thus, using the case to illuminate the issue (Yin, 2014).

This research design was appropriate in that it was not limited to one stage, but rather was divided into the stages of an ethnographic case study (Hammersley, 2007). The stages of the study were unfixed, intertwined, and informed by the study's theoretical and conceptual frameworks. As Yuha (2014) explains, within an ethnographic case study design, processes such as constructing research questions, analysing qualitative data, and interpreting data are layered. Given their complexity, these processes often continue until the research is completed.

Commencement of this study was preceded by 16 to 18 months of developing research skills, reviewing the literature, and gaining ethical approval. For example, prior to conducting the interviews, the skill of careful active listening was learnt by the researcher to prepare for restraint and patience from rushing the participants to answer or interrupting their responses (Simons, 2009). Similarly, research training for the predominant use of video-recorded observation was embraced. The use of video-recorded observations is encouraged to digitally capture multimodal data, to facilitate multimodal transcription, and to reflect the diversity of meaning making resources (Flewitt, Hampel, Hauck, & Lancaster, 2017, Chapter 3).

Key qualitative aspects of an ethnographic case study—namely video-recorded observations, and video-recorded and audio-recorded semistructured interviews—were incorporated to reveal the rich details of social interactions within the study’s context (Hammersley, 2007). Additionally, qualitative research within an ethnographic case study design provided the opportunity to be interpretive, and to prioritise the findings and contributions of the data (Freebody, 2003). Therefore, emphasis was placed on making sense of a phenomenon by observing and interviewing the student participants in their everyday context within authentic affinity spaces as opposed to experimental and clinical ones that are created (Hammersley, 2007; Hayes & Duncan, 2012). Overall, by using qualitative methods, the researcher achieved a primary goal of ethnographic case studies; that is, to explore the in-depth interactions and perspectives of people (Chong & Hung, 2017).

Data were gathered at the research sites to answer the research questions. The research sites, one school and three homes, were conducive to video-recorded observations and video-recorded semistructured interviews. Although an ethnographic case study approach to research is well supported, support is less common from those who argue that this design does not require the researcher to be fully immersed in the society and culture of the participants for sufficient time (Simons, 2009). The view of literacies within the field of NLS was embraced and guided the focus on (a) observing various ways that people use new literacies to communicate the whole meaning of a phenomenon, (b) the different ways in which participants’ perspectives can be represented and interpreted during the fieldwork stage, and (c) the need to spend time in the field of research and become immersed in the literacies practices and D/discourses within the research sites (Chong & Hung, 2017; Gee, 2015a).

The research design required the organising and the analysis of the data. Data organisation and data storage during the early stage of data collection were crucial, due to the magnitude of data that was collected and due to ethical considerations. Moreover, thematic coding of the participants’



perspectives and observed social interactions through multimodal transcriptions laid the foundation for data analysis, descriptions, and interpretation (Flewitt et al., 2017, Chapter 3). The study concluded with the interpretation and written discussion of the data. Theoretical perspectives of multimodality and D/discourse and the notion of inclusive new literacies guided explanations of the findings.

### **4.3 Research Sites**

Section 4.3 describes the selection of the two research sites where the participants' routine daily social interactions and daily practices often occurred. Attention is paid to the homes of the three students with an ASD and three parent participants, and to the school of the three student participants with an ASD, five peer participants without an ASD, and five teacher participants. The selection of three homes and one school as the research sites was based on the notion that situated practices are embedded within Discourses and affinity spaces (Gee, 2004, 2012). Patterns of communicating through the combination of language and other social communication modes were observed. Social interactions within these sites were situated in the participants' experiences and perspectives, and through various identities (Gee, 2014). Consistent with research, this ethnographic case study was situated in the physical real-world and virtual real-world of the individuals studied (Heyes, 2017; Lin, 2016; Yuha, 2014).

The researcher visited the homes of "Ethan", "Mason", and "Noah" to conduct student video-recorded observations, and to conduct the parent video-recorded and audio recorded semistructured interviews. The three homes were located in a Southeast Queensland rural suburb, and were quiet and free from distractions. Figure 3 demonstrates Noah at home in a quiet space, engaged online with *Minecraft*®.



*Figure 3.* Noah engaging with Minecraft® at a home site.

Home visits were conducted to provide this study with aspects of the depth and consistency of an ethnography. They enabled the researcher to observe and to record richer representations of students' online and home interaction and literacies experiences, than schools could afford (Hammersley, 2007). Furthermore, the participants' homes facilitated data to be gathered in online and offline social contexts. The foundation was made for a connection between literacies that were situated across virtual and physical spaces, and formal and informal learning environments. The perspectives of parents regarding the use of multiplayer games provided insight into the students' at-home literacies. Parent perspectives have broadened understanding of how literacies can be built between home-school contexts (Feiler et al., 2007) and virtual-physical contexts (Bourgonjon et al., 2011).

The research was also conducted at "Green Meadows State School" to observe the students engage with their peers in small group face-to-face social interactions. This school site was viewed as an affinity space within which students socially interacted and engaged with literacies on a daily basis (Gee, 2007b). It was perceived to be embedded with D/discourses that had social interaction affordances for peers, friends, gamers, and students (Gee, 2014). Inferring from recent research,

students with an ASD belong to a classroom Discourse in which they share affinities with their peers (Locke et al., 2016). Green Meadows State School, was, therefore appropriate for the video-recorded observations and documentation of the students' daily at-school peer interactions, as they socially interacted as peers and friends. It was also an appropriate site to ask interview questions about student online and offline gaming experiences, teacher understanding of literacy, and student and teacher perspectives of how online multiplayer games influence the social interactions of students with an ASD. The *Melbourne Declaration on Educational Goals for Young Australians* (MCEETYA, 2008) encourages teachers to support students through the literacies of information and communication technology because literacies education is essential to the education of Australian students.

Green Meadows State School served a large student population of over 1200 students, with approximately 120 staff. From 2015, the school catered for students from Preparatory to Year Six and aged four to 12 years. Factors such as the number of students diagnosed with disabilities had been significant. During the time of data collection, the school had a special education support program and assisted over 100 students, including those diagnosed with an ASD. The percentage of children identified as having ASD was approximately 5%. School visits were in line with the research aims to focus on student and teacher perspectives regarding online multiplayer games for the social interactions of students with an ASD, within educational settings. They enabled observations of offline peer face-to-face social interactions of the students, within their usual formal educational setting. School visits also provided a context to understand the affordances of online multiplayer games for the social interactions of students with an ASD within educational settings.

#### **4.4 Participants**

An ethnographic approach involves using a group of people to facilitate in-depth understanding of an issue (Hammersley, 2007). Within the design of this study, four participant

groups were used: students with an ASD, peers without an ASD, parents, and teachers. Information about the participants and their roles were also relevant to the research design (see Table 3 below). This section evokes how within a D/discourse framework (Gee, 2015b), the notion of *identity* was (a) used as a sample marker to describe the discourses, social actions, and social identities that the participants enacted at the research sites (Jones, 2017, Chapter 9); (b) linked to their interest-driven and friendship-driven participation within affinity spaces (Ito et al., 2009); and (c) situated within their social interactions and literacies practices (Stein, 2008).

Researchers have shown that purposeful sampling is commonly used in qualitative studies to facilitate the ability to (a) identify and select participants (or a case) who meet set criteria, and (b) describe, highlight, and share new understandings of unfamiliar experiences (Patton, 2015; Suri, 2011). Following a notion of sampling with a purpose (Patton, 2015), the researcher allowed Ethan, Mason, and Noah, and their parents and teachers the choice to volunteer their participation after being invited to participate in this research.

Table 3

*Participants and Description of Roles*

Participants	Description of participants' roles
5 x 9-to-10-year-old students with an ASD	<ul style="list-style-type: none"> <li>• Read information package and gave written and oral assent to participate in the research</li> <li>• Each participated in 3 at-screen sessions of <i>Minecraft</i>® play while the researcher conducted 9 segments of 3 times 30-min video-recorded observations at home sites</li> <li>• Each participated in 3 small group peer face-to-face social interactions in a classroom setting while the researcher conducted 9 segments of 3 times 30-min video-recorded observations</li> <li>• Each participated in 3 semistructured interviews while the researcher conducted 9 segments of 3 times 30-min video-recorded and audio recorded semistructured interviews in a classroom setting</li> </ul>
5 x 9-to-10-year-old peers without an ASD	<ul style="list-style-type: none"> <li>• Read information package and gave written and oral assent to participate in the research</li> <li>• Each participated in 3 small group peer face-to-face social interactions in a classroom setting while the researcher conducted 9 segments of 3 times 30-min video-recorded observations</li> </ul>
3 parents of the students with an ASD	<ul style="list-style-type: none"> <li>• Read information package and gave written and oral consent to participate in the research, and for their children to participate in the research</li> <li>• Each participated in 1 segment of 30-min video-recorded and audio recorded semistructured interview at home sites</li> </ul>
5 primary-school teachers of the students with an ASD	<ul style="list-style-type: none"> <li>• Read information package and gave written and oral consent to participate in the research</li> <li>• Each participated in 1 segment of 30-min video-recorded and audio recorded semistructured interview at school site</li> </ul>

As illustrated in Table 3 each participant had roles. The ethics processes and considerations for the participants and their roles will be discussed below in section 4.5.

Information about the students with an ASD was gathered through the student, parent, and teacher interviews. Following analysis of the students' demographic data, three themes were derived by grouping like responses into interests and dislikes, and into activities students engaged in for social interactions when in the school. The demographic results of the students are illustrated below in Table 4.

These students met the criteria of having a medical diagnosis of ASD and having a high interest in online multiplayer games, including *Minecraft*®. They engaged with multiple avatars, including their own. Their avatars were given pseudonyms. Ethan's avatar was referred to as "EthanMBrown", Mason's avatar was named "CrawlysnakeM", and Noah's online identification was "NlittleSniper". All random avatars referred to in Chapters Five and Six will be identified as "Stevatar". All random online players that the students with an ASD engaged with will be referred to as "Steve". The researcher's knowledge of the identity of the online players was not necessary for the purpose of this research. Therefore, their identity remains anonymous. As members of the online multiplayer gaming and classroom Discourses (Gee, 2015b), the students provided insight into the situated contexts of social interactions and the situated uses of social communication modes within these affinity spaces.

Table 4

*The Students with an ASD's Demographic Data*

Students' strengths/personal interests in home settings	Students' dislikes	High-interest activities in school
<ul style="list-style-type: none"> <li>• Technology—multiplayer and single player games</li> <li>• Hobbies—drawing, building <i>LEGO</i>® bricks, engaging with dinosaur related semiotic resources</li> <li>• Physical activities—trampoline</li> </ul>	<ul style="list-style-type: none"> <li>• Bullying</li> <li>• Not having their own way</li> <li>• Sports, such as soccer</li> <li>• Some academic work, such as mathematic</li> </ul>	<ul style="list-style-type: none"> <li>• Technology—engagement with <i>iPads</i>™, computer games</li> <li>• Creative activities—drawing, and building <i>LEGO</i>® bricks</li> <li>• Playing games—tiggy, tag, cards, games in the school playground and sand pit, computer games, and <i>iPad</i>™ games</li> <li>• Some academic work—mathematics and spelling</li> </ul>

Table 4 shows that, the students had a high interest in activities such as playing video games through technological devices, including television, *Xbox 360*™, PCs and *iPads*™. They also had

high interests in drawing, building *LEGO*® bricks, and singing. Most of the students had a low interest for sports and physical outdoor activities and disliked antisocial behaviours, for example bullying.

The three boys were diagnosed using the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision* criteria, by experienced clinicians including psychiatrists, paediatricians, and neurologists (American Psychiatric Association, 2000). In addition, they had received an ASD verification through the state government verification process in its *Education Adjustment Program* to identify their need for support within the public education system (Queensland Government, 2017). At the time of data collection, at-school literacies learning was done in the classroom environments through regular collaboration of their classroom teachers, special education staff, heads of curriculum, learning support teachers, an engagement coach, and a guidance officer. This differentiated and collaborative support in an inclusive setting, for students' needs and diversity is encouraged by Booth and Ainscow (2011).

Purposeful sampling was used to draw research participants from students who had high levels of interest in *Minecraft*®, experiences with online multiplayer games, and were willing to participate in the study (Patton, 2015; Suri, 2011). Male students were chosen because in Green Meadows State School, more boys with an ASD informally expressed their interest in the Discourse of online multiplayer games than girls with an ASD, and because the prevalence of boys with an ASD diagnosis was higher among boys than girls. Hence, it was in the context of an online gaming affinity (Hayes & Duncan, 2012), the prevalence of ASD, and the male to female ratio for an ASD diagnosis (Christensen et al., 2016), that this study selected male participants diagnosed with an ASD. As previous estimates by the Centers for Disease Control and Prevention (2017) have indicated, 1 in 42 boys has a diagnosis of ASD, as opposed to 1 in 189 girls diagnosed. Similarly, in Australia, males are four times more likely to be diagnosed with an ASD than females, with the



prevalence rates being 1.1% and 0.3% respectively (Australian Bureau of Statistics, 2017). Previous trends in video games have suggested that the number of males drawn to multiplayer games increased drastically (Bonanno & Kommers, 2008), and that males are considered to be more experienced in the field of multiplayer games than females (Bourgonjon et al., 2011).

Nine-to-ten-year-old students were selected for the context of this study because of their expected social development milestones (Berk, 2012). Notably, students of this age may understand themselves and other people as group members. They may engage in peer interactions, same sex groups, and club-oriented activities (Berk, 2018). Nine-to-ten-year-old students may sustain attention and concentration for a longer period of time than younger primary students (Davies, 2011; Drewes & Schaefer 2016). They may have the ability to transition to the rules of games, and to understand the complimentary roles of others who are playing simultaneously with them (Berk, 2012; Davies, 2011; Drewes & Schaefer 2016).

To broaden understandings of the affordances of online multiplayer games for the offline social interactions of students with an ASD, they were observed in the school setting where they interacted in small groups, with five of their peers. The peer participant group consisted of one female and four males, some of whom were friends of the students and online gamers. Previous studies have suggested that students with an ASD are drawn together with other people to engage in a shared interest or common affinity, such as online multiplayer games (Gallup et al., 2016; Kuo et al., 2014). Research has indicated that observed interactions between students with an ASD and their peers provide insights into their social interactions (Locke et al., 2016; Ozuna et al., 2015). Hence, describing the face-to-face at-school interactions of students with an ASD with peers with whom they engage on a regular basis, held more validity to the findings than describing the students' offline play by themselves at home. The roles of the peer participants to participate in the research are highlighted above in Table 3 (section 4.4).

In addition to student participants and peers, the research participants included a group of parents. The parents of Ethan, Mason, and Noah were between 40 and 50 years old. Table 3 (section 4.4) illustrates the parents' roles with the research design. Educational research (Bourgonjon et al., 2011; Comber & Barnett, 2003; Martini & Sénéchal, 2012; Wernholm & Vigmo, 2015), and efforts in educational reforms within the classroom (MCEETYA, 2008), support the power of home-school literacies between families and school communities. The importance of the viewpoints of teachers, within the context of inclusive education (Able et al., 2015) and video gaming (Marino et al., 2013), was also acknowledged. There were a sufficient number of interested teacher participants at one school with experience with the students with an ASD to be able to conduct the research. Therefore, following the notion of sampling with a purpose (Palinkas et al. 2015; Patton 2015), the teacher selection was based on the teachers' involvement with students with an ASD in the school setting. The teachers were aged 35 to 45 years. This participant group included some of the students' regular classroom teachers and support education teachers, and teachers who taught students with an ASD. The teachers had knowledge about students' experiences with online multiplayer games. Their teaching experiences extended up to 22 years and ranged from early childhood to upper primary-school settings. Data collection from the teachers provided insight into how online multiplayer games can be used as inclusive resources to support the students' social interactions in physical and virtual world contexts. Table 3 (section 4.4) displays the teacher participants' roles in the research.

Collectively, 16 participants took part in the research. Three students with an ASD participated in video-recorded social interactions in online and offline spaces. Five peers participated in video-recorded face-to-face social interactions with the students with an ASD. Three parents shared their perspectives of online multiplayer games for the social interactions of their sons with an ASD, through audio-recorded and video-recorded semistructured interviews. Five teachers'

views of the potentials and constraints of online multiplayer games were collected through audio-recorded and video-recorded semistructured interviews.

#### **4.5 Pilot Study**

A pilot study received ethics approval. It was conducted and considered useful to allow the refining of the research methods prior to conducting the larger ethnographic case study. The pilot study informed the suitability, limitations, and implications of the methodological decisions of the main research (Simons, 2009). Hence, by conducting a pilot study, the researcher had sufficient time to address deficiencies in the design of the larger study. Aspects of the design of the pilot study were modelled from the planning of the main research design. The pilot study used the qualitative method of a video-recorded observation for data collection.

The data set for the pilot study was a publicly accessible online video-recorded observation of a 9-year-old boy's engagement with *Minecraft*®. It was unknown whether the boy has a diagnosis of ASD. A diagnosis of ASD was not a criterion for the pilot study. The focus of the pilot study was the use of multimodal analysis to transcribe, code, analyse, describe, and interpret the publicly accessible video recording. Table 5 below, demonstrates the transcription and coding of the publicly accessible online video-recorded observation of the engagement of a 9-to-10-year-old child's engagement with *Minecraft*®.

Table 5

*Transcript of Publicly Accessible Video: Child Playing Minecraft®*

Date of transcription and coding 22/11/14			
Length of video 0:00-7:30			
Transcript			
<p>Screen displays a still image of a blurred blue, green, brown and grey <i>Minecraft®</i> terrain. There are images of blocky sky, trees. The words '<i>Minecraft®</i>', 'single player', 'multiplayer', 'options', and 'quit game' spread across screen. On the top right of the screen is a video of Joshua. The cursor hovers over word 'singleplayer'. Joshua says, "Ahh, okay". Clicking sounds of the mouse and typing on keyboard are heard. Joshua clicks on 'singleplayer'. More words appear on the screen. Joshua looks at the screen. He appears to make eye contact with the observer. His eye contact shifts to his computer screen. He smiles as he swayed and bobbed in the chair. Says "Urm." He swayed and bobbed in chair. The clicking sounds of mouse and typing on keyboard are heard. The words 'New lets [let's] play' appear on the screen. Joshua reclines in his seat and clicks the text 'More world options'. This action generates new words on screen. Joshua clicks on words 'World type superflat'. He continued to type. Clicking sounds of keyboard and the mouse are heard. Joshua Swivels in his chair. He raises and lowers his head as he gazed from the keyboard to the screen. The option 'New world' is selected on the screen. "Urr, welcome to the worst player of <i>Minecraft®</i>." Words 'Loading world building terrain' appear on the screen. Joshua says, "Op!" He blinks. He puts his clinched fist on his mouth and blows on his clinched fist. The action makes rhythmic trumpet like sounds. Joshua moves his head to gaze across screen.</p>			
Time	Social communication modes		
	Speech	Sound and vocalisation	Body Movement/Gesture
0:01	Ahhhh, okay	<ul style="list-style-type: none"> <li>• High pitched</li> <li>• Typing</li> <li>• Rustling</li> </ul>	<ul style="list-style-type: none"> <li>• Types on keyboard</li> <li>• Body leans towards screen</li> <li>• Swivels in chair</li> <li>• Raises and lowers head from keyboard to screen</li> </ul>
0:04	Urm	<ul style="list-style-type: none"> <li>• Typing of key board</li> <li>• Clicking of mouse</li> </ul>	<ul style="list-style-type: none"> <li>• Swivels in chair</li> <li>• Raises and lowering head from keyboard to screen</li> </ul>
0:14	Urr, welcome to the worst player of <i>Minecraft®</i> .	<ul style="list-style-type: none"> <li>• Typing of key board</li> </ul>	<ul style="list-style-type: none"> <li>• Swivels in chair</li> <li>• Raises and lowers head from keyboard to screen</li> <li>• Types on keyboard</li> </ul>

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		<ul style="list-style-type: none"> <li>• Clicking of mouse</li> </ul>	<ul style="list-style-type: none"> <li>• Blinks</li> </ul>
0:19	Ohp	<ul style="list-style-type: none"> <li>• Trumpet sound</li> <li>• Makes rhythmic “blowing raspberry” sounds</li> </ul>	<ul style="list-style-type: none"> <li>• Puts clinched fist on mouth</li> <li>• Blows on clinched fist</li> <li>• Moves head to gaze across screen</li> </ul>
0:39	Mumbles	<ul style="list-style-type: none"> <li>• Typing of key board</li> <li>• Clicking of mouse</li> </ul>	<ul style="list-style-type: none"> <li>• Stands</li> <li>• Moves head to gaze across screen</li> <li>• Steps towards screen</li> </ul>

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It is acknowledged that components of the pilot study are small in comparison to the main study and the timeframe of completion was approximately one month as opposed to four years. Nevertheless, the online video-recorded observations provided implications for transcribing and coding the modes of social communication that students with an ASD used when they engaged with online multiplayer games. The data analysis for the pilot study revealed that data analysis is a multistage and time-consuming process (Flewitt et al., 2017, Chapter 3). Following Jewitt (2006) multimodal analysis began with repeated viewing and listening of the data for transcription, supplemented with coding for the segmentation and naming of the modes and themes, in light of the research questions.

The analysis process of the pilot study was consistent with the warning of Evers (2011) and Flewitt et al. (2017, Chapter 3) that video-recorded observations and interviews can be time consuming due to intensive transcriptions. Hence, the researcher’s ability to investigate a complex topic, to transcribe, describe, analyse, and interpret a manageable quantity of data from the video recordings was taken into consideration. Accordingly, with regards to the larger study, at least 5

hours of transcribing was allotted for every 1 hour of real-time recorded observation and interview (Simons, 2009).

Drawing on Pink (2007), the pilot study told that social interactions with video games are observable and recordable practices that can be transcribed into written texts. The study revealed that, oral, written, visual, gestural, and sensory aspects of human interaction can be analysed within virtual contexts. The pilot study revealed that there are multimodal affordances of online multiplayer games. It revealed that, oral, written, visual, gestural, and sensory aspects of human interactions can be analysed within virtual contexts. The data analysis for the pilot study was useful for the researcher to refine the research question and subquestions about the benefits and constraints of online multiplayer games for the social interactions of students with ASD. Consistent with the work by Kress (2013), the pilot study showed that a social semiotic multimodal approach can guide analysis on the correlation between how people use multimodal resources and the social context in which they interact. Data analysis also reflected that engagement with *Minecraft*® is a multimodal experience. The findings revealed that meanings for social interactions can be understood through various social communication modes such as speech, sound, and gestures (Jewitt, 2017, Chapter 2). They evoked the notion that gamers engage in conversations with oneself, the screen, and social partners (Gee, 2015b). Overall, the pilot study offered implications for data collection through video recording (Pink, 2007) and multimodal analysis of video-recorded data.

#### **4.6 Data Collection**

It has been noted that an ethnographic case study approach is well suited to allowing the adaptation and use of a variety of methods appropriate for collecting the study's data (Robben & Sluka, 2015; Yuha, 2014). This approach enables researchers to spend an adequate amount of time within the affinity spaces and Discourses of the participants (Gee, 2015a). Research instruments are used to make observations, and to understand interactions and experiences (Robben & Sluka, 2015).

Table 6 below, illustrates that video-recorded observations, and video-recorded and audio-recorded semistructured interviews were selected as data sets. Video recording was a primary data source for this research, as it permitted repeated visual and audio examination of the unfolding of complex social interactions and the multimodal forms of social communication that the students used (Flewitt et al., 2017, Chapter 3). Unlike ethnographic handwritten field notes (Emerson, 2011) and audio-recorded interviews (Warren & Karner, 2010), video recording did not limit the data collection to only what was heard. Video recording enabled active listening to pay attention to the meaning of what was said (Knoblauch, 2012).

Table 6

*The Data Sets*

Participants	Data sets	Research questions	Data analysis	Research sites
3 students <ul style="list-style-type: none"> <li>• Boys</li> <li>• 9-to-10-year-old</li> <li>• Diagnosed with an ASD</li> <li>• High interest in online multiplayer games, for example <i>Minecraft</i>®</li> </ul>	9 segments of 3 times 30-min at-screen video-recorded observations (4.5 hrs)	1. What are the potentials and constraints of online multiplayer games for the social interactions of 9-to-10-year-old students with an ASD?  1(a) What multimodal forms of social communication do students with an ASD use when engaging with online multiplayer games?	Multimodal analysis and D/discourse analysis	Students' homes
5 peers <ul style="list-style-type: none"> <li>• 1 girl and 4 boys</li> <li>• 8-to-10-year-old without an ASD</li> <li>• High interest in</li> </ul>	9 segments of 3 times 30-min small group peer face-to-face video recorded observations (4.5 hrs)	1. What are the potentials and constraints of online multiplayer games for the social interactions of 9-to-10-year-old students with an ASD?	Multimodal analysis and D/discourse analysis	Green Meadow State School

online  
multiplayer  
games

3 students

- Boys
  - 9-to-10-year-old
  - Diagnosed with an ASD
  - High interest in online multiplayer games
- 9 segments of 3 times 30-min video-recorded and audio-recorded semistructured interviews (4.5 hrs)
1. What are the potentials and constraints of online multiplayer games for the social interactions of 9-to-10-year-old students with an ASD?
- 1(a) What multimodal forms of social communication do students with an ASD use when engaging with online multiplayer games?
- Multimodal analysis and D/discourse analysis
- Green Meadow State School

3 parents

- Parent of child with an ASD
- 3 segments of 3 times 30-min video-recorded semistructured interviews—schedules of 10 questions (1.5 hrs)
- 1(b) What are parents' perspectives of the enabling and constraining features of online multiplayer games for the social interactions of children with an ASD?
- Multimodal analysis and D/discourse analysis
- Parents' homes

5 teachers

- Primary-school teachers
  - Experience teaching students with an ASD in years 3,4,5
- 5 segments of 3 times 30-min video-recorded semistructured interviews—schedules of 10 questions (2.5 hrs)
- 1(c) What are teachers' perspectives of the enabling and constraining features of online multiplayer games for the social interactions of students with an ASD within formal educational settings?
- Multimodal and D/discourse analysis
- Green Meadow State School

Table 6 signifies the notion that a Discourse can be studied as a dance that is embedded within changing patterns of resources, communicative events, perspectives, places, and times (Gee, 2014).



These approaches to data collection reinforced the importance of the participants' and stakeholders' contribution to knowledge (Booth & Ainscow, 2011; Santoro, 2014), the merging of home and school literacies (Bourgonjon et al., 2011; Warschauer & Tate; 2017, Chapter 5), and multimodal ways to collect data (Jewitt, 2017, Chapter 2).

**4.6.1 Video-recorded observations [RQ 1 and 1a].** The use of digital audio-visual devices has increased because of the devices' ability to capture social interaction processes (Knoblauch, 2012). In ethnographic research, these devices become crucial tools for observing, experiencing, capturing, and understanding ethnographic realities and knowledge about individuals through conversations, images, senses, and other discourses (Pink, 2007). Hence, the video-recorded observations were captured through a digital camera. The researcher recorded approximately 18 segments of 30-minute video-recorded observations of students' interactions. The video-recorded observations set out to answer the following questions:

1. What are the potentials and constraints of online multiplayer games for the social interactions of 9-to-10-year-old students with an ASD?
  - (a) What multimodal forms of social communication do students with an ASD use when engaging with online multiplayer games?

Data were collected during nine segments of 3 times 30-minute video-recorded observations of the boys' online interaction at the screens with random online players. Given the effectiveness of this method of data collection (Simons, 2009), an additional nine segments of 3 times 30-minute data were collected by video recording students' engagements in offline peer face-to-face interactions. The data collected were in consideration of its manageability (Flewitt et al., 2017, Chapter 3). Guided by Pink and Morgan (2013), the data were sufficient to allow profound and valid ways to understand firsthand the gaming experiences of the students. For this purpose, the researcher recorded approximately nine observation hours of data. The face-to-face interactions of

the students with an ASD were videoed in a free-play setting that was physically bounded from nonconsented children.

The researcher observed the students with an ASD as they engaged with *Minecraft*® through semiotic resources, for example computer screens and handheld controllers. One digital camera captured the students' bodies as they interacted with *Minecraft*®. For the majority of times, the students sat in chairs, manipulated the controllers, and their bodies faced the screens. The other digital camera captured the details on the screens. To ensure that the quality and effectiveness of the video devices were fitted for the context of the research, quality check was done in advance and at the start of each at-screen observation session.

As a participant observer, the researcher became physically and socially immersed in the interactions of the students. The researcher remained in the room where the data were collected and participated through direct observations of the interactions and through responder-speaker conversations with the students as they participated in the at-screen interactions. By extending the theoretical perspectives of D/discourse (Gee, 2015a) and elements of ethnographic research (Robben & Sluka, 2015), the researcher was situated within the affinity spaces of the students as a social interaction partner, learner, and as an observer. The researcher used the video-recording technique while she was present in the affinity spaces of the students to observe them, and to record their routine activities within the virtual worlds (Gee, 2015b). A semiotic perspective (Kress, 2013) was embraced to observe the students during their at-screen engagement with *Minecraft*®. Video recording also allowed the researcher to capture social communication modes that were verbal and nonverbal, and social interaction potentials and constraints. Attention was paid to student engagements with material semiotic resources, such as screens, and handheld game controllers. Moreover, the lenses of the digital cameras captured details that may have been missed by the lenses of the naked eyes.

Video recording was also used to gain new knowledge of the influence of online multiplayer games for the students' offline face-to-face social interactions. The researcher video recorded the students with an ASD as they engaged in a classroom, with their peers and with material semiotic resources such as *Minecraft*® toys and books, printed texts, art and craft materials, resources for writing, and educational playing cards. Most of the semiotic resources in the classroom were available prior to the commencement of the data collection. However, the researcher made available additional semiotic resources. Two digital cameras captured the students' and peers' bodies as they interacted with each other and the resources. To ensure that the quality and effectiveness of the video devices were fitted for the context of the research, quality check was done in advance and at the start of each peer face-to-face observation session. Subsection 4.6.2 describes how one-on-one video-recorded and audio-recorded semistructured interviews were appropriate for enabling the perspectives of the student, parent, and teacher participants to be shared within the context of this research.

**4.6.2 Semistructured interviews [RQ 1, 1a, 1b, and 1c]** To complement the study's video-observation based approach, 17 times 30-minute video-recorded and audio-recorded semistructured interviews were conducted. Nine segments of 3 times 30-minute video-recorded semistructured interviews were collected from the three student participants with an ASD. Three segments of 30-minute video-recorded semistructured interviews were collected from the parents. Five segments of 30-minute video-recorded semistructured interviews were collected from the teachers.

The purpose of the semistructured interviews was to gather data from the participants through specific questions that would elicit relevant responses to research question 1 and subquestions 1b and 1c (Brinkmann, 2013). Within the ethnographic case design, interviewing was considered an active form of social interaction that produced knowledge, conversations, explanations, views, and descriptions of aspects including activities and objects that are related to the research aim

(Brinkmann, 2013; Roulston, 2010). The format of the semistructured interviews enabled the researcher to have conversations with the students, parents, and teachers to understand their perspectives of the social interaction affordances associated with online multiplayer games. See Figure 4 for a screen shot from the student video-recorded semistructured interviews.

As shown in Figure 4, the semistructured interviews had a face-to-face individual structure, with the basic pattern of interaction being a question-answer talk sequence (Roulston, 2010).



*Figure 4.* Screen shots from student and teacher semistructured interviews.

Figure 4 illustrates face-to-face interactions between the researcher and a student, and between the researcher and a teacher. Using a digital camera to capture the video-recorded semistructured interviews (a) provided a more accurate and higher level of permanency of capturing the participant's multimodal ways of communicating, for example through speech and gestures, than nonrecording methods, and (b) offered better veracity and reportage of accuracy than handwritten notes and audio recording (Simons, 2009). An audio recorder was used as back up. It captured the data in a different form, in case the digital camera malfunctioned or other unforeseen technical problems were experienced. To ensure that the quality and effectiveness of the video and audio devices were fitted for the context of the research, quality check was done in advance and at the start of each interview.

During interviews, participants may give responses that they think that the interviewer wishes to hear (Brinkmann, 2013; Kvale, 2007). Therefore, the use of open-ended questions within the semistructured interviews sessions provided the opportunity for the participants to share information without being constrained by their thoughts of the researcher's perspectives. Caution was also taken against leading the interviewees to a desired response by constructing the questions to be open ended (Kvale, 2007). Giving the participants a voice and avoiding undue disturbance caused by negative reporting were considered to be good ethical practice (Simons, 2009). Consequently, the researcher refrained from interrupting the participants during the interviews and withheld judgements about the participants' perspectives.

Similarly, Simons (2009) warns that the interviewees may have the tendency to dominate the interview, and thus, may stray from giving the relevant information that is needed to answer the research questions. These limitations were avoided by clearly and succinctly restating the research's focus and purpose of the interviews at the time of the interviews. Before the interviews started, the estimated time for completion was communicated to the participants. The researcher proceeded with the interview after assurance that the participants understood the research purpose. To maintain the focus of the research, the interviews' content was structured through three interview schedules of six to 14 questions. The constructs targeted in the interview questions were consistent with the research questions, and were guided by the study's theoretical framework.

Semistructured interview schedules directed the composition of follow-up questions about students' online engagements with multiplayer games and social interactions in face-to-face small group settings. Interview schedules were components of the interview protocols, which were used to guide the interview process. Conversely, as the protocols were only guides, some questions were not asked in the same order as outlined in the interview schedules (Roulston, 2010). Each interview protocol had a detailed header about the time, participant, and location of the interview. The

interview questions were typed in bold to distinguish them from the interviewees' responses. See Table 11 (subsection 4.7.1.2 below) for a student interview protocol.

The interviews required the selection of rooms that were quiet, convenient, and free from distractions. Students and teachers were interviewed in private meeting rooms and empty classrooms within the school site where their anonymities were protected, and where they felt relaxed and comfortable. Parents were interviewed in their homes with the same conditions, to provide the opportunity for them to be more forthcoming without distractions (Jewitt, 2017, Chapter 2). The research participants were consulted regarding the interview times so that there were minimal disruptions to student learning and daily routines. The interviews were completed by thanking the participants for their time. At the same time, the participants were assured of confidentiality. They were offered a summary of the study's results and a summary of the research findings.

**4.6.2.1 Student semistructured interviews [RQ 1 and 1a].** The student semistructured interview schedule is displayed below in Table 7. It outlines the topics and questions discussed during the student video-recorded semistructured interviews. The focus of the first sets of topics was on the students' demographics and interests, behaviours, and activities. Previous research has suggested that repetitiveness in interests, behaviours, and activities in students with an ASD may occur with a high frequency (Leekam et al., 2011). Questions, for example, "Is there something that you are good at?" and "What are some of your dislikes?", drew on the notion of identity in the D/discourse theory (Gee, 2015b). They were used as a sample marker to describe interests and dislikes of the students who were members of several Discourses. These topics framed the collection of data about the students' interests in online video gaming (Finke et al., 2015; Gallup et

al., 2016). Some of the findings that emerged from these questions were discussed in section 4.4 about the student participants' demographics.

Table 7

*Student Interview Schedule*

Topics	Interview questions
1. Students' demographics about themselves	<ul style="list-style-type: none"> <li>• Is there something that you are good at?</li> <li>• What is your favourite subject?</li> <li>• What are some of your dislikes?</li> </ul>
2. Students' interests in <i>Minecraft</i> ® related activities	<ul style="list-style-type: none"> <li>• Why do you like to play <i>Minecraft</i>® with others?</li> <li>• Do you read <i>Minecraft</i>® books?</li> <li>• Why do you read <i>Minecraft</i>® books?</li> <li>• Do you play with <i>Minecraft</i>® toys?</li> <li>• Tell me examples of <i>Minecraft</i>® toys that you like to play with.</li> <li>• Why do you play with <i>Minecraft</i>® toys?</li> </ul>
3. Activities students engage in for social interactions when in the school playground	<ul style="list-style-type: none"> <li>• Do you speak with others when you are playing in the playground?</li> <li>• Do you share ideas with others when you are playing in the playground?</li> <li>• What games do you play with others in the playground?</li> <li>• What do you like to do with others in the playground?</li> </ul>
4. Students' description of online multiplayer games played at home	<ul style="list-style-type: none"> <li>• Tell me about the games that you play online with others when you are at home.</li> </ul>
5. Students' description of online multiplayer games played at school	<ul style="list-style-type: none"> <li>• Tell me about the games that you play online with others when you are at school.</li> </ul>
6. Physical games students play at school, in the playground and at home with others that are related to <i>Minecraft</i> ® and other online multiplayer games – e.g. soccer, handball, tiggly.	<ul style="list-style-type: none"> <li>• Do you play games, such as soccer, handball or tiggly?</li> <li>• Are there any games other that you play at school?</li> <li>• What games do you play at break time with others?</li> <li>• Do you talk about <i>Minecraft</i>® with your friends when you are playing at school?</li> <li>• Do you pretend to play computer games when you are in the playground?</li> </ul>
7. Student recollections of their online multiplayer game playing history,	<ul style="list-style-type: none"> <li>• How long have you been playing <i>Minecraft</i>®?</li> </ul>

that is, how long they had been playing <i>Minecraft</i> ®	<ul style="list-style-type: none"> <li>• How old were you when you began to play <i>Minecraft</i>®?</li> </ul>
8. Members of students' online affinity groups	<ul style="list-style-type: none"> <li>• Who do you play <i>Minecraft</i>® with?</li> <li>• Do you play <i>Minecraft</i>® with people who you have not met?</li> <li>• Do you play <i>Minecraft</i>® with people who you do not know?</li> <li>• Why would you not play <i>Minecraft</i>® with someone?</li> </ul>
9. The average number of hours students spend playing <i>Minecraft</i> ® and other online multiplayer games per week day	<ul style="list-style-type: none"> <li>• How often do you play <i>Minecraft</i>® each day?</li> <li>• On which day do you play <i>Minecraft</i>® the most?</li> <li>• Would you like to have more time to play <i>Minecraft</i>® when it a school day??</li> <li>• Do you think that you spend too much time playing <i>Minecraft</i>® before and after school?</li> <li>• Do you think that you spend enough time playing <i>Minecraft</i>® Monday to Friday?</li> </ul>
10. The average number of hours students spend playing <i>Minecraft</i> ® and other interactive multiplayer games per weekend day	<ul style="list-style-type: none"> <li>• How often do you play <i>Minecraft</i>® on a Saturday?</li> <li>• How often do you play <i>Minecraft</i>® on a Sunday?</li> <li>• Would you like to spend more time on a weekend playing <i>Minecraft</i>®?</li> <li>• Do you think that too much time playing <i>Minecraft</i>® on Saturdays and Sundays?</li> </ul>
11. Students' reciprocity in virtual and physical environments	<ul style="list-style-type: none"> <li>• Tell me some of the things that you do with other online players when you play online.</li> <li>• Do you ever like to talk about <i>Minecraft</i>® with friends when not playing the game on the computer?</li> <li>• Do you ever like to play other games with your friends when not playing the game on the computer?</li> </ul>
12. Student views about the benefits, potentials, enabling features of <i>Minecraft</i> ® for social interaction	<ul style="list-style-type: none"> <li>• Do you think that playing <i>Minecraft</i>® helps you get along with others?</li> <li>• Tell me how playing <i>Minecraft</i>® helps you to get along with others.</li> <li>• How does playing <i>Minecraft</i>® help you to play with other?</li> </ul>
13. Student views about the constraints, hindrances, and constraining features of <i>Minecraft</i> ® for social interaction	<ul style="list-style-type: none"> <li>• How does playing <i>Minecraft</i>® make it hard for you to play with others?</li> <li>• Tell me how <i>Minecraft</i>® makes it hard for you to play with others.</li> <li>• Are there any difficult things about playing <i>Minecraft</i>® with others?</li> </ul>



Table 7 displays the interview schedule and the topics that were discussed with the students. Interview questions two and three addressed their engagements with the semiotic resources of *Minecraft*® and other online multiplayer games, and their at-school and video gaming interests. Questions, including “Why do you read *Minecraft*® books?”, and “Tell me examples of *Minecraft*® toys that you like to play with” provided understandings of semiotic resources that the students used for meaning making in social interactions. These questions drew on the notion that the Discourse of online multiplayer games is fitted with semiotic resources, such as characters, tools, symbols, strategies, and values, that are inherent to meaning making and social communication during gaming activities (Bainbridge & Marchionini, 2010; Gee, 2015b). Semiotic resources were realised for their material and semiotic ways of influencing social interactions across various social contexts (Kress, 2012, Chapter 3).

Additionally, topics three to 10, including “What do you like to do with others in the playground?”, “Tell me about the games that you play online with others when you are at home”, “How often do you play each day?”, and “Tell me some things that you do with other online players when you play *Minecraft*®” were linked with research question 1 and subquestion 1a. They aimed to broaden understandings of (a) the relationships of students with an ASD, such as their friendships (Petrina, Carter, Stephenson, & Sweller, 2016), and how they were developed, sustained, and perceived (American Psychiatric Association, 2013); (b) restrictive and repetitive behaviours, interest, and activities (Troyb et al., 2016); and (c) the students’ displays of reciprocity (Leach & LaRocque, 2011).

These questions were asked to gather data on their interest-driven and friendship-driven participation (Ito et al., 2009), and situated social interactions and literacies practices within the Discourse of online multiplayer games, and within online and offline affinity spaces (Gee, 2007b, 2015b). The D/discourse theory (Gee, 2014) evokes the notion that individuals can be identified as

members of various Discourses because of situated contexts, situated uses of language and other forms of social communication, virtual and physical spaces, and shared and common affinities. The students' recollections of their online multiplayer game playing history, members of their affinity groups, and the number of hours and days that they spent engaged with online multiplayer games were critical to the research aims outlined above in Table 1, the research design. Overall, given the social interaction difficulties that students with an ASD may face across various contexts (American Psychiatric Association, 2013), these topics highlight their participation with online gamers and friends (Gallup et al., 2016), reciprocal involvement with others (Backer van Ommeren, Koot, Scheeren, & Begeer, 2017), and patterns of interest, activities, and behaviours (Harrop et al., 2014).

Topic 11 is matched to the main research question. It focuses on the students' reciprocal interactions in virtual and physical environments. Students were asked to tell of the things that they did with other online players when they play online. The questions prompted them to talk about the ways that they displayed reciprocity, or difficulties displaying it, in conversations with friends or play activities. Persistent difficulties with reciprocity may be displayed during the social interactions of students with an ASD (Leach & LaRocque, 2011; Shochet et al., 2016). Students with an ASD are described as experiencing difficulties in displaying reciprocity when they display limited uses of verbal and nonverbal social communication modes through conversational turn taking, back-and-forth engagements, initiations and responses, and sharing information or material resources (Bang et al., 2013; Leach & LaRocque, 2011).

Questions 12 and 14 were framed by notions of affordances (Jewitt, 2017, Chapter 2). Drawing on Gibson's (1977, Chapter 3) notion of affordances, some questions investigated students' perspectives of the rewards, benefits, and enabling features of online multiplayer games. Accordingly, students were prompted to tell about how *Minecraft*® helped them to get along and play with others. Another key purpose of the questions was to gain student perspectives of the

constraints of online multiplayer games for their social interactions. Constraints were revealed through prompts about the ways social interactions were limited, inhibited, constrained, and hindered (Kress, 2013) within the Discourse of online multiplayer games (Gee, 2015b). Specially, the students were asked to tell about how *Minecraft*® and other online multiplayer games made it hard for them to play with others.

Given the diverse ways that students make meanings and the social communication difficulties that the student participants with an ASD are believed to face (American Psychiatric Association, 2013), there was no single effective way to phrase the research questions. Theory of mind suggests that some students with an ASD may have difficulties with the ability to understand the thoughts, intentions, and feelings of others (Pelligra, Isoni, Fadda, & Doneddu, 2015) and to understand that these thoughts, desires, intents, and perspectives may be different from their own (Baron-Cohen et al., 2013). Similarly, theory of executive dysfunctions suggests that they may have found it difficult to process complex information during the interview sessions (Craig et al., 2016). Therefore, following Brinkmann (2013) and Kvale (2007) the video-recorded semistructured interviews were paced appropriately for the researcher and students to socially interact comfortably through conversations for sharing understanding, experiences, thoughts, and feelings. During the interview sessions, consideration was made for the uniqueness of each participant, and for their cognitive ability, and age. Ambiguous or unfamiliar terms that were found in the interview questions were rephrased and explicitly explained for them. For example, rather than having the questions standardised (Simons, 2009), introductory questions, follow-up questions, probing questions, clarifying questions, specifying questions, direct questions, restructuring questions, and interpreting questions were used to obtain additional information from the student interviewees. These types of questions were asked to clarify points that the researcher was uncertain about or that seemed to have been ambiguous to the student participants (Kvale, 2007). The questions were

augmented with visual support following the suggestion that students with an ASD may often require strategies, for example visual cues, prompting, and contextual support, that show when they could contribute to conversations (Leach & LaRocque, 2011). With these considerations, the research questions were kept concise, simple, and short.

In sum, the semistructured interviews allowed more leeway than fully structured interviews to be informal, sensitive of the characteristics of ASD (American Psychiatric Association, 2013), and empathetic to the needs of the participants diagnosed with an ASD (Brinkmann, 2013). Drawing on the work by Kvale (2007), the structure of the student semistructured interviews also enabled deepened understandings of the research focus from students' points of view, uncovered multimodal meaning of social communication modes in social interaction, and elicited their perspectives that were not directly accessible, detectable, or observable through the video-recorded observations. The final interviews were used as opportunities to elicit critical information, generate relevant data needed for the research questions, and to clarify initial interpretations about emergent themes.

**4.6.2.2 Parent and teacher interviews [RQ 1, 1b, and 1c].** In addition to the student interviews, the parent video-recorded and audio-recorded semistructured interviews were used to gain deeper understandings of parents' perspectives of their children's online social interactions through online multiplayer games. The interviews addressed the topics presented below in Table 8. These topics included (a) parents' understanding of literacy/literacies and social interaction/social interactions; (b) parental knowledge of the online multiplayer games played by their children and their repetitive patterns of online play; and (c) parents' views about the benefits and constraints of online multiplayer games for social interactions, friendships, and reciprocity.

Table 8

*Parent Interview Schedule*

Topics	Interview questions
1. Parents' understanding of literacy and social interaction	<ul style="list-style-type: none"> <li>• How would you define literacy?</li> <li>• How would you define social interaction?</li> </ul>
2. Parental knowledge of the most common online multiplayer game played by children	<ul style="list-style-type: none"> <li>• What are the three most common online games that your child plays with others?</li> </ul>
3. Parents' views about the benefits and potentials of <i>Minecraft</i> ® for social interactions	<ul style="list-style-type: none"> <li>• What are some of the benefits of playing <i>Minecraft</i>® for your child's social interaction?</li> <li>• How does playing <i>Minecraft</i>® help your child's social interaction?</li> <li>• Do you think that playing <i>Minecraft</i>® helps your child to interact more with others?</li> <li>• Are there any good things that you like about your child playing <i>Minecraft</i>® with other?</li> <li>• Does playing <i>Minecraft</i>® help your child to develop skills for social interaction? If so what are they?</li> <li>• What are your views of online multiplayer games for developing meaningful, rich and reciprocal friendships?</li> <li>• What are your views of online multiplayer games for developing a sense of belonging?</li> </ul>
4. Parents' views about the constraints and hindrances of <i>Minecraft</i> ® for social interactions	<ul style="list-style-type: none"> <li>• How does playing <i>Minecraft</i>® make it difficult for your child to socially interact with others?</li> <li>• What are some of the disadvantages of playing <i>Minecraft</i>® for your child's social interaction?</li> <li>• Do you think that playing <i>Minecraft</i>® causes your child to interact less with others?</li> <li>• What difficulties does your child experience when he plays <i>Minecraft</i>® with others?</li> <li>• Can you describe some risks to social interaction that are associated with online multiplayer games?</li> </ul>
5. Parents' knowledge of the average number of hours their children spend playing and other online multiplayer games per week day	<ul style="list-style-type: none"> <li>• How often does your child play <i>Minecraft</i>® with others per week day?</li> </ul>

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6. Parents' knowledge of the average number of hours their children spend playing and other online multiplayer games per weekend day	<ul style="list-style-type: none"> <li>• How often does your child play <i>Minecraft</i>® on Saturdays and Sundays?</li> </ul>
7. Parents' views of children playing <i>Minecraft</i> ® online with other players	<ul style="list-style-type: none"> <li>• What are your views about your child playing <i>Minecraft</i>® online with other players?</li> <li>• How does playing on line develop or hinder their social interaction?</li> </ul>
8. Parents' views of their children's ability to communicate and respond to the needs, relational intentions and meanings of others through engagement with online multiplayer games	<ul style="list-style-type: none"> <li>• In what ways have online multiplayer games developed your child's ability to communicate with others?</li> <li>• In what ways have online multiplayer games developed your child's ability to respond to the needs, intentions and meanings of others?</li> </ul>

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Topic one, outlined above in Table 8, applied the perspective that literacies associated with the use of modern technologies, namely, online computer activities, have shaped the ways and opportunities that students have to socially interact with each other (Genlott & Grönlund, 2013). Furthermore, parents were considered to have expertise to define literacy because in some ways they are learners and teachers of formal and informal literacies (Feiler et al., 2007). The parents' responses about literacies and social interactions were examined to illuminate the links between (a) home, school, and online literacies, and (b) their influence on students' social interactions. To build bridges of home-school literacies it is important to have parental involvement in their children literacies outcomes (Martini & Sénéchal, 2012). It is necessary to have parental support for literacies strategies and interventions (Barone, 2013).

The questions in topic two, enabled data to be yielded about parental knowledge of the most common online multiplayer games played by their children. These questions were relevant to extend knowledge about the video games that students with an ASD may play with others in online

contexts (Gallup et al., 2016; Kuo et al., 2014). The data confirmed that *Minecraft*® had gained popularity among primary-school students (Dezuanni et al., 2015; Dusmann, 2013; Nebel et al., 2016), including those with an ASD. A key purpose of topics three to eight was to elicit information about the parents' perspectives of the enabling and constraining features of online multiplayer games for the social interactions of students with an ASD. Given the difficulties that are associated with an ASD, the parents were asked about how their sons' game play influenced their friendships, reciprocity, and patterns of play with others. The findings that emerged from the parent interviews add to research on parental views about the implications of video game play for aspects of their children's behaviours (Nikken & Jansz, 2006). Findings also contribute to research on parental perspectives about their children's video gaming interests and activities in virtual social interactions (Finke et al., 2015).

The researcher elicited the topics listed in the teacher interview protocol (see Table 9 below) to answer the question "What are teachers' perspectives of the enabling and constraining features of online multiplayer games for the social interactions of students with an ASD within formal educational settings?". These topics focused on information about the teachers' demographics, their teaching experiences with students diagnosed with an ASD, and their perspectives of the benefits and hindrances of multiplayer games for students. The interviewing of teachers occurred before, during, and after school hours at the school site to minimise disruptions to teaching and learning.

Table 9

*Teacher Interview Schedule*

Topics	Interview questions
1. Teachers' years of experience teaching in primary schools	<ul style="list-style-type: none"> <li>• How many years have you been teaching in the primary-school setting?</li> </ul>
2. Teachers' experience supporting the social interactions of students diagnosed with an ASD within inclusive classroom settings	<ul style="list-style-type: none"> <li>• Please describe your past and current role for supporting the social interactions of students with an ASD.</li> </ul>
3. Teachers' understanding of literacy and social interactions	<ul style="list-style-type: none"> <li>• How would you define literacy?</li> <li>• How would you define social interaction?</li> <li>• How can teachers develop the literacy skills of students with an ASD through social interaction?</li> <li>• How does literacy shape the social interactions of students with an ASD? How would you define literacy?</li> <li>• Do you agree or disagree that contemporary literacy practices of students with an ASD are shaped by digital technologies?</li> <li>• Why do you agree or disagree that contemporary literacy practices of students with an ASD are mediated by digital technologies?</li> </ul>
4. Teachers' knowledge of online multiplayer games	<ul style="list-style-type: none"> <li>• What are three common online multiplayer games that students with an ASD enjoy playing??</li> </ul>
5. Teachers' views about the benefits and potentials of online multiplayer game for social interactions within educational settings	<ul style="list-style-type: none"> <li>• What are some of the benefits of playing online multiplayer games for social interactions at school?</li> <li>• How does playing online multiplayer games help the social interactions of students with an ASD?</li> <li>• Do you think that playing <i>Minecraft</i>® helps students with an ASD to interact more with others?</li> <li>• Does playing online multiplayer games help students with an ASD to develop skills for social interactions? If so what are they?</li> <li>• What are your views of online multiplayer games for developing meaningful, rich and reciprocal friendships?</li> <li>• What are your views of online multiplayer games for developing a sense of belonging?</li> </ul>



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6. Teachers' views about the constraints and hindrances of online multiplayer games for social interactions within educational settings
- How does playing online multiplayer games make it difficult for your students with an ASD to socially interact with others at school?
  - What are some of the disadvantages of playing online multiplayer games for the social interactions of students with an ASD?
  - Do you think that playing online multiplayer games causes students with an ASD to interact less with others when they are at school?
  - What are some difficulties that students with an ASD may experience when they play online multiplayer games with others within a school setting?
  - Can you describe some risks to social interaction that are associated with online multiplayer games?
- 

The approach to proceeding with questions one and two on the teaching experiences of the teachers was based on the notion that teachers play an important role in the literacies education and social interactions of students with an ASD (Robledo, 2017). Accordingly, the questions were asked to establish that the teachers had experiences to understand and support the literacies and social interactions of students with an ASD, within inclusive formal educational environments. Questions three and four focused on the teachers' knowledge of and experiences with students with an ASD who have had a high interest in video games including those played online with other gamers (Finke et al., 2015; Gallup et al., 2016). Given this interest and the amount of time that students with an ASD engage with others in virtual contexts (Mazurek & Engelhardt, 2013a), it was logical that teachers had knowledge about the enabling and constraining features of online multiplayer games, for students with an ASD. As a result, teachers were invited to articulate and describe their views of some social interaction benefits difficulties that were associated with the Discourse of online multiplayer games.

The chapter thus far has established the context for the ethnographic case study. It outlined and described the research design and justified the research questions. Descriptions of the research

sites, research participants, and the data set were presented. The remainder of the chapter describes the analytical tools and processes, and the research validity and ethics.

#### 4.7 Data Analysis: Transcription, Description, and Interpretation

Within an ethnographic approach, there is not a clear distinction among the three processes of data analysis, data description, and data interpretation (Creswell, 2015; Hammersley, 2007). These processes were entwined and not linear, although at different stages of this research each of these processes at times became dominant and warranted separate treatment (Simons, 2009). For example, it was necessary to describe the findings after the data transcription so that the data could be better understood. The approaches to transcription and description of the data were best suited to understanding the data and answering the research questions. Figure 5 illustrates how data analysis was integrated within the processes of transcription, description, and interpretation.

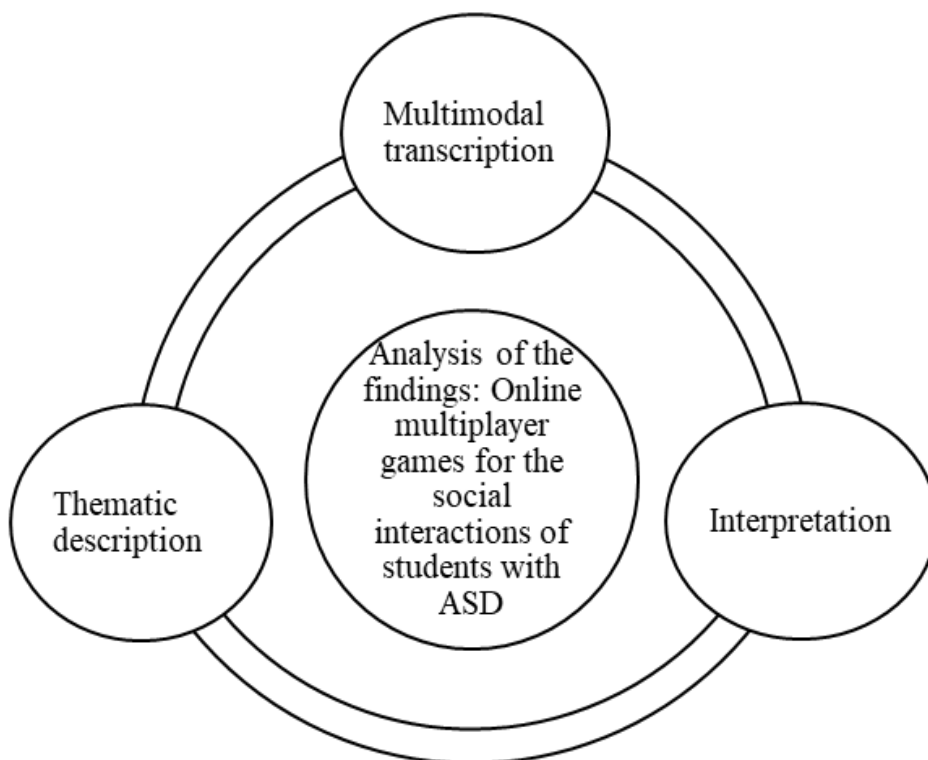


Figure 5. Integrated process of data analysis.

Figure 5 shows that, within the context of this study, data analysis was integrated within the stages of data transcriptions, description, and interpretation. These stages facilitated an inductive approach to the analysis of social communication forms and common themes from the data transcriptions and descriptions (Flewitt et al., 2017, Chapter 3). An inductive approach enables (a) rigorous readings of transcribed text data; (b) the emergence of frequent themes, important concepts, and overlapping categories from extensive raw data; (c) the development of a model about the experiences that emerge from the findings; and (d) analysis during transcription, description, and interpretation of the raw data (Thomas, 2006).

**4.7.1 Transcription: Observations and semistructured interviews.** Transcription laid a useful beginning to the coding, description, and understanding of major themes. Following qualitative methods for inductive coding (Thomas, 2006) and methods for multimodal transcription and text analysis (Baldry & Thibault 2006; Flewitt et al., 2017, Chapter 3), transcription shaped coding, description, and analysis of the data by taking into account all the different modal resources of the observations and interviews (Jewitt, 2006). Transcription involved transferring the details from the observations and interviews into a typed computer file, which was regarded as text data (Jaipal-Jamani, 2014). For increased accuracy, the data were transcribed as soon as possible after each observation was recorded. The transcripts were informed by the different research questions that they were intended to answer (Flewitt, 2005) and the notion that they should, as best as possible, reflect the diversity and variability of social communication modes that the students used (Flewitt et al., 2017, Chapter 3).

**4.7.1.1 Transcriptions of the video-recorded observations.** The peer face-to-face and at-screen video observations were transcribed using multimodal transcribing methods adapted from the works by Flewitt et al. (2017, Chapter 3) and Jewitt (2006). Each of the transcripts of the face-to-face video observations focused on representing the semiotic potentials of online multiplayer

games in peer face-to-face interactions. All the at-screen data were transcribed frame-by-frame. Moreover, as part of the process of identifying key themes, and analysing and interpreting the data, the video-recorded observations of the screens, and the students' multimodal engagements with *Minecraft*® random online players, the videogame controllers, the researcher, and their physical environments were watched and listened to repeatedly. Repeated viewing and listening of the video-recorded data and rereading the multimodal transcripts enabled the assimilation of contextual details about the semiotic meanings regarding the enabling and constraining features of online multiplayer games. For example, listening again to the students' tone of voice as they spoke about playing *Minecraft*® modified the researcher's transcription of the meaning of the responses. The transcription process involved thoroughly rereading the transcripts to make detailed meanings about social communication modes and the themes that emerged (Jewitt, 2017, Chapter 2). The verbatim transcription process was consistent with the warning of Evers (2011) that the transcription of video-recorded data can be time consuming and intensive. Symbols outlined below in Table 10 were used during the verbatim transcription of the data.

Table 10

*Notations used for Verbatim Transcription*

Symbol	Convention	Use
' '	Single quotation marks	Enclose quoted screen text
“ ”	Double quotation marks	Enclose quoted participants' speech
[ ]	Brackets	Enclose addition or explanation inserted in quoted text or speech
. . .	Ellipsis points	Verbatim written text or speech omitted

The transcripts of each face-to-face and at-screen video-recorded session were represented as typed text, which were placed into tabular observation protocols that contained the data transcription and coding. The tabular format and conceptual headings of “multimodal features” and “themes” allowed the introduction of an inductive approach to thematic coding at the time of data transcription (Thomas, 2006). Following Thomas (2006), the coding was influenced by the data. Table 11 below, provides a sample of an at-screen observation transcription and illustrates how the transcriptions were divided into columns representing “Transcript and screen shots”, “Time”, “multimodal features”, and “themes”. These headings in the protocol were used as tools to guide the description and interpretation of the relationship across and between multimodal features and themes in the interactions (Norris, 2017, Chapter 6).

The context of the following transcript (see Table 11 below) was Noah destroying a village built by Stevatar, with *Minecraft*® TNT, and then building a secret hideout to hide from Stevatar’s subsequent revenge.

Table 11

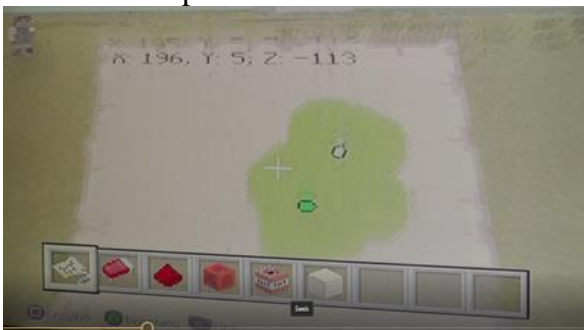
*Sample of At-screen Observation Protocol and Transcript*

At-screen Interaction 2: Observation Transcript
Section 1: Observation Protocol
Title of Research: The Affordances of Online Multiplayer Games for the Social Interactions of Middle-primary-school-aged Students with an ASD
Date: 22/11/15
Time of Interview: 4:00 pm
Research Site: Noah’s Home
Observer: Bessie Stone
Student Observed: Noah
Position of Student Observed: Student with an ASD

Description of Research: The participant of this 30-min video-recorded at-screen observation was purposefully selected. Participation in this research is voluntary, and with the informed and written assent and or consent of the participant. The anonymity and confidentiality of the participant is protected with the use of a coded name.

Section 2: Transcription and Coding

Transcript and screenshots	Time	Multimodal Features	Themes
<p>Noah: “He’s flying. I think he’s going to get revenge on me.”</p> <p>Screen: Stevatar flies right. Nlittlesniper flies away.</p> <p>Researcher: “I wonder what his revenge will be?”</p> <p>Noah: Takes yogurt tube from mouth with right hand. “Blowing up my death star.”</p> <p>Screen: Nlittlesniper walks through yellow flowers. Changes to elevated view of map.</p>	10:10	<p>Oral/Speech</p> <p>Visual/image</p> <p>Gestural/hand movement</p> <p>Visual/image</p> <p>Written/text</p>	<p>Support initiating social interaction with researcher/ Difficulties in relationship</p> <p>Support sustaining social interaction</p>
<p>Noah: Takes tube from mouth with right hand. “Just having a little bit of fun.”</p>	11:10	<p>Audio/sound</p>	<p>Developing and sustaining friendships</p>



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Screen: Enters lab constructed earlier. Door opens and closes with sound effects. Blocks door with cyan wool.



Gestural/hand  
body  
movements,  
gaze

Multimodal  
repetitiveness

Oral/speech

Noah: Raises neck, tilts head, and clasps knees together. "Because it's fun and, and I'm going to block him out."

Researcher: "You block him out so he can't get in?"

Noah: "Yeah, it's my base." Takes tube from mouth and places in lap. Shakes head up and down, closes eyes, and raises voice. "This is actually my base! No one is actually allowed in except for Steve. I only trust him," Moves knees together. "But after what I did, I think he is going to blow it all up." Lowers head to right. Eyes fixed on screen. "So that's why I'm blockading myself in."

Screen: Pans to the right and down on floor. Displays four holes in floor. Enters a hole.

Difficulties in  
relationship

Multimodal  
repetitiveness

Support sustaining  
social interaction

Developing and  
sustaining  
friendships

Visual/image

Support initiating  
social interaction  
with researcher



Noah: "And I'm going to my secret hide out." Takes deep breath. "Look, this

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is my secret hideout.” Raises eyebrows, widens eyes. Smiles.

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As illustrated in Table 11, the headings, “multimodal features” and “themes”, were important conceptual headings, to allow the introduction of thematic coding at the time of data collection. By collecting the interactions under these separate headings, these headings proved useful in exploring the repetitive level of attention that the students paid to each social communication mode and in describing the social interaction potentials and constraints of online multiplayer games. Collectively, the transcription of the data from the video-recorded observations provided a tool to describe, analyse, and interpret the social interactions of each student with an ASD.

**4.7.1.2 Transcriptions of interviews.** Transcriptions of the video-recorded and audio-recorded interviews focused on the perspectives of the participants and set out to answer the four research questions as stated in section 4.0. To guide the multimodal analysis of the semistructured interviews, interview protocols were created. The video and audio recordings of the interview data were transcribed in a verbatim manner to ensure accuracy of the participants’ responses (Evers 2011). Inductive coding of the interview data was used to identify the participants’ perspectives on the social interaction affordances of online multiplayer games. Inductive coding is a process that involves the readings of text rigorously and systematically to identify themes, label new categories, and gain multiple meanings from the transcribed data (Thomas, 2006). The inductive coding of the data continued until no new or relevant data emerged about the social interaction affordances.

To guide the transcription of the semistructured interviews sessions, the transcriptions also were represented as typed text into tabular protocols that contained the data transcription and coding. The dimensions of “multimodal features” and “themes” were important conceptual headings that allowed the researcher to introduce thematic coding and multimodal analysis at the



time of data transcription. Table 12 provides a sample of multimodal analysis that was applied to a transcription of a students' semistructured interview.

Table 12

*Sample Student Semistructured Interview Protocol and Transcript*

Interview Protocol and Transcript		
Section 1: Interview Protocol		
Title of Research: The Affordances of Online Multiplayer Games for the Social Interactions of Middle-primary-school-aged Students with an ASD		
Date: 27/11/15		
Time of Interview: 10:00 am		
Research Site: Green Meadows State School		
Interviewer: Bessie Stone		
Interviewee: Mason		
Position of Interviewee: Student with an ASD		
Description of Research: The participant of this 30-min video-recorded and audio-recorded semistructured interview was purposefully selected. Participation in this research is voluntary, and with the informed and written assent and or consent of the participant. The anonymity and confidentiality of the participant is protected with the use of a coded name.		
Section 2: Questions and Transcription		
Transcript	Multimodal Features	Themes
Researcher: "Can you tell me some of the things that you are really good at?" Mason: "Arm games." Researcher: "You are good at playing games?" Mason: Nods head up and down. Researcher: "Anything else?" Mason: "Drawing." Researcher: "What do you like to draw?" Mason: "I like drawing some <i>Minecraft</i> ® stuff." Researcher: "What is your favourite thing to learn when you are not in school?" Mason: "Ar, hm, favourite thing to learn is how to play games. Online games and some not online games."	Gesture      Visual-image	Personal strength/interest      Support for social interactions-conversational response

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<p>Researcher: “You mentioned <i>Minecraft</i>®. If someone were to you finish this sentence please. <i>Minecraft</i>® is, what would you say to them?”</p>		
<p>Mason: “<i>Minecraft</i>® is a game, hm, <i>Minecraft</i>® is a cool game that all are made out of blocks, everything. And you can get texture packs that make it look, you can get make Sergal and you can get like different skins and everything. You can get mods that arm make the game add more stuff into it.</p>	Visual/image	Support to sustain social interactions
<p>Researcher: “Do you play with <i>Minecraft</i>® toys?”</p>		
<p>Mason: “Yeah. I don’t have any though. Jackson brings in his and I play with them with him.”</p>		
<p>Researcher: “Why do you like to play with them?”</p>		
<p>Mason: “Because they are fun. Better than just doing boring things. It because it’s like when you are in <i>Minecraft</i>®”</p>		Sustain friendship
<p>Researcher: “So you play with <i>Minecraft</i>® toys with Jackson. What else do you do at break time with other children?”</p>		Support social interactions
<p>Mason: Plays with <i>Minecraft</i>® toy. “Sometimes go to the computer lab.” Looks at researcher. Sad tone. “It’s a shame they blocked it though. You could play <i>Minecraft</i>® on the computer lab. But they blocked it.”</p>		External constraint

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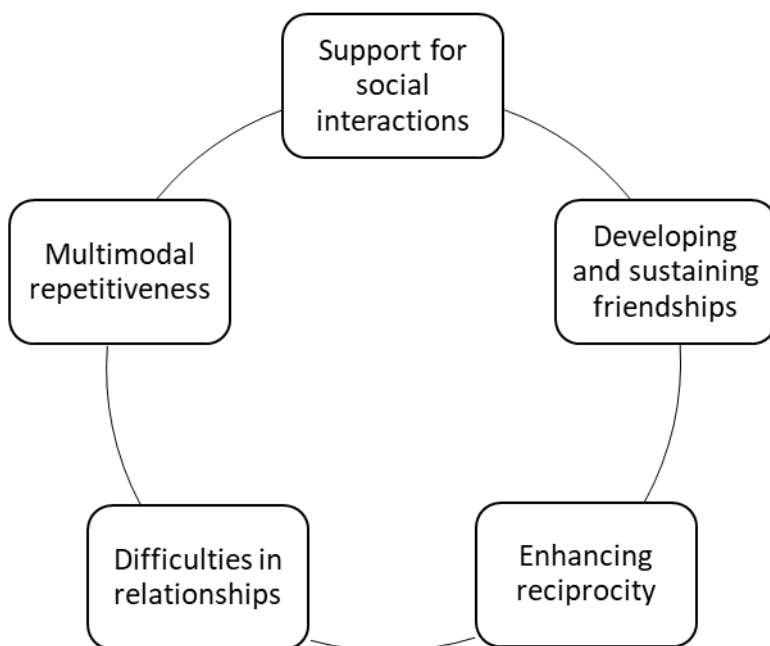
As illustrated above in Table 12, rich details of the different modalities in the context of the research were integral to transcription. Therefore, to fully capture the rich multimodal details of the interviews, and to transcribe as close as possible the interview interactions and context of the participants’ responses, aspects such as pauses, laughter, and interruptions were included in the transcriptions (Flewitt et al., 2017, Chapter 3; Simons, 2009). Likewise, just as true verbatim of speech is ideal for the transcription of interview data (Evers, 2011; Halcomb & Davidson, 2006), so was the significance of social communication modes, such as sound, images, and gesture, to the research (Bezemer, 2017, Chapter 25; Jewitt, 2006).

Together, following multimodal perspectives according to Flewitt et al. (2017, Chapter 3) and Jewitt (2017, Chapter 2), the observation and interview protocols used for the transcription of the

data enabled the researcher to identify (a) multimodal forms of social communication that students used at the screens and their semiotic meanings for social interaction affordances, and (b) key themes that occurred most frequently. Major themes that emerged from the data are listed below.

- Support for initiating and sustaining social interactions.
- Developing and sustaining friendships.
- Enhancing reciprocity.
- Multimodal repetitiveness.
- Difficulties in relationships.

Figure 6 illustrates the themes that emerged from the coded transcripts. The multimodal forms of social communication and the themes were represented visually through individual diagrammatic representations (Jewitt, 2017, Chapter 2).



*Figure 6.* Major themes that emerged from the coded transcripts.

To gain a holistic representation of the findings and highlight the social interaction affordances across various contexts, the individual graphic representations of the major themes were synthesised into a larger diagrammatic representation (see Figure 6). This approach engaged with the notions

that language combines with other social communication modes and represents situated meanings, social practices, experiences, and perspectives within particular groups (Gee, 2014). Multimodal perspectives enabled an integrated way to illustrate the verbal and nonverbal fractions of the multimodal whole, and to show the forms of social communication used in human interactions (Scallon & Scallon, 2017, Chapter 14), particularly within the Discourse of online multiplayer games (Gee, 2015b). In sum, the transcriptions contributed to the descriptions, analysis, and discussions of the findings. Following Jewitt (2006), the descriptions of the findings commenced after the transcription process was completed.

**4.7.2 Description and interpretation.** Description in ethnographic research suggests an intention to give a detailed rendering about the semiotic resources, settings, events, and activities of the case's interactions (Creswell, 2015). Accordingly, a rich description enabled the researcher to address the research questions and represent the social interactions that occurred (Simon, 2009). Theoretical perspectives of multimodality (Jewitt, 2017, Chapter 2) and D/discourse (Gee, 2015b) underpinned the presentation of the findings that were descriptively addressed in Chapters Five and Six. The descriptions included rich details about what was said, what was done, and what was seen, as revealed through verbal and nonverbal modal elements (Berg, 2017).

Theoretical perspectives of D/discourse and multimodality guided descriptions on multimodal forms of social communication—including oral, written, visual, gestural, and audio—that were used during the social interactions. Descriptions of social communication modes used as semiotic resources included focus on the use of speech, written text, images, gestures, and sounds. Importantly, the descriptions of the social interaction affordances involved the following: (a) the support to initiate and sustain social interactions, (b) friendship development, (c) how the students engaged in reciprocated aspects of social interaction, (d) repetitive uses of social communication

modes, and (e) difficulties in relationships. The descriptions established the foundation for the interpretation of the findings.

This research aimed to describe and interpret the affordances of online multiplayer games for the social interactions of students with an ASD. Interpretation of the data was generated from the analysis process (Hammersley, 2007): namely, the transcription and description of the data. Data interpretation also embraced multimodal perspectives (Kress, 2013) and D/discourse perspectives (Gee & Handford, 2012) to understand how different semiotic resources within the affinity spaces of online multiplayer games revealed social interaction affordances, for students with an ASD. Interpretation of the data was also guided by the conceptual framework of inclusive new literacies. This framework integrated terms and concepts from the field of NLS such as literacies (Street, et al., 2017, Chapter 16), social communication modes (Jewitt, 2006, 2017), social interactions (Peters et al., 2013), and video games (Beavis & Apperley, 2012, Chapter 2; Gee, 2015b). Terms, concepts, and notions from the field of inclusive education were integrated within the conceptual framework. Some examples include the medical and social models of disability (Oliver, 2013), inclusion (Ashman, 2014), support (Loreman et al., 2011), relationships (Kasari et al., 2011), and reciprocity (Wohn, 2011). The literature on ASD (American Psychiatric Association, 2013; Ozuna et al., 2015) was also drawn on to guide interpretation of the social interaction affordances.

These terms, concepts, and notions were instrumental to the interpretation of themes such as social interaction support, developing and sustaining friendship, enhancing reciprocity, multimodal repetitiveness, and difficulties in relationships. Through these, it was understood that all students should be supported in multimodal ways through new literacies and technologies to meet their needs within inclusive educational contexts (Loreman et al., 2011; Oakley, 2017, Chapter 10). This support may be necessary particularly if students experience difficulties or disadvantages to achieve their optimum levels of educational outcomes (Boche & Henning, 2015). Mandates, policies, and

initiatives for progress in inclusive education, such as those that were influenced by the *Melbourne Declaration on Educational Goals for Young Australians* (MCEETYA, 2008) were also drawn on to interpret the data. Interpretations were reinforced by the mandates to support all students through the literacies of information and communication technology to meet their targeted goals, whether they have a medical diagnosis or not. In sum, drawing on the notion that analysis, transcription, description, and interpretation are interrelated (Creswell, 2015), the interpretation was guided by the study's theoretical and conceptual frameworks, the literature review, and the research questions. The following section describes the processes that were employed to increase the accuracy and credibility of the findings and their interpretation.

#### **4.8 Research Validity**

The validity of this research was strengthened using digital recording, self-reflexivity, multiple participant perspectives, manually transcribed data, and respondent validation (Berg, 2017; Halcomb & Davidson, 2006; Santoro, 2014; Torrance, 2012). The use of multiple perspectives, through the semistructured interviews of three students, three parents, and five teachers, allowed the researcher to fairly construct various in-depth and descriptive accounts of the data (Santoro, 2014). Additionally, the 18 segments of 30-minute video-recorded observations, including at-screen and small group peer face-to-face observations, and 17 segments of 30-minute video-recorded and audio-recorded interviews, provided substantial data and empirical evidence to answer the research questions. The research was conducted in a transparent and self-reflexive manner (Berg, 2017; Creswell, 2015; Denzin, 1997). Consistent with the design of an ethnographic case study, the researcher spent time in the field of research, being immersed in the at-screen and face-to-face social interactions of the students studied (Heyes, 2017; Lin, 2016; Yuha, 2014). Self-reflexivity and transparency about the researcher's presence were paramount to this study because they allowed the opportunity to examine the reliability of the research methods used for data collection

and to critically analyse whether there was parity of power between the researcher and the research participants (Berg, 2017; Creswell, 2015; Denzin, 1997). Participation in the research was voluntary. Participants were able to opt out of study at any time, without any sense or perception of coercion, if they felt discomfort or distress from the researcher's presence while being filmed.

The trustworthiness of the data was strengthened by the researcher's involvement in the transcription process. The researcher manually transcribed and coded the data in a verbatim manner. A manual verbatim manner of transcription to reveal and understand semiotic affordances was preferred rather than the use of external transcribers or a digital program to transcribe, analyse, and interpret the data (Evers, 2011; Halcomb & Davidson, 2006). During the transcription process, the validity of criterion for the data sets was reassured through the repeated viewing of and listening to the data. Reaffirmation of the research's validity was guaranteed in that the data were saturated to ensure that no new or relevant data emerged about the social interaction affordances of online multiplayer games. By personally transcribing the data, the researcher engaged in a step-by-step progression of understanding the complexity of the data through the theoretical lenses of multimodality (Kress, 2013) and D/discourse (Gee, 2014).

The trustworthiness of the data was positioned through a primary strategy typically used by qualitative researchers; namely, respondent validation (Torrance, 2012). This strategy is also known as member checking (Birt, Scott, Cavers, Campbell, & Walter, 2016). Cross-checking the accuracy of the data transcription from multiple perspectives strengthened the claims and warrant of this research (Koelsch, 2013). The reliability and accuracy of the transcription procedure was strengthened by using the following verification procedures. As critical colleagues, and experienced professionals in the fields of research, literacies, and ASD, the research supervisors assessed the accuracy of the transcripts and compared the transcriptions with the raw data. The research supervisors provided feedback. Necessary adjustments to the transcriptions were made so that

descriptions of richer quality were generated (Simons, 2009). Equally important, the participants were given opportunities to check and confirm specific aspects of the data, and to indicate whether transcripts of their interviews comments and responses were reported accurately and fairly, in the context of the research (Berg, 2017). Subsequently, member checking afforded the participants opportunities to challenge what they perceived as misinterpretations, to fill in omissions, and to correct errors and misunderstandings, lest any misinterpretation of the data exists (Simons, 2009).

The study's validity was checked across different stages of the study. Although this research cannot claim to be value-free, the aim was to meet the methodological requirements that were necessary for strengthening the study's validity. The researcher established the validity of this research through strategies that increased its rigour, trustworthiness, credibility, authenticity, and generalisability. The following section describes the ethics process and considerations for the study.

#### **4.9 Research Ethics**

Research ethical approval and clearance were sought and granted in accordance with the guidelines of *The National Statement on Ethical Conduct in Human Research, 2007* (Australian Government; 2014a) and the Australian Catholic University Human Research Ethics Committee. This research was granted research ethical clearance from the Queensland University of Technology (1500000470) and the Australian Catholic University Ethics Register Number 2017-171T. The process of seeking ethics approval and clearance involved the submission of a National Ethics Application Form (Australian Government, 2014b). Research ethics guidelines of the Queensland Government Department of Education and Training (Queensland Government, 2015) were also followed to conduct the research from within the school site, because the research was conducted before, during, and after school on a Queensland Government Department of Education and Training site.



This research was considered to be high risk because of privacy, confidentiality, and sensitivity issues surrounding the ASD diagnosis of students, the students being aged 9 to 10 and the use of video recording with children. Drawing on the notion of respecting the rights of students within research and inclusive educational contexts (CRPD, 2016; Flewitt, 2005; Ravet, 2011), this study considered the need for confidentiality of data and for the use of unbiased language throughout the research process. Parents were given a package with documents to inform them of the research and its aims. The informed, written, and voluntary consents of the parents were gained for their children's voluntary participation in the research. In addition, the informed, written, and voluntary consents of the parent and teacher participants were gained for their personal participation in the interview process of the research. To protect the confidentiality of the student participants with an ASD, and to give ethical considerations to the sensitivity of their medical diagnosis of ASD, information about ASD was only included in the information package of the parent and teacher participants.

After the parents gave consent for their children's participation, the research purpose was discussed individually with the students through an informal discussion. The students were required to give written assent to participate in the research process. Written assent refers to the researcher ensuring that the children involved are able to understand the motives and agenda of the study and are capable of providing positive agreement to participate in the research (Farrell, 2005). The research purpose was rephrased for the students to assure they understood the research purpose. Gaining the written assent of the student participants acknowledges that the researcher values the principle of respect for the participants (Flewitt, 2005).

The participants remained anonymous during the voluntary recruitment. They were informed of the research purpose and their consents were gained to share the data with the research supervisors (Simons, 2009). The participants were informed of the plans for the data and offered a

summary of the study's results. Reporting the empirical findings was considered as significant as collecting the data (Robben & Sluka, 2015). All of the participants were reminded that they had the opportunity to withdraw from participation throughout the research without comment or penalty. To maintain the ethical standard that was expected of the research and to protect the anonymity of the participants (Simons, 2009), the real names of the participants were used for the storage and organisation of the data, but pseudonyms were used for reporting and publication purposes. As mentioned earlier in this chapter, the student participants with an ASD are referred to as Ethan, Mason, and Noah. The students engaged with random players and avatars. *Minecraft*® players use avatars as graphical 3-D character representations to immerse themselves in *Minecraft*® virtual world (Cordeiro & Nelson, 2014). All random online players are referred to as 'Steve'. All random avatars are identified as 'Stevatar'.

To ensure that ethical obligations for the study were continually met, as required by the National Health and Medical Research Council (Australian Government, 2014b), the University policy, and Queensland Government Department of Education and Training terms and conditions for human research, the researcher regularly consulted with the relevant research websites, the research supervisors and the Education Faculty's Ethics Advisor throughout the stage of the study. Contact details for the research supervisors and the University Research Ethics Unit were provided to the participants and school principal in the information and consent documents. Any data collected as part of this study were stored securely, as per the University management of research data policy.

#### **4.10 Summary of Chapter Four**

Chapter Four has described the context for this descriptive ethnographic case study. A description of the study's design and methodology was also presented. Figure 7 (see below) presents a conceptual summary of the research design and methodology.

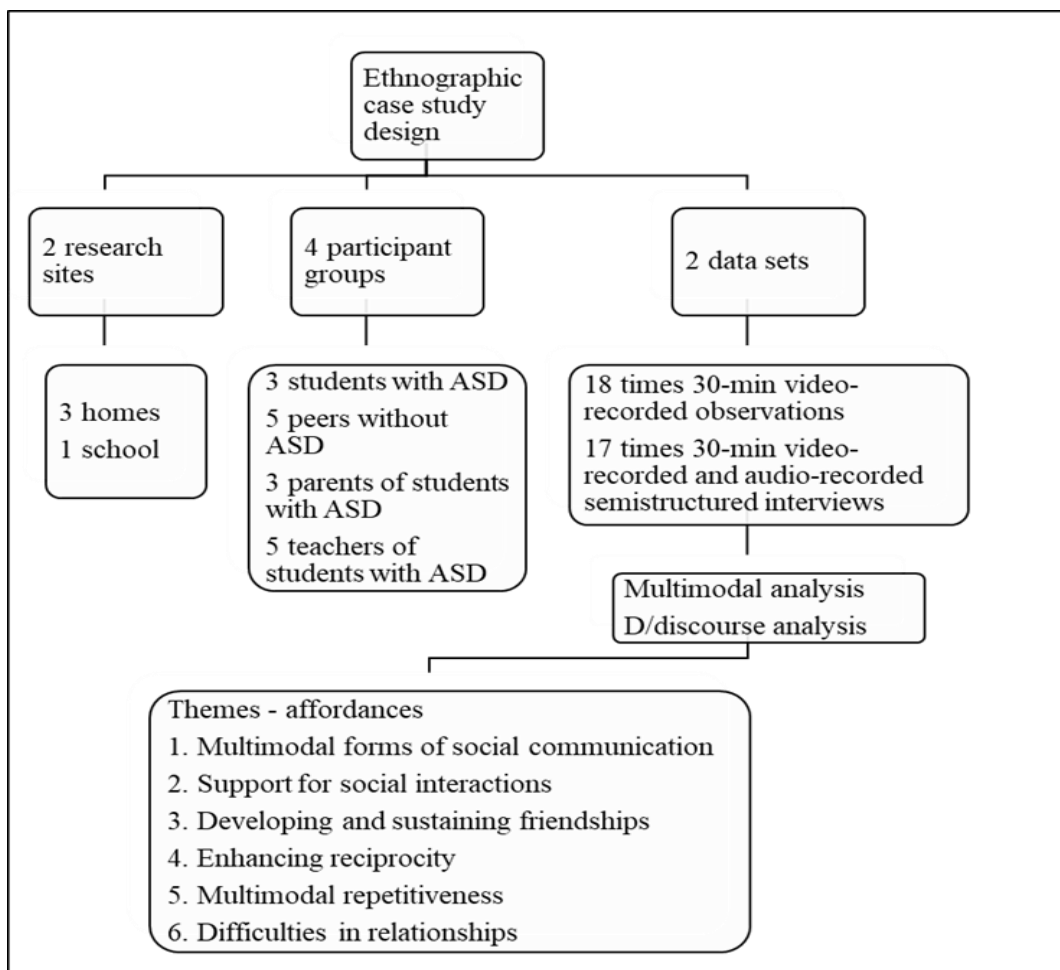


Figure 7. Conceptual summary of the research design and methodology.

Figure 7 illustrates the importance of the research design and methodology to describing the affordances of online multiplayer games for the social interactions of students with an ASD. The descriptions above provided details of the research sites and participants, data collection tools, and data analysis. Discussions of the research validity and ethics were also included in this chapter. Given the effectiveness of the research design for collecting rich data about students with an ASD

(De Wolfe, 2014), part one of the findings is presented in Chapter Five. The descriptions and discussions within Chapter Five highlight the findings of the social interaction potentials of online multiplayer games for students with an ASD.

## Chapter Five: Social Interaction Potentials of Online Multiplayer Games

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Chapter Four described the methodological design of this ethnographic case study.

Pseudonyms were used to protect the identities of the research participants. Chapter Five presents part one of the findings, in relation to the research questions, restated here:

1. What are the potentials and constraints of online multiplayer games for the social interactions of 9-to-10-year-old students with an ASD?

From the main question the subquestions are:

- (a) What multimodal forms of social communication do students with an ASD use when engaging with online multiplayer games?
- (b) What are parents' perspectives of the enabling and constraining features of online multiplayer games for the social interactions of children with an ASD?
- (c) What are teachers' perspectives of the enabling and constraining features of online multiplayer games for the social interactions of students with an ASD within formal educational settings?

The data revealed that, online multiplayer games provided support for initiating and sustaining social interactions. The games also enabled platforms for developing and sustaining friendships, and provided opportunities for enhancing reciprocity. Each of the three data set (described in Chapter Four) contributed to understanding how the students' engagements with online multiplayer games offered these social interaction potentials. However, the at-screen interactions yielded the most relevant data about how engagements with *Minecraft*® supported social interactions, developed and sustained friendships, and enhanced reciprocity. Therefore, the descriptions in each section begin with at-screen findings about these potentials. Relevant descriptions and discussions of the data from the peer face-to-face observations, and from the

perspectives of the students with an ASD, the parents, and the teachers involved will be included to support the at-screen data and enrich the findings. What follows is an overview of Chapter Five.

This chapter focuses on the potentials of online multiplayer games and presents descriptions and discussions of the findings in four sections. The findings that revealed the potential to support social interactions are presented in section 5.1. Section 5.2 describes the potential to develop and sustain friendships and section 5.3 presents the findings about the potential to enhance reciprocity. Given the consistency of the findings across the data sets, each section ends with a discussion that synthesises the findings and contributes to answering research question (RQ) 1 and subquestions 1a, 1b, and 1c. Chapter Five concludes in section 5.4 with a discussion of the potentials of online multiplayer games for the social interactions of middle-primary-school students with an ASD. Table 13 summarises the findings on the social interaction benefits that students received through their engagements with online multiplayer games. These findings were common across the data sets.

Table 13

*Social Interaction Potentials of Online Multiplayer Games*

Support to initiate and sustain social interactions in multimodal ways	
The students with an ASD	<ul style="list-style-type: none"> <li>• Used interrogative, imperative, and declarative speech.</li> <li>• Shared information in conversations and discussions.</li> <li>• Greeted others in authentic ways.</li> <li>• Sent and received written messages.</li> <li>• Produced written texts through virtual signs, virtual books, online chat boxes, and material resources.</li> <li>• Mirrored virtual gestures for offline social interactions.</li> <li>• Gestured in authentic and comfortable ways without prompts to do so.</li> <li>• Played collaboratively, creatively, and competitively in personal and sharable affinity spaces.</li> <li>• Controlled the “who”, “how”, “when”, and “where” of social interactions in affinity spaces.</li> </ul>
Opportunities to develop and sustain friendships	

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The students with an ASD	<ul style="list-style-type: none"> <li>• Orally expressed enjoyment during play with friends.</li> <li>• Shared secrets, experiences, information, and semiotic resources.</li> <li>• Constructed and reconstructed friendship identities.</li> <li>• Gathered written information about friends.</li> <li>• Chatted with and messaged friends online through digital texts.</li> <li>• Engaged in creative, collaborative, adventurous, and competitive activities with friends.</li> <li>• Helped and showed kindness to friends.</li> <li>• Engaged in symbolic play with friends.</li> <li>• Had friends in local, global, offline, and online affinity spaces.</li> <li>• Joined, connected with, invited, and welcomed friends online.</li> </ul>
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Platform to enhanced reciprocity

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The students with an ASD	<ul style="list-style-type: none"> <li>• Engaged in reciprocal speaker-responder type conversations.</li> <li>• Traded, shared, and mutually viewed virtual creations and semiotic resources.</li> <li>• Exchanged invitations, messages, drawings, and information.</li> <li>• Reciprocated virtual gestures.</li> <li>• Engaged in cooperative and competitive activities.</li> <li>• Shared virtual and physical affinity spaces.</li> </ul>
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The findings summarised above in Table 13 were common across the at-screen and peer face-to-face interactions, and the student, parent, and teacher interviews. Table 13 supports the discussions in sections 5.1 to 5.4 below.

This chapter’s design is guided by the theoretical perspectives that meaning is multimodally designed and expressed through a multiplicity of semiotic categories and communication forms (New London Group, 1996). It integrates meanings from the student, teacher, and parent perspectives. Chapter Five embraces the notions of meeting learners’ needs (Ravet, 2011) and merging home-school literacies (Feiler et al., 2017; Vigdor et al., 2014). Findings on the potential of online multiplayer games to support the social interactions of the students with an ASD are now described.

## **5.1 The Potential to Support Social Interactions [RQs 1, 1a, 1b, and 1c]**

One of the core characteristics associated with a diagnosis of ASD is persistent deficits in social communication and social interactions (American Psychiatric Association, 2013). As a result, some students with an ASD may generally initiate and sustain less social interactions than their peers and participate in fewer sustained social interactions than students without an ASD (Ozuna et al., 2015). Additionally, without adequate support for social interactions, some students with an ASD may find it difficult to reciprocate in conversations (Koegel et al., 2014), and may be rejected by their peer group (Watkins et al., 2015). Support for initiating social interactions may therefore be vital for some students to increase generalisation of social interaction skills and positive social play with peers (Koegel et al., 2012). Through the lens of inclusive education (Foreman & Arthur-Kelly, 2017), some students may also require support in social interaction areas such as communication, language development, and social skills.

With the growth of new technologies and their literacies, the ways in which students with an ASD socially interact, such as through computer activities, are changing (Odom et al., 2015). A few previous studies have indicated that some students with an ASD spend a significant amount of time engaged with video games, particularly in online contexts (Gallup et al., 2016; Mazurek & Engelhardt, 2013a). Similarly, previous video gaming research has reported on the interactions of primary-school students within the context of online multiplayer games (Dezuanni et al., 2015). The use of video games as a social skill intervention is a growing interest for students with an ASD (Ferguson et al., 2013). This body of literature indicates a need to understand the social interaction support that online multiplayer games afford students with an ASD.

The researcher understands that several forms of social communication can be distinguished as separate systems of semiotic resources that contribute to meaning (Jewitt, 2017, Chapter 2). Likewise, they can be drawn on as a multimodal configuration for communication and



representation. Drawing on this notion, the findings revealed that the students were supported to initiate and sustain social interactions through verbal and nonverbal forms of social communication. See Table 14 below, in subsection 5.1.1, for screen shots and highlighted examples of verbal and nonverbal forms of social communication that were coded from the at-screen transcription excerpts. The students' use of oral, written, and gestural modes is the focus in this section.

Subsection 5.1.1 to subsection 5.1.5 describe the findings of how interactions with *Minecraft*® and other online multiplayer games supported the capacity of students with an ASD to initiate and sustain social interactions through social communication modes such as speech, writing, and gestures across virtual and physical affinity spaces (Gee, 2015b). The discussion of these findings and their implications are presented in subsection 5.1.4. Figure 8 introduces and highlights the potential of online multiplayer games for supporting the social interactions of students with an ASD.

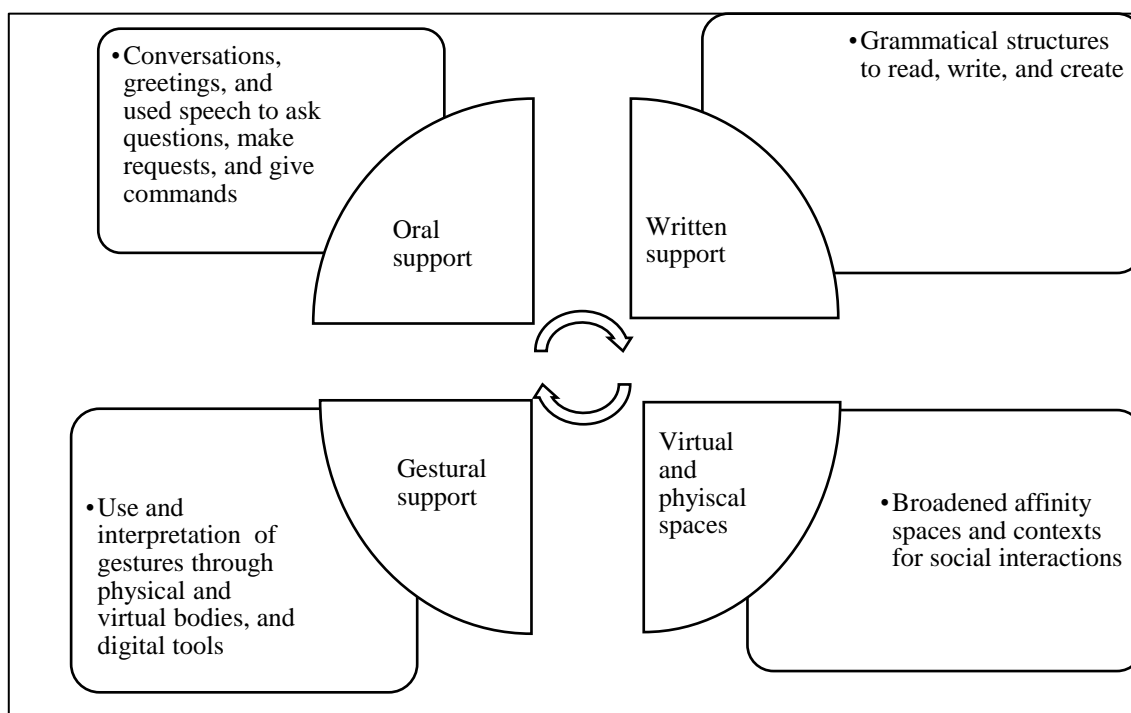


Figure 8. Potential to support social interactions.

These findings displayed in Figure 8 were common across the at-screen and peer face-to-face observations, and the student, parent, and teacher interviews. The at-screen findings are now presented.

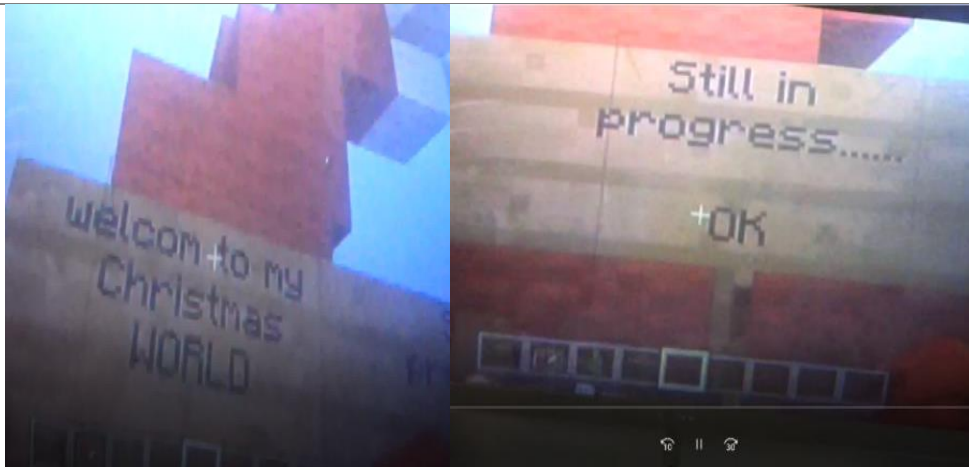
**5.1.1 At-screen findings: Support for social interactions.** Observed instances of at-screen social interactions were coded in the data to reveal patterns of support that were provided by the semiotic resources of *Minecraft*®. The student participants with an ASD were introduced in Chapter Four as Ethan, Mason, and Noah. They engaged in verbal and nonverbal ways with random players and their avatars. *Minecraft*® players use avatars as graphical 3-D character representations to immerse themselves in *Minecraft*® virtual world (Cordeiro & Nelson, 2014).

Table 14

*Forms of Social Communication during At-screen Minecraft® Play*

Verbal forms of social communication	Transcription excerpts from the at-screen observations
Oral mode	Noah: “Stevatar follow me!” Screen: Moves closer to Stevatar. Closeup of Stevatar’s face and elevated view of map. Moves forward. Pans to the right. Displays Stevatar standing beside a brick wall. Pans up to Stevatar. Noah: “Stevatar, follow me okay?”
Written mode	Mason: “I created this new world called Christmas world.” Researcher: “Where?” Mason: Points to screen. “That there. On <i>Minecraft</i> ®.” Screen: Pans over village. Displays grass. Moves towards a <i>Minecraft</i> ® sign that is topped with a huge red Christmas hat. The sign displays ‘Welcom [welcome] to my Christmas WORLD Still in progress OK’

Screenshot of Mason's welcome sign



Nonverbal forms of social communication

Transcription excerpts and screen shots from the at-screen observations

Visual mode

Screen: Ethan engages with a *Minecraft*® mini game called “Build Battle”. Displays *Minecraft*® plot with special features, including flowers, grass, trees, water, and lily pads, as well as the owner’s name.

Ethan: High pitched, raises eyebrows, “Oh that’s this one, this one looks pretty, this one look pretty greenish. I am going legendary.” Sits up and reshuffles body in chair.

Screen: Displays winner’s plot. Pans up, and displays sun, blue skies, and firework. Pans down to plot. Displays avatars who achieved 2<sup>nd</sup> and 3<sup>rd</sup> places.

Screenshot of *Minecraft*® plot



Gestural mode

Screen: Repeatedly moves his avatar’s hand towards Stevatar’s hand.  
Noah: High five! Peetch” Sharp jolting body movements each time he says “peetch”. “Peetch, peetch, peetch, peetch. . .”

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Screen: Repeatedly gives Stevatar high fives. (Moves his avatar's hand towards Stevatar. His avatar moves back and forth and jumps towards Stevatar at the same time that Stevatar moves towards the screen and jumps up.)  
Noah: "I love giving him high fives, in this game."

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Table 14 illustrates multimodal forms of social communication, such as oral, written, and gestural, that were shaped, repeated, shared, observed, and interpreted during the students' at-screen interactions. This table matches research question 1 and subquestion 1a, and supports the discussions presented in sections 5.1 to 5.4. Descriptions of how at-screen social interactions were initiated and sustained through multimodal elements, such as speech, writing, and gestures, are now presented.

**5.1.1.1 At-screen opportunities to support speech.** The at-screen findings revealed that each student socially interacted through speech over 100 times, during each at-screen video-recorded observation. Collectively, the students' use of speech included but was not limited to, greeting others, sharing knowledge and information, making requests, giving commands, and directing game play. For example, *Minecraft*® provided opportunities for them to initiate social communication through spoken greetings, such as "Hello", "Hi", and "How are you doing buddy?". Another notable use of speech was when Noah requested Steve's shared social interaction. He asked, "So what do you say we do today buddy? Let's play some Hide and Seek?" Noah also directed Stevatar to "follow" him so that he could "show" Steve his "secret hideout". Initiations included verbal directives to the researcher to "look at", "watch", and "see" *Minecraft*® content and material.

The students' requests and directives pointed to their intentions to initiate and sustain shared activities in social interactions, rather than engage in single player activities. This intention was understood through their use of collective pronouns, such as "we", and personal pronouns such as "you", "me", and "us". In summary, the data revealed opportunities for the students to initiate and

sustain social interactions through speech; and that speech within this context served multiple communicative reasons.

**5.1.1.2 Supporting online social interactions through written texts.** In addition to speech, the at-screen data also indicated that Ethan, Mason, and Noah initiated and sustained social interactions through the typing, clicking, reading, and selecting of written grammatical units. For example, digital alphabetical symbols, words, clauses, phrases, and written sentences enabled the students to ‘invite’, ‘welcome’, and ‘join’ other online players on Minecraft® servers and in virtual spaces that they created, such as a ‘Christmas WORLD’, arenas, houses, and beds (see above in Table 14, subsection 5.1.1). Likewise, they wrote on Minecraft® signs to initiate the playing of virtual games, including “*Minecraft*® Hide and Seek”. They also used dialogue boxes and ‘chats’ and initiated social interactions, through messages, such as ‘Do you want to team up?’.

From further observations, it was revealed that the students’ selection of written texts enabled them to control whom they participated with in creative, adventurous, competitive, and combative types of play, as well as superhuman experiences, such as flying and teleportation across *Minecraft*® spaces. Additionally, the digital texts and the students’ discussions revealed that they had access to over ‘68’ video games each, these included “*Halo*®”, “*Call of Duty*®”, and “*Portal*™”. They scrolled through up to 45 pages of friends lists, and said that they played those games in online multiplayer format with others.

**5.1.1.3 At-screen findings: Support through gestures.** The at-screen findings revealed that, in addition to the support received through spoken and written language, students initiated and sustained social interactions through the gestural mode. For example, they physically manipulated the game’s controllers by touching, tapping, clicking, and pressing them. Their smiles were configured with laughter, giggles, and spoken words, including “love” and “like”, and expressions,

such as “wee!”. They also made frequent eye contact with the researcher, and displayed finger and hand pointing towards the screens.

Similarly, students’ digital-gestural pointing through cursors, supported their bids for the researcher to “look” at how their avatars and Stevatar made eye contact; moved their hands to give “high fives” and “hit” each other; and mined, dug, and placed blocks during shared cooperative and competitive activities. Digital-gestural pointing was also used to move in, around, and out of *Minecraft*® environments, for instance villages, and virtual spaces, including “hiding” spots. The at-screen data revealed that, the students received social interaction support in multimodal forms of social communication, including oral, written, and gestural. Next, subsection 5.1.2 describes the social interaction support that was revealed through the peer face-to-face observations.

**5.1.2 Social interaction support: Peer observations and student interviews.** Findings from peer face-to-face interactions and student interviews provided evidence that the students’ engagements with the semiotic resources of online multiplayer games supported their social interactions. The peer face-to-face social interactions of the students with an ASD were observed as they engaged offline with educational resources, including material semiotic resources of online multiplayer games (see Figure 9 below). Results obtained from the peer face-to-face observation data revealed that the material semiotic resources supported the students to initiate and sustain their social interactions with their peers in offline social contexts. To demonstrate, the students frequently spoke about their gaming experiences and expertise, particularly with *Minecraft*®. For example, Ethan revealed that he “played *Minecraft*® ever since [he] was actually five [years old]”.



Figure 9. Peer social interactions supported by *Minecraft*® semiotic resources.

The students initiated and sustained social interactions with their peers through dialogues about *Minecraft*® sounds and printed texts. To demonstrate, Ethan asked, “Do I sound a little bit like a *Minecraft*® zombie? Hhhher.” Additionally, the students drew their peers’ attention to their reading of printed written text, such as *Minecraft*® books. However, they did not initiate and sustain social interactions through written text that they produced, although they had access to the resources to do so.

Ethan, Mason, and Noah students also engaged with their peers through gestures, such as smiles, finger and hand pointing, bodily movements, eye-contact, and gazes. They shared physical spaces with peers and sustained social interactions in the proximity of peers who shared their interests with *Minecraft*® material semiotic resources. For example, Ethan dragged his body towards his peers, then sat and faced them as they played with *Minecraft*® material semiotic resources. He spoke about wanting “to live” in a village as “a villager” with his peers. The data gathered from the student semistructured interviews revealed similar findings about how the

students were supported in social interactions through their engagements with online multiplayer games.

The students with an ASD were asked during the semistructured interviews to tell of online multiplayer games that they played. They listed “*Minecraft*®”, “*Terraria*™”, “*Agar.io*®”, “*Ark: Survival Evolved*”, “*Need for Speed*™” and “*Portal*™” as some of the video games that they played online in multiplayer format. Their responses suggested that support for social interactions through online multiplayer format can be provided through a variety of high interest video games, and their semiotic resources.

Furthermore, when asked about some of the good things about playing with other online players, the students said that the “multiplayer” option enabled them to “show” other “people” their abilities and “how to do” things, and to tell others what they wanted to “play with”. They got opportunities to boast about their “nice and cool secret stuff”. Students spoke about opportunities to “roleplay” and use gestures, namely “punching” avatars, jumping “high”, running into walls, and acting like animals. They revealed that, *Minecraft*® supported their social interactions by enabling them to be “inside another world” and to join spaces on “servers” where they could initiate and sustain social interactions through “talk” and written “chat” and “actions”. Online multiplayer games enabled them to “make up [their] own rules” about whom they invited to play, joined in social interactions, and maintained social interactions with. They also supported the students’ social interactions with siblings, online players, material-world “friends”, and peers. For example, students played some games together with peers in the same physical spaces, such as in their homes. Overall, data from the peer face-to-face observations and the student semistructured interviews revealed that the students’ social interactions were supported in multimodal ways through the virtual and material semiotic resources of online multiplayer games. The next subsection describes the parent and



teacher perspectives of online multiplayer games to support the social interactions of students with an ASD.

**5.1.3 Parent and teacher perspectives: Social interaction support.** Data gathered from the mothers of Ethan, Mason, and Noah enriched the at-screen findings and broadened insights about the social interaction support that their children received within the context of online multiplayer games. The parent participants were asked to provide details of how online multiplayer games supported the social interactions of their children with an ASD. They listed “*Minecraft*®”, “*Halo*®”, “*Call of Duty*®”, and “*Pokémon*™” as some of the video games that their children played online with others. Noah’s mother said that he was “always asking” her “to ring” another parent to ask permission for a peer “to get online” and play with him. The students’ motivation to initiate and sustain “play” through online multiplayer games was reflected in comments such as “he is enjoying it”, and “he actually likes”.

The parents mentioned that prior to their sons’ engagement with online multiplayer games, their boys found it “hard” to “talk” and “express” themselves to others. They often required a “nudge”, and other forms of motivation to greet and engage in social interactions with others. Conversely, their experiences with initiating and sustaining social interactions with online players had given them the “confidence” to greet others, and “open up and talk” to others face-to-face about “the different things” that they had built, done, and played in the games. Parents also described how they observed their sons “read”, “talk”, “write” and listen through the semiotic resources of multiplayer games. Talk, giggles, and laughter were often heard during their sons’ simultaneous online and offline social interactions with their friends at each other’s homes.

Finally, parents perceived their sons were “getting practice” to respond “to people in real life” and in “face-to-face” contexts. For instance, they shared that the support that their sons received online carried “on at school” through their “talk” and “drawings”. The focus is moved to

the teacher perspectives of online multiplayer games to support the social interactions of students with an ASD. According to the teachers, their students spoke about many games that they played online with others. “*Minecraft*®”, “*Pokémon*™”, “*Call of Duty*®”, and “*Mathletics [Online]*” are a few examples.

Teacher responses revealed that, student engagements with and “passion for” online multiplayer games gave the students common discourse threads and motivation to “spark up” conversations with peers and adults “if they want to”. For example, their students asked for peer opinions about the games. They talked about the features of the characters of the games they played. their students also spoke with their peers about their accomplishments, “their high scores”, who or what they had “killed” or “beaten”, and what “they had won” in battles. These findings are consistent with the at-screen data that students with an ASD initiated and sustained speech about their online multiplayer game experiences.

The teachers also revealed they observed changes in the students’ “confidence” level during social interactions. Teachers believed that the games influenced the students’ confidence level to initiate and sustain social interactions through speech, images, written and gestures associated with online multiplayer games. For example, teacher responses indicated that there seemed to be an increase in the students “self-esteem” when they were viewed by their peers as “experts” and asked to share information about their video gaming. Opportunities for some students to share information and knowledge about video gaming boosted confidence and made the students “feel good”. Changes in confidence levels to initiate and sustain social interactions through spoken and written language, and gestures were particularly noticeable in students who were “generally isolated” “within their own worlds”, engaged in “parallel play”, and who did not have a “good social network in school”.

Additionally, teacher interview data revealed that discourses of online multiplayer games supported the removal of gestural “barriers” to social interactions. This support was exemplified when the students “naturally” made “eye contact” while they engaged in conversations about the games. Teachers also discussed that some students made eye contact and shared visual attention between printed texts and the faces of their social partners during the times that they (a) played cards and created drawings that were similar to the games’ images, (b) wrote stories about their video gaming experiences, and (c) read printed texts related to online multiplayer games. In addition, some students engaged in fantasy play and mimicked some of the “characters” and avatars’ gestures. They displayed “leaps and curls”, and robotic “turning”, walking, and arm movements. The pressure to “worry about” making eye contact and other gestures was lost in the positivity, “happiness” and “excitement” that the students associated with the games and their “common interest” in them.

Finally, teachers perceived that online multiplayer games also (a) opened a “door” into “a world’ in which virtual experiences were as realistic as those in the material world, (b) gave students instant feedback for sustained social interactions, and (c) afforded social interaction “opportunities” that were previously “geographically” and “economically” inaccessible. They also suggested that to maximise support for offline and online social interactions, that students with an ASD “network in the same room” in a “face-to-face [peer] group”. In this way, students can (a) “challenge” peers in the games, (b) request immediate “feedback” about their gaming activities, and (c) develop their abilities to read facial gestures and “body language” that are often used in initiating and sustaining social interactions. Teachers implied that social, financial, and physical barriers are being removed so that students with an ASD can “bring the world” into their gaming spaces, and socially interact beyond the physical school environment, with worldwide gamers.

This subsection described the findings on the parent and teacher perspectives of online multiplayer games to support the social interactions of students with an ASD. Both participant groups revealed that the students were supported in their social interactions in multimodal ways. The following discussion in subsection 5.1.4 synthesises the findings from the at-screen observations, peer face-to-face observations, and the students', parents', and teachers' semistructured interviews. It centers on the potential of online multiplayer games to support the social interactions of students with an ASD.

**5.1.4 Summary and discussion of the findings: Social interaction support.** Collectively, the findings that are described above revealed that online multiplayer games, namely *Minecraft*®, provided opportunities for the students to initiate and sustain social interactions through speech, written texts, and gestures, and within physical and virtual spaces. These findings are presented in Figure 8. The findings supported understandings of verbal and nonverbal social communication forms that may be displayed in the social interactions of students with an ASD diagnosis (American Psychiatric Association, 2013). They are also consistent with previous findings that implied that the social interactions of students with an ASD can be understood in multimodal ways, such as through speech (So et al., 2014), written text (Asaro-Saddler, 2016b), and gestural behaviours (Medeiros & Winsler, 2014).

Additionally, the results supported previous findings that revealed children with an ASD have a high interest in video games, including those played online with other gamers (Finke et al., 2015; Gallup et al., 2016; Mazurek & Engelhardt, 2013a). These findings also reflected that engagements within the Discourse of online multiplayer games extend beyond oral and written language to make meaning for social interactions (Gee, 2015b). They indicated that students with an ASD use a diversity of social communication modes to represent their behaviours and expressions (Graham & Macartney, 2012).

The data have important implications for targeting students with an ASD's affinity and special interest with video games to support their social interactions (Mazurek & Engelhardt, 2013b). Given the new literacies of technologies and digital cultures, such as online multiplayer games (Garcia, 2017, Chapter 16), the data are also suggestive of implications to target verbal and nonverbal forms of social communication for social interactions. Drawing on 21<sup>st</sup> century descriptions of multimodality and literacies, there are implications to target several social communication modes in virtual and online contexts for social interactions (Jewitt, 2017, Chapter 2; Merchant et al., 2014; Street, et al., 2017, Chapter 16). The multimodal support afforded to the students in this research and the implications are further elaborated in the discussions below.

**5.1.4.1 Support to use speech in social interactions.** Oral language, speech, and conversational reciprocity are often necessary for communicating meanings and sustaining social interactions (Paul et al., 2009). However, these are often areas of difficulty for some students with an ASD (Lanter & Watson, 2008). In this regard, some students with an ASD may require oral and speech intervention to develop social interaction skills in sharing attention, social engagement and regulation, and symbolic play (Almirall et al., 2016). The data yielded by this study provided convincing evidence that students were supported to initiate and sustain their online and offline social interactions through speech.

Evidence presented in this subsection revealed that, online multiplayer games supported the students to initiate social interactions through interrogative, imperative, and declarative speech (Halliday & Matthiessen, 2014). Students shared information, made requests, and gave commands as they interacted with online players, the researcher, and with their friends, peers, and family members. Online multiplayer games supported the students with opportunities to practise oral skills, such as spoken greetings, verbal initiations and responses, and conversational reciprocity, during their online gaming experiences, and subsequent to their online game play in physical settings.

Some of their engagements were filled with laughter and giggles, suggesting that they had some levels of enjoyment, relaxation, and fun in authentic ways.

These findings are significant, given that some students with an ASD may demonstrate evidence of monologue-style speech, and may experience difficulties with the use of contingent responses (Nadig, Lee, Singh, Bosshart, & Ozonoff, 2010). Moreover, during conversations they sometimes appear to have difficulties with turn-taking skills (Paul et al., 2009). As Kagohara et al. (2013) imply, some students with an ASD may require support to greet their peers, respond to the greetings of peers, and gather information about peers, such as how they are doing and what they are doing. Drawing on Halliday and Matthiessen (2014), and Gee (2015b), the findings have important implications for extending our knowledge of how interrogative, imperative, and declarative speech may be used to make requests, give commands, and share information within the Discourse of online multiplayer games. These findings also provided additional evidence that online multiplayer games may support discussions of virtual gestures, images, characters, actions and settings, and the strategies that are used during gameplay (Bradford, 2012, Chapter 13).

These aspects of the findings reflected the implication to use students' gaming interest and motivation to enhance their enjoyment and participation in conversations (Gee, 2007a). The potentials revealed from the findings align with those from the study by Gallup et al. (2016). In that study, youths with an ASD were motivated to take conversational turns as they participate in enjoyable virtual social interactions with peers and friends. The findings reinforced that engagements with online multiplayer games lead to exchanges in conversations between gamers and that enjoyment is an important aspect of video gaming (Coleman, 2011; Beavis, Muspratt, & Thompson, 2015). These opportunities to enhance reciprocal conversations and students' enjoyment in social interactions may be encouraged, especially if students are frequently in separate physically

spaces from their peers and receive limited support for diversity (MacArthur et al., 2012, Chapter 10).

In view of all that has been mentioned so far, the findings were suggestive that semiotic resources of online multiplayer games can provide additional platforms to orally support students with an ASD. The games can support students to greet others. There are also opportunities to practise making requests, giving commands, directing game play, and sharing information with their peers and adults.

**5.1.4.2 Written support for social interactions.** Difficulties with written communication and written expressions can impact on the abilities of students with an ASD to initiate and sustain social interactions that occur through the written mode (Zajic et al., 2016). Students with an ASD have received support through written scripts (Charlop-Christy & Kelso, 2003). Support has also been received to improve performance in written language and in written expression (Delano, 2007; Pennington, 2009). Similarly, this research's findings revealed the potential of online multiplayer games to support the social interactions of students with an ASD through the typing, clicking, reading, and selecting of written grammatical units. Grammatical units, including alphabetical letter, phrases, and sentences were used to invite and join other players on servers, attract attention, and greet other players. The students also sent virtual messages, communicated written rules, and engaged in superhuman experiences, for example, teleportation-type initiations, and flying. Taken together, the data also showed that the production of written texts through virtual signs, books, and writing chat boxes, was an important component of the students' social interactions. Likewise, the students initiated and sustained face-to-face social interactions through discourses that they wrote, drew, read, and produced about online multiplayer games.

These findings are relevant given the writing difficulties that some students with an ASD may experience in planning through the written mode, and with initiating and sustaining social

interactions through the written mode (Asaro-Saddler, 2014; Geither & Meeks, 2014). The data supported the notions that the potential of written texts in video games can support social interactions by giving voices to gamers as well as by enabling them to engage in at-screen social interactions with others (Jewitt, 2005). Additionally, the evidence presented in this subsection suggests that the written semiotic resources of online multiplayer games may be targeted to provide scaffolded support for virtual social interactions. As implied by Ito et al. (2009), students maintain constant contact with others through internet connections and written messaging. The importance of semiotic resources such as written chat boxes to support the reading, writing, and selection of screen texts for interactions is also discussed in the works by Gallup et al. (2016) and Gee (2015b).

These findings provided insight into how written language within the Discourse of online multiplayer games (Gee, 2007b) can be used in the meaning making process to reveal affordances, expound knowledge, report events, share experiences, and enable and regulate activities (Halliday & Matthiessen, 2014). Targeting these potentials may reflect the one of core notions of inclusive new literacies, which is to understand the real daily struggles to social inclusion and barriers in literacies that students face, and to support students' needs through the semiotic resources of online multiplayer games (Foreman & Arthur-Kelly, 2017; Gee, 2015b).

**5.1.4.3 Gestural support for social interactions.** Previous studies have revealed that some students with an ASD may require support to make meanings from gestures, if they display difficulties with skills to receive, understand, and produce nonverbal modes of social communication during their social interactions (Grossman & Tager-Flusberg, 2012; Serret et al., 2014). However, the literature implies that gestural potentials may be enhanced by gamers' abilities to recognise and execute actions and movements through their avatars (Beavis & Apperley, 2012, Chapter 2). Gamers' gestural potentials may also be enhanced when they align their own cognitive



and physical abilities with their avatars' skills, abilities, surrogate bodies, and identities (Gee, 2015b).

Similar to the notions above, this study has highlighted the potential of online multiplayer games to promote students' spontaneous and comfortable use of gestures, such as smiles and eye contact, as they socially interact in online and offline contexts. Students also used digital gestures, namely pointing through cursors. The findings showed that online multiplayer games supported the students' using, interpreting, and mirroring of avatar gestures in symbolic physical and virtual play (Hughes, 2002; Marsh et al., 2016). Multimodal perspectives guided the understanding of gestural signs, gestural material patterns, and gestural social interaction potentials that emerged during the students' engagements with the semiotic resources of online multiplayer games (Bezemer, 2017, Chapter 25; Jewitt, 2017, Chapter 2).

These potentials are welcomed for the social interaction support of students with an ASD because the literature informs us that some students may experience difficulties exchanging eye contact (Jeffries, Crosland, & Miltenberger, 2016), engaging in symbolic and representational play (Hobson et al., 2009), and may have preferences for limited physical touch during social interactions (Riquelme et al., 2016). Similarly, some students with an ASD may experience difficulties to use their physical bodies to engage in shared physical activities (Freeman et al., 2015). These difficulties imply the importance of embracing the above gestural potentials for students' social interactions.

Based on recent studies, although virtual environments may enhance the abilities of students with an ASD to make meanings from facial gestures (Kandalaft et al., 2013), some students with an ASD may still require explicit and implicit approaches to support their social understandings of facial gestures (Schaller & Rauh, 2017). There is possible implication that the gestural potentials of some virtual characters' can support the nonverbal communication of students with an ASD

(Georgescu, Kuzmanovic, Roth, Bente, & Vogeley, 2014). The findings were suggestive that the gestural potentials of online multiplayer games can be targeted to support the use of gestures in more natural and comfortable ways without any pressure to do so. As Joseph et al. (2008) state, forced eye contact may cause some children with an ASD discomfort in and resistance to social interactions. Gestural support may also be useful for students with an ASD who benefit from gestural scaffolding of social situations (So et al., 2015).

Drawing on the works by Boche and Henning (2015) and Warschauer (2007), the findings suggested that within the context of online multiplayer games, targeted support and scaffolding may be required to assist students who (a) experience gestural disadvantages, and (b) may require gestural support to competently complete certain tasks or to effectively engage in activities. The discussions presented above implied that social interaction potentials within the Discourse of online multiplayer games can be understood in multimodal ways. Next, subsection 5.1.4.4 integrates and discusses the findings on the multimodal ways that the students socially interacted within virtual and physical affinity spaces (Gee, 2015b).

**5.1.4.4 Physical and virtual affinity spaces for social interactions.** Online multiplayer games synchronise modes and enable shared gaming experiences while gamers socially interact on servers and within the virtual affinity spaces (Hayes & Duncan, 2012). They also allow gamers to maintain personal space while they engage in virtual gaming experiences that are almost as realistic as playing with real persons in face-to-face contexts (Stagner, 2013). Technology that supports the personalisation of space for social communication acknowledges the diversity in the social interaction preferences, behaviours, and needs of students with an ASD (Porayska-Pomsta et al., 2012).

The data evoked these notions and showed that *Minecraft*® servers and virtual spaces acted as main hubs for personal and sharable interactions. More broadly, online multiplayer games

broadened the virtual and physical, online and offline, and personal and shared affinity spaces in which the students' social interactions took place (Gee, 2015b). They also provided virtual-world spaces that were perceived to be realistic, as well as physically, geographically, and economically inaccessible. The games afforded social interactions that may have been costly or impractical within the physical spaces of the school environment (Goldstein, 2011, Chapter 24). These findings also have implications to extend the social spaces of students with an ASD to realistic virtual environments, when physical environments for social interactions are physically and financially inaccessible. There is also implication to create affinity spaces that could support situated uses of multimodal forms of social communication; local and worldwide contexts for social interactions; integrated, shared, and common affinities; and collaboration, learning, motivation and social skills for social interactions within virtual and physical inclusive settings (Gee, 2015; Hayes & Duncan 2012).

The findings implied that the affinity spaces of online multiplayer games (Hayes & Duncan, 2012) may be targeted to broaden understandings of social interactions of students with an ASD across various contexts (American Psychiatric Association, 2013). Furthermore, the data are suggestive that the virtual and physical affinity spaces afforded by online multiplayer games may be targeted to support social interactions through interest-driven activities and participation (Ito et al., 2009; Schmierbach et al., 2012). The evidence suggested that the literacies within the affinity spaces of online multiplayer games can support students to engage in social spaces that they consider to be interesting, especially if they struggle to fit into other social groups (Gee, 2007b; Sanford & Madill, 2006). Finally, students' abilities to play online multiplayer games in physical and virtual affinity spaces provided suggestions for expanding social interaction spaces and for increasing opportunities for students' interactions to be more predictable and scaffolded. Some

students with an ASD may prefer to bypass some limitations and unpredictability of social interactions that they may experience in physical environments (Gallup et al., 2016).

**5.1.4.5 Conclusion to section 5.1.** Findings presented above revealed the students engaged with verbal and nonverbal forms of social communication such as the spoken, written, and gestural modes. Multimodal analysis revealed that their engagements with semiotic resources of online multiplayer games increased students' opportunities to initiate and sustain social interactions in online and offline affinity spaces, and home and school environments. This understanding was guided by the theoretical perspectives of multimodality (Jewitt, 2017, Chapter 2) and D/discourse (Gee, 2007b). The findings of this study are consistent with the work by Gee (2015b). They both indicate that the Discourse of online multiplayer games allow players to use resources to gain benefits for social interactions. Figure 8 (presented above) illustrates the support for initiating and sustaining social interactions that was enabled through a configuration of social communication modes, including speech, writing, and gestures.

The diversity of social communication modes that the students engaged with offered implications for valuing the diverse ways that they can practise initiations and responses during online and offline social interactions. Support for diversity is a valuable notion in the field of NLS and a fundamental contextual aspect of inclusive education (Ashman, 2014; Beamish & Saggars, 2013, Chapter 14; Warschauer & Tate, 2017, Chapter 5). Differentiating support for social interactions through the semiotic resources of online multiplayer games should take into account that these games are potential motivators for social interactions in classroom and extracurricular activities, as well as the different interests, abilities, needs, and skills of all students (Metzger & Paxton, 2016; Tomlinson & Imbeau, 2010). Overall, the empirical findings in this study enhanced our understanding of how (a) online multiplayer games can motivate the interests of students with an ASD to socially interact, and (b) how their online multiplayer gaming interests could be

channelled to further promote, develop, and sustain their capacities for social interactions within formal educational settings. The next section presents the findings on online multiplayer games for developing and sustaining the friendships of the students with an ASD and their implications for social interaction support.

## **5.2 The Potential to Develop and Sustain Friendships [RQs 1, 1a, 1b, and 1c]**

The term *friendship* is described as a relationship in which individuals share mutual interests and have a liking for one another (Boyd et al., 2015). Research reflects that the friendships of students with an ASD in the physical world is a growing area of interest (Calder, Hill, & Pellicano, 2013; Petrina et al., 2016). Petrina et al. (2016) report evidence that the reciprocal friendships and friendship qualities among students with an ASD and their peers were perceived to be lower than those of their peers without an ASD. Previous studies have also documented the difficulties that students with an ASD face in their friendships, and indicated that they may have a few friendships and may be on the periphery of their social networks in offline contexts (Kasari et al., 2011; Mazurek & Kanne, 2010; Petrina et al., 2014). Given these difficulties, researchers and educators have explored and designed several interventions, such as teaching prosocial behaviours and training through peer-buddy programs, to develop and sustain the friendships and friendship skills of students with an ASD (Erickson et al., 2014; Finke, 2016; Milner & Haslam, 2013).

Despite these findings and the interests shown by students with an ASD for online friendships, only a few studies have explored the friendships of children and youths with an ASD within the context of online multiplayer games (Gallup et al., 2016; Kuo et al., 2014). The complexity of the term *friendship* is highlighted in the literature, especially because the terms *friend* and *friend online* have been reconstructed by online multimodal interactions that are embedded with new kinds of literacies (Bagwell & Schmidt, 2011; Ito et al., 2009). Individuals often engage with

the literacies of online multiplayer games, to develop friendships and to socially interact with their friends in virtual spaces as frequently and long as possible (Eklund & Roman, 2017).

This section presents the findings from the data sets about the potential of developing and sustaining the friendships of students with an ASD through multimodal interactions with online multiplayer games. Subsection 5.2.1 to subsection 5.2.5 describe the findings of how interactions with *Minecraft*® and other online multiplayer games supported the capacity of students with an ASD to develop and sustain friendships, through social communication modes, such as written, visual, and gestural forms, and across virtual and physical affinity spaces (Gee, 2015b). Figure 10 below, summarises the multimodal potentials of online multiplayer games to sustain and develop the students’ friendships. The discussion of these findings and their implications are presented in subsection 5.2.3.

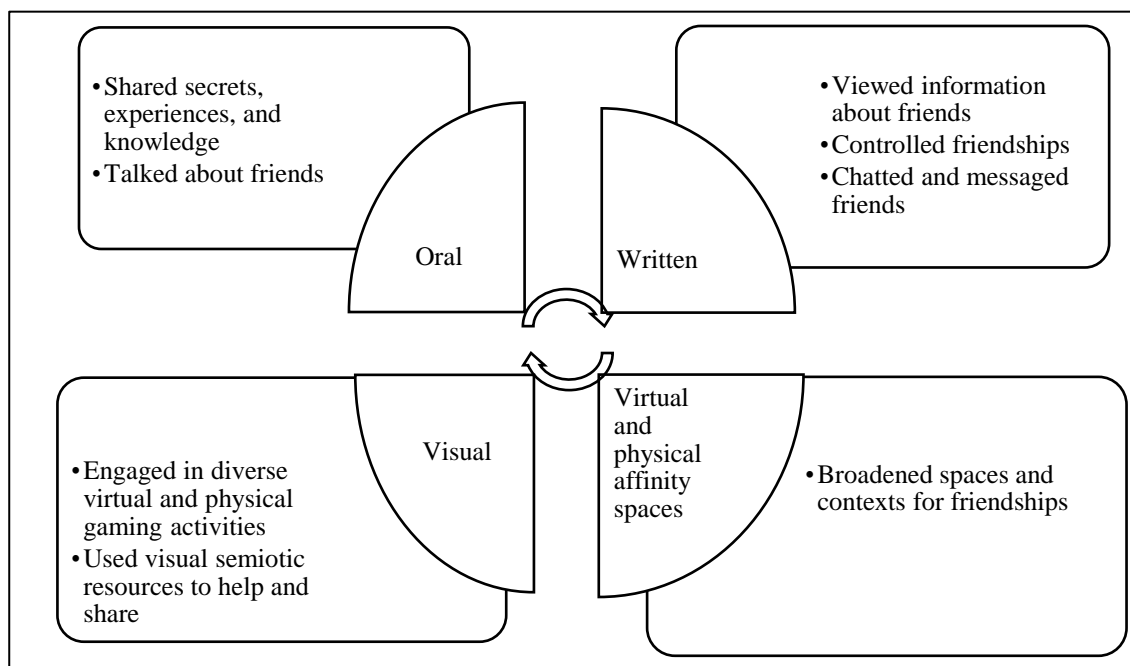


Figure 10. Potentials that developed and sustained friendships.

These findings summarised in Figure 10 were common across the at-screen and peer face-to-face interactions, and the student, parent, and teacher interviews. The findings from the at-screen observations, peer face-to-face observations, and student interviews are now presented.

**5.2.1 Develop and sustain friendships: Observations and student interviews.** Table 14 above, illustrates the multimodal forms of social communication, including written and visual, that the students accessed and drew on to develop and maintain their friendships. Descriptions of how friendships were displayed through multimodal elements, such as speech, writing, and images, are now presented. The at-screen data revealed that ‘friendship’ was a recurring theme. For example, the word ‘friend’ in its singular and plural forms was displayed on the screen approximately 40 times during Noah’s at-screen observations. Some online gamers were referred to by the students as “best friend” and “my friend”, and some were virtual friends whom they had never met in face-to-face contexts. There were also opportunities for the students to voluntarily ‘select’ and ‘invite friends’ from ‘friend lists’ to socially interact with, “welcome” friends into virtual spaces, and “join” friends in *Minecraft*® environments and *Minecraft*® sessions. Students had opportunities to ‘impress friends by posting screenshots of...*Minecraft*® creations to Face-book [Facebook] from the in-game pause menu’.

Other opportunities to develop and sustain friendships were inferred as the students scrolled up and down through digital texts that communicated specific information about friends’ profiles, online statuses, and activities. The three students also had usernames that they created and by which their friends identified them during online play. For example, Mason was named ‘CrawlysnakeM’, Noah was identified as ‘NlittleSniper’, and Ethan’s avatar’s name was comprised of his first name, surname, and middle-name’s initial, ‘EthanMBrown’. Likewise, digital texts, such as ‘1,166 currently playing [*Minecraft*®]’, told that the students’ friendship potentials were many, especially because they wanted “to make friends with” other online players.

The students’ use of print text on controllers and digital text on the screens offered support to move through different spaces and locations with their friends. They controlled who they became friends with on their local networks by selecting written ‘host options’, having passwords and

passcodes to secure their servers, and having the ability to use the ‘remove friend’ function in their games. The data revealed that students engage with the discourse of friendship through the written mode, and that they had opportunities and platforms to develop and sustain friendships.

In addition to the use of digital text, *Minecraft*® images provided opportunities for the students to engage in collaborative and shared play with their friends. To explain, the students discussed how they got “help” from their friends to build virtual images, including “no man’s land”, ships, whales, houses, and villages. They shared that they did “jobs” for their friends and shared resources, in particular “bows” and “diamond swords”. Comments such as “you deserve an arrow!”, and “here’s some wood and . . . some bones for you!” contributed meanings about how images were used to show levels of kindness to their friends. At times, only their friends’ avatars were “allowed in” their “secret” bases and hideouts where the students played with, displayed, and hid “valuables”, for instance “diamonds”. The students developed and sustained friendships through multimodal forms of social communication, such as written and visual. Students’ speech at the screens also provided data about how *Minecraft*® sustained and developed their friendships. The at-screen data were consistent with the findings from the peer face-to-face interactions.

Data from the peer face-to-face observations revealed that the students’ peer social interactions were influenced by the friendship discourses of online multiplayer games. To list a few examples, the play between the students and their peers consisted of talk about “friends list”, *Minecraft*® avatar “Alex” as a “girlfriend”, and “a friendly . . . ghastr”. Additionally, the students’ discussions with their peers revealed that, at times, they “were . . . online playing” games, including “*Minecraft*®” and “*Call of Duty*®” with some of their school friends. These findings are discussed below in subsection 5.2.3.

With regards to the findings from the student semistructured interviews, students were asked to tell how online multiplayer games helped their friendships. Their responses indicated that they



“got along with” “a bunch of friends” who were their online friends and school friends and that they were “mostly helpful” to their friends during online play. They took turns with their friends to play online multiplayer games at each other’s homes. Students said that they were less likely to “kick . . . a good friend” from their server. They shared usernames with peers, and exchanged secrets and information about their gaming experiences with their physical-world friends. These responses contributed to understanding how their friendships were developed and sustained through online multiplayer games.

The student interview data also revealed that, during school recess times, students pretended to make virtual hideouts during symbolic play with their friends. They also played *Minecraft*® games in the “sandpit” and with the games’ material semiotic resources, such as “*Minecraft*® toys”. Students also regularly spent time drawing images that represented multimodal elements of online multiplayer games, such as virtual characters and their actions. The student interview data were consistent with the at-screen and peer face-to-face observation data. Data showed that the students developed and sustained friendships through their engagements with *Minecraft*® and other online multiplayer games. Subsection 5.2.2 describes the parent and teacher perspectives of online multiplayer games to support the social interactions of students with an ASD.

**5.2.2 Parent and teacher interviews: Developing and sustaining friendships.** This subsection describes the findings from the parent and teacher interviews about the potential of online multiplayer games to develop and sustain the friendships of students with an ASD. Parent participants were asked to share their perspectives on the potential of online multiplayer games for developing their son’s friendships. Their responses revealed that, since their sons began playing online multiplayer games with “school” and “international” friends, they developed the confidence to make “new” friends, and to “develop...friendships” within the “group” of peer gamers with whom they “had the same interests”. Parents also revealed that the students and some of their peers

knew “each other” and played “with each other” online. Other comments, for example he “picked up a few more friends” and “he’s become friends with some of them”, suggested that the students formed and sustained a “certain kind of friendship” when they were “playing with friends online”.

In summary, further analysis of the parent responses revealed that some of the friendships in the students’ online groups were extended to “school” where they formed “interest” groups within their “friend circle”. The parents said that their sons talked with their school friends “about the same sort of thing [things] that they do online”. During school hours their sons created drawings “of the characters from” the games with their friends. They also engaged online with friends who were from various countries around “the world”. The teacher interview data revealed similar findings about online multiplayer games to develop and maintain the friendships of students with an ASD.

Teacher participants were asked to share their perspectives on the potential of online multiplayer games for developing the friendships of students with an ASD. The teachers shared that, prior to their students’ play with online multiplayer games, some students had only a few friends. They were once perceived as being “alienated”, socially out-casted, and “generally isolated”. Conversely, “through their interests in online gaming”, the “characters” in the games, and the gaming worlds that “they play in”, the same students became friendlier as they shared “their ideas” and “pictures” with other students. They were able to “bridge” friendship gaps that existed between themselves and “other peer gamers”. Furthermore, with “a common ground to stand on” some students with an ASD seemed more likely to “make an effort to engage with” potential friends and likely to “start building relationships”. There was potential to “set [friendship] groups” by building clubs with other gamers outside of school hours. Teachers suggested that for those students who “may not have [had] any friends”, engagement through online multiplayer games may have been the “only form of interaction” that was appreciated and enjoyed to develop friendships. The

following discussion in this subsection, centers on the potential of online multiplayer games to develop and sustain the friendships of students with an ASD.

**5.2.3 Summary and discussions: Developing and sustaining friendships.** The purpose of section 5.2 is to describe and discuss the findings on the potential of online multiplayer games for developing and sustaining the friendships of three students with an ASD. Research findings described above revealed that the students' material-world and virtual-world friendships were developed, sustained, and bridged orally, textually, and visually through the semiotic resources of online multiplayer games. Specifically, the findings presented showed that their friendships in offline and online contexts were developed and sustained through the speech, written texts, and images, in virtual and physical spaces afforded by online multiplayer games (see Figure 10).

The findings reflected a convergence of students' friendships through the games' virtual and physical semiotic resources, in online and offline contexts. The notion of "convergence of friendships" refers to the cross-referential connection between 21<sup>st</sup> century students' virtual world and online friendships, and physical world and offline friendships that students develop and sustain. A connection may be achieved through virtual and material semiotic resources and within virtual and physical affinity spaces. This notion builds on the works by Edwards (2013, 2016) on blended play across traditional and digital contexts. As students' patterns and practices of play shift between physical contexts and digital contexts, their friendships are broadened to virtual affinity spaces (Gallup et al., 2016; Hayes & Duncan, 2012; Richards & Burn, 2014). The discussions presented below and their implications are significant given that some students with an ASD may manifest difficulties in developing, sustaining, and understanding relationships such as friendships (American Psychiatric Association, 2013; Finke, 2016).

**5.2.3.1 Oral potentials for developing and sustaining friendships.** A few studies have shown that the friendships of students with an ASD can be understood through their speech and

conversations about video games (Boyd et al., 2015; Gallup et al., 2016). Participants in the study by Gallup et al. (2016) articulated that some online multiplayer games motivated them to frequently socialise and interact with friends. Similarly, research by Ito et al. (2009) on the digital youth community has indicated that conversations about friendship-driven participation in online gaming activities are common among youths. Humans are more likely to share secrets with others who are within their circle of friends (Machin & Mayr, 2012). Students are often more comfortable developing friendships and socially interacting with peers with whom they share common interests (Hornby, 2014).

The data evidence described above revealed that online multiplayer games supported the students' use of speech to engage in conversations about their online and offline friendships. They engaged in conversations with their peer friends in the physical world. Conversations were about shared gaming secrets, experiences, and knowledge. Additionally, the data indicated that the students became friendlier in their conversations across multiple settings since they began to engage with online multiplayer games.

These findings align with the notion that spoken language can signal relationship types that people have or intend to develop, and can build relevant connections within social contexts (Gee, 2014), such as the Discourse of online multiplayer games. This study found that online multiplayer games also afford gamers to have user-created content, for instance their game levels that they can share with other players, a result that is consistent with those of Trundle (2012, Chapter 14). It is, therefore, unsurprising that *Minecraft*® also enabled opportunities for primary-school students (without an ASD) to learn from their friends and socially interact with their friends through conversations (Dezuanni et al., 2015).

Given the relevance of the findings, an implication is to target the games' oral potentials for students to engage in conversations (Gee, 2015b). Students may become friendlier, and may

develop and sustain more enjoyable, interesting, and reciprocal friendships with their friends through a shared gaming interest, instead of being on the sideline of their social groups (Gallup et al., 2016; Kasari et al., 2011). Personal engagement and participation may increase the chances of meaningful friendships for students with an ASD (Mehling & Tassé, 2015). Additionally, mutual friendships between students are often developed and sustained through affection, the sharing of secrets, mutual trust, and loyalty and collaboration (MacArthur et al., 2012, Chapter 10). Some students with an ASD may have unilateral friendships that may not be as rich in quality as those of their peers without an ASD (Kasari et al., 2011). These oral potentials have significance in supporting student friendships given the difficulties they may experience in establishing and maintaining friendships (Petrina et al., 2014).

**5.2.3.2 *Written potentials for developing and sustaining friendships.*** Previous research has suggested that engaging students in discourses about friendship may be fundamental to constructing, developing, and sustaining their friendships as meaningful interactions (Chasin, 2008). For example, the prevalence of written features in online multiplayer games, such as ‘friends list’ (Schmierbach et al., 2012), increases opportunities for social interactions. Similarly, the findings described above in this subsection highlighted how online multiplayer games enabled students to read usernames, friend lists, and friends’ gaming profiles. They were also given opportunities to visually gather information about their friends’ online statuses and activities. In this way, the students were able to build on their offline knowledge about their school friends. The clicking, typing, and selecting of written texts facilitated the students’ potentials and levels of control to embrace, develop, and sustain friendships. They had opportunities to invite and join friends in

virtual environments and to progress through the games' spaces collaboratively, creatively, and competitively.

The findings are considered as important because previous research revealed that some students with an ASD may have fewer meaningful, rich, sustained, and reciprocal friendships than their peers without an ASD (Kasari et al., 2011). Fewer students with an ASD may be nominated and sorted for their reciprocal friendship and social interactions than their peers without an ASD (Chamberlain et al., 2007). Their desire for friendship development and quality friendships in material-world contexts may often be unreciprocated (Petrina et al., 2016). Moreover, some friendships may be unpredictable and challenging for some students with an ASD (Gallup et al., 2016). Opportunities to initiate friendships through invitations to join online servers and virtual activities may be easier and may present less risks than initiating friendships in face-to-face and offline contexts (Buote et al., 2009).

The current research's findings align with the research findings of Gallup et al. (2016). The data show implication for some online multiplayer games to offer innovative resources for students with an ASD to explore, develop, and sustain friendships. The findings suggested that the use of written elements in online multiplayer games could be markers of their friends' identities, profiles, and online activities (Jewitt, 2006). Therefore, they have implications for motivating students to socially interact with online players who have friendship identities (Machin & Mayr, 2012).

The data were also suggestive that online friendships can provide opportunities to practise and to learn how to navigate friendships of high quality (Beavis & Apperley, 2012, Chapter 2). As Ito et al. (2009) explain, online friendships may develop reconfigured understandings of friendships and enable connections through friendship-driven activities, such as messaging in online spaces. The findings also have implications for scaffolding friendship-driven participation in virtual contexts, particularly through the potentials and affinities of digital texts. Students' engagements in

friendship-driven activities can facilitate online connections and extend existing friendships with peers whom they already know in their physical lives (Gee, 2007a; Ito et al., 2009).

**5.2.3.3 Visual potentials for developing and sustaining friendships.** In addition to the use of speech and written text, much attention has been given to the visual behaviours, visual expertise, and the strong attachments of students with an ASD to images, objects, and activities (Foss-Feig et al., 2016; Martineau, Hernandez, Roche, Andersson, & Bonnet-Brilhault, 2010). Visual strategies have been used to understand the visual potentials of students with an ASD (Trembath, Vivanti, Iacono, & Dissanayake, 2015), and to address the social communicational and social interaction difficulties of students with an ASD (Shane et al., 2012). These strategies include interventions, such as the use of avatar assistance for facial recognition and social skills support, and hand-held electronics and video modelling for visual support (Ganz, Boles, Goodwyn, & Flores, 2014; Hopkins et al., 2011).

There is evidence from the data described above to add to the existing body of research. Attention to the observed student interactions with visual elements revealed that students engaged in creative, collaborative, adventurous, and competitive uses of virtual images and their material representations, with their friends. For example, they comfortably socially interacted with their school friends through shared visual interests, such as drawing, toys, and fantasy play associated with online multiplayer games. Additionally, they used the potentials of visual semiotic resources for sharing, helping, and showing kindness to their friends, and to engage in conversations and symbolic play with their friends.

These displays by the students are consistent with previous research that has shown that some students with an ASD can be caring to others and can build on friendships from their material-world (Milner & Haslam, 2013). Likewise, the results confirmed that the visual mode may at times be their preferred mode of interaction (Joseph, Keehn, Connolly, Wolfe, & Horowitz, 2009). The

visual mode facilitated the students' sharing of visual semiotic resources, and their visual contributions to shared endeavours with their online friends in *Minecraft*® activities. It evoked mutual respect for the needs and rights of others (Kolm, 2008). Analysis of the visual mode also indicated collaboration, participation, and shared resources (Booth & Ainscow, 2011) in D/discourses and affinity spaces (Gee, 2015b). The relevance of shared interests and collaboration among students for developing friendships is an important aspect of inclusive education (Hornby, 2014).

According to the literature, some students with an ASD may display difficulties with initiating relationships (Freeman et al., 2015). However, considering the visual abilities of some students with an ASD (Joseph et al., 2009), this study's findings have implications to target and support students' tendency to be helpful to, and supportive of their peer friends, through the use of virtual images. This type of support may be considered for students with an ASD who have a visual learning style, and who have been found to benefit from visual supports and scaffolding of social situations (Finke, Wilkinson, & Hickerson, 2016; Trembath et al., 2015). The results also offer implications for supporting and advancing students' physical and virtual symbolic play abilities through the potentials offered by virtual reality and from their engagements in virtual environments (Herrera et al., 2008; Hughes, 2002; Marsh et al., 2016). Next, subsection 5.2.3.4 integrates and discusses the findings on the multimodal ways that the students developed and sustained friendships within virtual and physical affinity spaces (Gee; 2015b).

**5.2.3.4 Affinity spaces: Developing and sustaining friendships.** Previous research has indicated that some students with an ASD experience relationship difficulties and have fewer nominated reciprocal friendships in social spaces, such as the classroom, than their peers without an ASD (Chamberlain et al., 2007). In a social world that is influenced by technologies, the ability to maintain and sustain relationships with friends in the long-term through multimodal forms of social



communication is essential (Degges-White & Borzumato-Gainey, 2011). Researchers continue to try and understand the friendships and friendship patterns of students with an ASD (Howard, Cohn, & Orsmond, 2006; Mazurek & Kanne, 2010), particularly through online media and gaming environments (Gallup et al., 2016; Kuo et al., 2014).

This study builds on the works by Gee (2004, 2015b). It adds to this body of research, new findings that the students with an ASD's engagements with online multiplayer games broadened their friendships to local, global, offline, and online affinity spaces. Additionally, by drawing on the concept of friendship-driven activities (Ito et al., 2009), the data suggested that engagements with the games laid the foundation for the students to connect with peer friends and to develop offline friendships through shared online gaming participation. The students also made decisions about whom they sustained friendships with. These findings were important to understanding the social interaction potentials of online multiplayer games for the students' friendship, when considering that some students with an ASD may face obstacles to transfer friendships across various contexts (Mazurek & Kanne, 2010). The potentials presented above are reflected in other studies from the general population (Eklund & Roman, 2017; Schmierbach et al., 2012). Eklund and Roman (2017) reported that online multiplayer games may facilitate a broadened source of friendship for adolescents in online and offline contexts. Likewise, Schmierbach et al. (2012) reported that online multiplayer games provide opportunities for gamers to actively seek to develop electronic friendships with people who are personally known and with people from around the world.

This study's findings offered implications for primary-school students to use *Minecraft*® servers that allow them and their friends to simultaneously connect and interact from various physical and virtual locations. These implications are consistent with the findings from across the general population (Dezuanni et al. 2015). The data also suggested implications for developing friendships through integrated ways of socially interacting, and through patterns of communicating

that are associated with virtual affinity groups and affinity spaces (Gee, 2015b). There are additional suggestions to develop the friendships of students with an ASD who are drawn together with other people to engage in a shared interest (Kuo et al., 2014). Gamers are often drawn together with other gamers in the affinity spaces of online multiplayer games (Gallup et al., 2016; Hayes & Duncan, 2012). The results may also help us to better understand how to facilitate the extending of students' friendships across social contexts, after they have had virtual practice to develop and sustain them (Whyte et al., 2015). Drawing on Gee's (2015) transfer principle, the results broaden understandings of how to target online multiplayer games to provide online and offline affinity spaces for students to chat and connect with their friends through multiple modes of social communication.

**5.2.3.5 Conclusion to section 5.2.** Social interaction difficulties experienced in friendships and other relationships across various environments, constitute the characteristics of ASD (American Psychiatric Association, 2013). Given these relationship difficulties, research within the context of inclusive education has indicated that students with an ASD may require support to learn about developing and maintaining relationships such as friendships (Al-Ghani & Al-Ghani, 2011). Previous research, including that of Boyd et al. (2015), has indicated the potential of video games for developing friendships when they are played collaboratively.

The findings of this study contributed to the body of research and have shown that the semiotic resources within the Discourse of online multiplayer games provided platforms and affinity spaces for students to develop and strengthen friendships in both virtual and physical environments (Gee, 2015b). Multimodal perspectives (Kress, 2017, Chapter 4) and D/discourse perspectives (Gee, 2007a) enabled understanding that the genre of online multiplayer games is a Discourse that afforded the students, as members, to describe and evaluate their relationships in that domain. Students engaged and participated with friends within the affinity spaces of that Discourse,

through multimodal ways. Gee (2014) holds that individuals belong to more than one Discourse communities and affinity groups. Findings from this study were consistent with this notion, showing evidence that the students were friends to other gamers, classmates, peers, and online players. The results also supported the idea that video games (including those played online) can provide networks for students to interact with their school friends, peer friends, close friends, not so close friends, local friends, and global friends (Beavis & Apperley, 2012, Chapter 2). Therefore, their friendships were described across various contexts.

The findings implied that the semiotic resources and affinity spaces of online multiplayer games may support the bridging of peer friendships across virtual-worlds and material-worlds, and in-and out-of-school worlds (Beavis et al., 2012; Gee, 2015b). There are implications to extend students' friendships in multimodal ways beyond their physical bodies and physical worlds to their virtual ones. The results add to a small but growing body of online multiplayer gaming studies, which focuses on the friendships of students with an ASD (Gallup et al., 2016). They are consistent with the notion that friendship and gaming are key domains of social practices among youths in online contexts (Ito et al., 2009). Data from this study confirm previous research findings that have suggested that online outlets are a source of friendships for many students (Buote et al., 2009). Considering all the evidence from the data, the findings, as illustrated in Figure 10, suggest that the multimodal semiotic resources of online multiplayer games can enrich the friendship potentials of some students with an ASD. When the friendships of students are enriched in multimodal ways, students are more likely to feel like they belong and can socially participate within inclusive settings (MacArthur et al., 2012, Chapter 10).

Recommendations are made in Chapter Seven for educators to consider the potential of online multiplayer games for developing and maintaining friendships between students with an ASD and their peers. These recommendations are offered given the growing rates of an ASD diagnosis, the

difficulties that students with an ASD face in developing and sustaining friendships, and the exponential growth in video game play among primary-school students with an ASD (Christensen et al., 2016; Finke, 2016; Mazurek & Engelhardt, 2013a). The establishment of friendship-driven participation with peers might be a progressive step to sustaining lasting relationships particularly when adults, such as teachers are unavailable to provide support for social interactions (Ito et al., 2009). Section 5.3 presents findings on how online multiplayer games enhanced the reciprocity of the students with an ASD.

### **5.3 The Potential to Enhance Reciprocity [RQs 1, 1a, 1b, and 1c]**

Students who possess reciprocity may demonstrate it through showing motivation to socially engage with others (Constantino et al., 2003). They may display an awareness of their peer's interpersonal and emotional cues, and appropriately interpreting and responding to the interpreted cues. Reciprocity is also associated with skills in relationships, conversations, cooperative and competitive game play, socialisation, problem solving, and self-awareness (Leach & LaRocque, 2011; Petrina et al., 2016; Velez et al., 2016; Zamzow et al., 2016). It may also be displayed through the ability to make meanings from the communication forms and mental states of oneself and those of other individuals (Rodrigues et al., 2013, Chapter 11).

Children with an ASD are described as experiencing difficulties in displaying reciprocity. For example, they may display difficulties with the use of verbal and nonverbal social communication modes in conversations, and through sharing, back-and-forth engagements, and initiations and responses (American Psychiatric Association, 2013). Hence, they may require support from adults, including parents and caregivers, to enhance their reciprocal skills in daily activities and routines (Leach & LaRocque, 2011). Inclusive education embraces cultures and communities where reciprocity is displayed through collaboration, participation, shared resources, and involvement among stakeholders and students (Booth & Ainscow, 2011). The existing research suggests that

reciprocity during video gaming can be demonstrated when students take turns and observe each other play (Beavis & Apperley, 2012, Chapter 2). Section 5.3 focuses on how the students' multimodal engagements with *Minecraft*® and other multiplayer games enhanced their reciprocity.

The descriptions and discussions of the relevant findings draw from the data sets and are guided by theoretical perspectives of multimodality (Jewitt, 2017, Chapter 2) and D/discourse (Gee, 2004). Subsection 5.3.1 to subsection 5.3.4 describe the findings of how interactions with *Minecraft*® and other online multiplayer games enhanced the students' display of reciprocity, through social communication modes—such as oral, written, visual, and gestural—across virtual and physical affinity spaces (Gee, 2015b). Figure 11 summarises the multimodal potentials of online multiplayer games to enhance reciprocity. The discussion of these findings and their implications are presented in subsection 5.3.4.

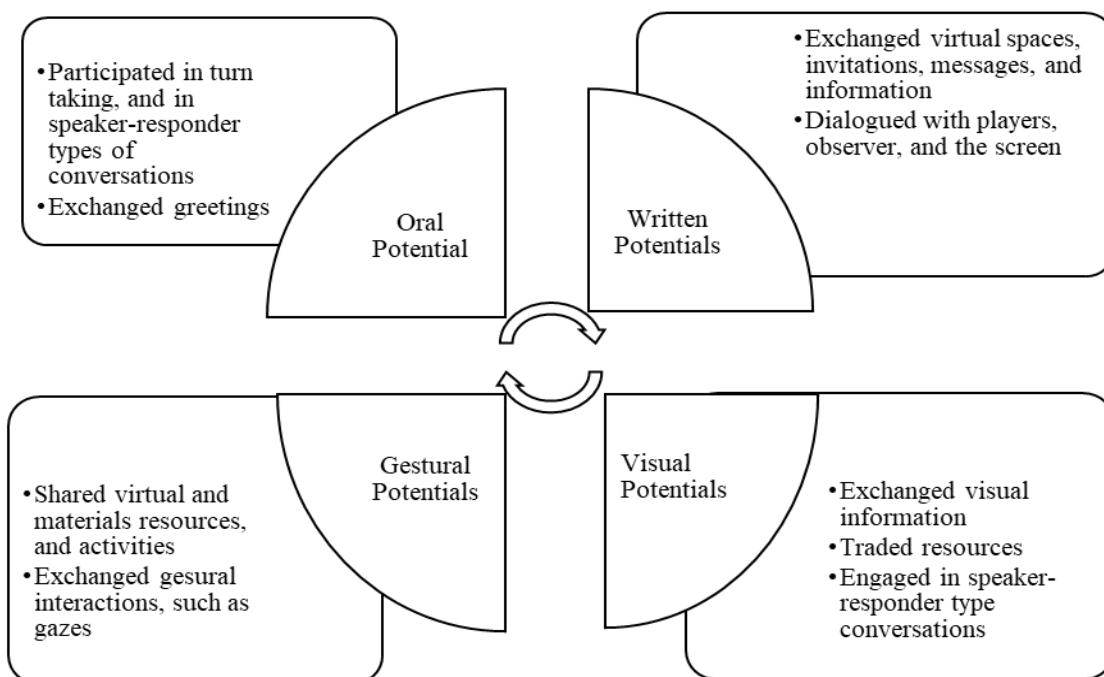


Figure 11. Potentials that enhanced reciprocity.

These findings summarised in Figure 11 were common across the at-screen and peer face-to-face interactions, and the student, parent, and teacher interviews.

**5.3.1 At-screen findings: Reciprocity through *Minecraft*®.** This subsection describes how engagement with *Minecraft*® afforded Ethan, Mason, and Noah the potential to enhance reciprocal writing, visual reciprocity, and gestural reciprocity within virtual and physical spaces. Table 14 above, illustrates the multimodal forms of social communication—such as oral, written, visual, and gestural—that the students used and drew on to enhance their reciprocity. Descriptions of how at-screen reciprocity was displayed through multimodal elements—including digital writing, virtual images, and virtual gestures—are now presented.

The findings revealed that the students were prompted by the screen-based texts to ‘enter [the] sign text’ and that they mutually exchanged messages and information with other online players through the production and reading of *Minecraft*® signs. For example, Mason wrote the “sign” ‘wanna help build fnaf’ (“Do you want to help me build Five Nights at Freddy’s?”). After Mason encouraged Steve to “write down a sign” as a reciprocated response to his question, he read Steve’s signs, such as ‘Wher is freddey fras bers’ (“Where is Freddy Frazbear?”).

As the server hosts, the students were probed by digital texts and reciprocated responses with online players and the screens. For example, there were opportunities for the students to click on words, for instance ‘send’, ‘exit’, ‘yes’, ‘no’, ‘back’ and ‘cancel’, when they were presented with screen texts, including, ‘To continue, you have to leave your current party and join the new one. Leave your current party?’ In addition, the clauses ‘invite to party and chat’ and ‘join session in progress’ are two examples of many clauses that the students had access to click on to “play” with other players in *Minecraft*® activities. The students also had opportunities to ‘compare games’ with other players and to ‘send’ other players a ‘message’ or messages at any time. They viewed other players’ online status and ‘activity’ feeds to keep up-to-date with what they were doing. Students participated in written ‘forums’ and chats through the entering of written texts in dialogue boxes.

The findings revealed that the students engaged in reciprocal virtual engagements through the written mode. Similarly, analysis of virtual images revealed reciprocal engagements.

Reciprocity through *Minecraft*® images was evident in the students' competitive building. Students' use of reciprocity was evident in their creation of structures, villages, and towns in virtual worlds. To give an example, at the core of Ethan's *Minecraft*® 'Build Battle' experiences, he was required to vote with 11 other gamers on the design and creation of 'competing builds' associated with themes such as 'Rio', 'Selva', and 'Whale'. He gave and received frequent and immediate written feedback about the images of plots through the words 'super-poop', 'poop', 'good', 'legendary', and 'epic'.

The process of trading *Minecraft*® items between the students and *Minecraft*® villager mob, and the students and other online players also suggested potentials for enhancing reciprocity. For example, Noah bartered items for the villagers' emeralds and the villagers traded their items for his emeralds. Similarly, students shared resources such as food, "blocks", "bows", and "diamond swords", with other gamers. There were observed instances when the gathering, crafting, and mining of these images and other semiotic resources sustained their survival and that of other gamers.

Data also revealed that *Minecraft*® images influenced the students' participation in speaker-responder type conversations with the researcher, other online players, and the screens. To demonstrate, the researcher enquired about the identity of Ethan's avatar: "Which one is your avatar? Is it the one holding the sword?". Ethan responded, "This one. This is mine." Reciprocity was also demonstrated through games such as the hiding and seeking of virtual images. For example, when Noah reciprocated turn taking in "*Minecraft*® Hide and Seek" his request, "Is it okay if I be the seeker this time?" suggested that he wanted to share the role of hiding and seeking of avatar images with Steve. These findings will be discussed below in section 5.4.

In addition to these findings, gestural elements within *Minecraft*® enhanced the students' reciprocal interactions. As the students played *Minecraft*®, their uses of reciprocal gestures entailed their participation with other online players through mutual and complementary gestures, for instance, following and leading of avatars; throwing, dropping, and catching items; sharing materials; and building with blocks. Additionally, there was a back-and-forth flow of social interactions between the students and other players as they explored the landscape, gathered resources, crafted materials and items, and combated hostile creatures such as skeletons, creepers, and zombies. To demonstrate, Ethan engaged in a *Minecraft*® game of 'Zombie Manic' in which 'zombie' avatars and 'human' avatars competed against each other. He played as "a zombie" that reciprocated "help" through gestures, including hitting 'human' avatars and striking them with swords.

Virtual gestures were also described and observed as signs that students and other gamers were "looking out for" each other. To demonstrate, *Minecraft*® supported Noah's virtual mobility to repetitively raise his virtual hand towards Stevatar and give "high fives" as he complimented Stevatar on his "good . . . teamwork" in defeating their "enemy" the "Ender Dragon". He also shared a "precious . . . Ender Dragon egg" with Stevatar. The students were also immersed in avatar-to-avatar interactivity through frequent closeup first-person and third-person gazes of avatars' faces and views of avatars' bodies. Their avatars joint gazes with other avatars at the visible elements of *Minecraft*®. Their gazes appeared to be exchanges of eye contact and transactional signs for virtual engagements. At other times, the avatars engaged in a reciprocal pattern of tapping, punching, and hitting each other's faces and bodies as they initiated social interactions and responded to bids for social interactions. The at-screen data revealed that the students displayed reciprocity through multimodal forms of social communication including written, visual, and gestural. Next, subsection focuses on the peer face-to-face observations, and



describes the evidence of enhanced reciprocity that was revealed through engagements with the semiotic resources of online multiplayer games.

**5.3.2 Enhancing reciprocity: Peer face-to-face interactions.** The findings from the peer face-to-face interactions provided insight into how the semiotic resources of online multiplayer games influenced the offline reciprocity of Ethan, Mason, and Noah. Notably, the students engaged in turn-taking conversations and exchanged information with their peers about their online multiplayer game experiences and expertise. For example, when peers commented about how long they “played *Minecraft*®”, Ethan reciprocated that he “played *Minecraft*®” from the age of “five”. They also discussed reciprocated peer relationships with other peer gamers and online gaming friendships.

Their demonstration of reciprocity was also particularly evident when they shared proximity with their peers and took turns to engage with printed texts and toys that were associated with *Minecraft*® (see Figure 12).



*Figure 12.* Reciprocity through *Minecraft*® material semiotic resources.

Figure 12 demonstrates how reciprocity was also evident when the students displayed problem solving skills to construct material semiotic resources that represented *Minecraft*® virtual images,

and the ability to make meanings from the speech and gestures of their peers. For example, the students reciprocated conversational speech, and gestural meanings through smiles, finger pointing, hand and bodily movements, eye-contact, and gazes more frequently and for longer periods of time when their peers engaged with material *Minecraft*® semiotic resources, than they did when their peers engaged with non-*Minecraft*® semiotic resources. The data gathered from the student, parent, and teacher semistructured interviews revealed similar findings and are presented below.

**5.3.3 Enhancing reciprocity: Student, parent, and teacher interviews.** In response to the interview question, “What are some good things that you like about playing *Minecraft*® with others?”, students stated they were able to send messages to other players, “talk” with others through *Minecraft*® “chat”, and “go to places” with others. Students liked that they were able to ask for help, to invite others to play with them, and to take turns playing online multiplayer games at their homes and their friends’ homes. Additionally, they revealed that they watched online gaming videos that other gamers posted and that they had uploaded their own gaming videos online.

The data revealed the parents’ perspectives of online multiplayer games to enhance the reciprocity of their children. Parents were asked questions, including “What are your views of online multiplayer games for developing meaningful, rich and reciprocal friendships?”. Their responses included comments about their sons sharing, taking turns, playing fairly, and “getting along” with peer gamers who shared common interest in online multiplayer games. Since their sons’ engagements with online multiplayer games the boys reciprocated peers’ greetings at school in more authentic ways, instead of being prompted to respond. Additionally, parent comments revealed that Ethan and Mason reciprocated the physical spaces within which they played together online. Comments included, “friends come over”, “he [Ethan] goes over and they play the *Xbox*™ together”, and “once a week [Mason] plays at Ethan’s place”. During those times, the parents of

both boys observed that conversations, laughter, and giggles often filled physical spaces in which they played online games.

In addition to the parents, teacher participants were asked the interview question “What are your views of online multiplayer games for developing meaningful, rich, and reciprocal friendships?”. The teachers’ responses indicated that engagement with these games was beneficial for students to “share and take turns” with other players. This perspective especially applied to students who seemed to “think” only about themselves and that “no one else” was “in the picture”. The responses indicated that the video-game play of students could be video recorded and then shown back to the students to “look at . . . themselves” and “talk . . . about” aspects of reciprocity such as “turn taking”, “fairness”, and “problem solving”.

A notable suggestion to “double” the “benefit” of online multiplayer games for reciprocity was that of sitting students and their peers “together” in the same physical space. Teacher responses implied that simultaneously playing “multiplayer games online” and in “face-to-face group” settings with peers can enhance opportunities to mutually read “body language”, “body cues”, “facial cues”, and “emotions”. Sitting students and peers together may enable them to flick “games to each other” and to play together online and offline “at the same time”. According to teachers, students may have opportunities to talk to each other through scaffolded Internet connectivity and face-to-face social interactions “in a group setting”. The teachers perceived that this arrangement facilitated more reciprocal “benefits” than engaging with online games in “solo” play. Similarly, teacher responses indicated that the games’ semiotic resources supported opportunities for students to build “little communities” and interest groups in which they and their peers can “support” each other. Together, the parent and teacher interview responses revealed that online multiplayer games provided a platform for the students to engage in reciprocal social interactions. The following

discussion centers on the potential of *Minecraft*® and other online multiplayer games to enhance the reciprocity of students with an ASD.

**5.3.4 Summary and discussion: Enhancing reciprocity.** The findings revealed that the games enabled several multimodal ways to demonstrate reciprocity in social interactions. Notably, the students engaged orally in reciprocal conversations, demonstrated reciprocity in written forms through digital and printed texts, and participated visually in reciprocal engagements through virtual images and their material representations. They also reciprocated gesturally in virtual and physical ways. See Figure 11 for a summary of the findings.

These findings are relevant given that some students with an ASD may experience difficulties in showing reciprocity within social contexts, and in displaying reciprocal conversations, sharing, back-and-forth engagements, and initiations and responses through the use of verbal and nonverbal social communication modes (American Psychiatric Association, 2013; Leach & LaRocque, 2011). Drawing on the *Melbourne Declaration on Educational Goals for Young Australians* (MCEETYA, 2008), students with an ASD, as literacies learners, need to be supported to relate well with others and develop skills through their interactions with technology. Within the context of online gaming, this support may help them to enhance crucial reciprocal skills as a social capital during school years and post school years (Wohn, 2011).

Drawing on the works by Halliday and Matthiessen (2014) and Kress (2013), the findings offer implications to target a multiplicity of verbal and nonverbal communication forms that can be used to reveal potentials for enhancing the reciprocity of students with an ASD. The discussions below draw further on multimodal perspectives (Kress, 2013) and D/discourse perspectives (Gee, 2014). These perspectives are embraced to broaden understandings of the potentials and to further highlight the significance and implications of the findings.

**5.3.4.1 Speech: Enhancing reciprocity.** Reciprocity, such as in conversations, is an important aspect of social interactions (Paul et al., 2009). It is a visible indicator of balanced turn taking and empathy (Leach & LaRocque, 2011). Some researchers have focused on strategies to improve the verbal reciprocity of children with an ASD, following the verbal initiations of others (Rollins, Campbell, Hoffman, & Self, 2016). Others have claimed that the use of pharmacological interventions increased conversational reciprocity performance of children with an ASD (Zamzow et al., 2016).

This current work contributes to existing knowledge on reciprocity and students with an ASD by providing evidence that the students orally engaged in turn taking. They participated in speaker-responder types of conversations with others. Students were described as being more enthusiastic, and alert, and being friendlier when they reciprocated speech about the Discourse of online multiplayer games. They also exchanged verbal greetings within the school setting without prompts and more frequently.

These findings are important, given that some students with an ASD may experience difficulties in demonstrating reciprocal relationships (American Psychiatric Association, 2013). Other students may have a shy, quiet, personality that may make it difficult for them establish and reciprocate peer relationships (Humphrey & Symes, 2010b). A recent study by Locke et al. (2016) has revealed that “on average, students with [an] ASD spent about 40% of the recess period jointly engaged with peers in a reciprocal activity, conversation, or [physical-world] game as compared to 70% of their classmates” (p. 654). Despite these challenges, the data are supportive of the video gaming literature that has suggested that online multiplayer games can benefit the development of reciprocity through verbal exchanges in conversations about shared experiences and in discussions about themselves and peers as online game players (Beavis et al., 2012; Hannaford, 2012, Chapter 12).

Given the significance of the findings, there is implication to support students with opportunities to use balanced-conversational turn taking. This support may help students to communicate and respond to the intentions and meanings of others and to increase their levels of comfort, enjoyment, excitement, and social boldness in conversations (Leach & LaRocque, 2011). As Beavis and colleagues (2015) highlight, enjoyment is an important aspect of video gaming. Reciprocal conversations are considered to be a primary component of virtual-world and physical-world social interactions (Gee, 2015b). They are essential for illuminating issues and discussing themes within one's social world (Clayman & Gill, 2012, Chapter 9). For example, student gamers may need to discuss the characters, tools, symbols, strategies, and values that are fitted within the Discourse of online multiplayer games (Bainbridge & Marchionini, 2010). They may have conversations about the gaming advice and knowledge that they receive from their friends and give to their friends (Dezuanni et al., 2015).

There are implications to target the potential of online multiplayer games to enhance the reciprocation of greeting with peers through speech. Scaffolding and reinforcement for reciprocated greetings with peers have tangible social interaction rewards (Rodrigues et al., 2013, Chapter 11), within virtual and physical worlds. For example, students with an ASD may gather information about peers such as how they are doing, and may make meaning of peers' communication (Kagohara et al., 2013; Solomon et al., 2016).

**5.3.4.2 Written text: Enhancing reciprocity.** Virtual environments may provide opportunities for reciprocity through written dialogues and authentic exchanges of written messages between students with an ASD and their peers (Gallup et al., 2016). Teaming up with peers through the written mode may motivate students with an ASD to engage actively in social interactions and contribute to beneficial outcomes (Hornby, 2014). Theoretically, available written semiotic

resources may enable the making of signs during moments when individuals need to connect with others and reciprocate meaning in the social interaction process (Jewitt, 2017, Chapter 2).

The data described in this section contributed new understandings of reciprocity through the written mode, for students with an ASD. The written mode enhanced reciprocity between the students and other gamers through facilitating their ability to exchange invitations to online servers, and to access and join virtual spaces. Similarly, the sharing of messages, information, and resources, the making and reading of signs, and the giving and receiving of help and team support in gaming activities exemplified reciprocity. The written data has extended our knowledge of how online multiplayer games support the reciprocity of written information and ideas (Ferdig, Rasinski, Pytash, & Bernasconi, 2014).

These findings converge with the notion that reciprocity is displayed through the exchange of virtual resources and written messages (Wohn, 2011). Wohn's perception of reciprocity in the social network of video games also aligns with the understanding that the virtual written forums of *Minecraft*® enable players to send and receive messages, to exchange tips and tricks with each other, and to engage in activities including trading, building, going on adventures, and competing (Arnroth, 2014; Cordeiro & Nelson, 2014). The value of the findings is highlighted in the difficulties that some students with an ASD may have with written expression and reciprocity (Leach & LaRocque, 2011; Pennington, 2009).

There are implications to target the games' written semiotic potentials, such as in written dialogues in chats and forums, to enhance the authentic sharing of messages, help, skills, and interests, and the mutual exchange of invitations to play collaboratively. It is argued that shared participation and turn taking in conversations are reflective of inclusive cultures, within online and offline affinity spaces (Gee, 2015b; MCEETYA, 2008). The findings also have implications to target students' desires to team up with other players to survive and show off gaming skills.

According to Stagner (2013), to survive is a common desire within the context of multiplayer games.

**5.3.4.3 Images: Enhancing reciprocity.** From a multimodal perspective (Kress & Van Leeuwen, 2006), images influence turn taking and synchrony of oral and audio patterns between speakers and listeners. They may provide opportunities for interpersonal use, such as for mutual viewing, feedback, and sharing of resources, help, jobs, and favours in online and offline spaces. The creation of images in virtual spaces, particularly in online multiplayer games, can enhance reciprocal relations, sharing of interests, and experiences between students and their peers who may view the same virtual images (Jewitt, 2017, Chapter 2).

Data in this study reflected these notions and indicated that the students reciprocated the viewing of virtual creations, and material resources that represented virtual images. Additional potentials to enhance reciprocity were facilitated through (a) participation in speaker-responder type conversations about virtual images and their material representations, and (b) observable mechanics, such as gathering of food, mining for and crafting of materials, and making tools that were needed for virtual survival. There was also evidence of trading, sharing, and mutual exchanging of visible semiotic resources, during online and offline social interactions. Similar with these findings, Arnroth (2014) notes that visible mechanics, for example survival, gathering food, building civilisations, and the management of resources, are major concepts in other video games with online multiplayer platforms. Findings presented above reflect that social network games, such as those played online, facilitate the exchange of resources between players (Wohn, 2011).

The findings have additional implications to provide opportunities for enhancing reciprocity through creation of virtual images, mutual viewing of virtual creations, and exchanging of speech, written text, and visual information about virtual images. Opportunities to design in online multiplayer games may enable student gamers to link their creativity and use of images to



reciprocate social interactions (Beavis & Apperley, 2012, Chapter 2). Students may also need scaffolded support to reciprocate visual meanings for survival of themselves and other gamers through observable mechanics such as gathering of food, mining for material, making tools, and crafting.

**5.3.4.4 Enhanced reciprocity through gestures.** Reciprocity that is recognised in interactions implies that ideas, support, and participation are exchanged (Saggers, Macartney, & Guerin, 2012, Chapter 9). It also involves the targeting of gestural potentials to function as signs for expressing, initiating, responding, and imitating during experiences (Colletta & Guidetti, 2012). However, for some students with an ASD there may also be the difficulties with the use of gestural initiations in physical spaces, including classroom environments (Wong & Kasari, 2012). Some students with an ASD may also experience difficulties with using gestures, such as eye contact, during conversations and nonverbal interactions (Simut, Vanderfaeillie, Peca, Van de Perre, & Vanderborght, 2016; Worth, 2008).

Despite these difficulties, the findings presented above revealed that engagements with *Minecraft*® facilitated the students' display of gestural reciprocity through several ways, namely the sharing of virtual resources, engagement in cooperative and competitive activities, and exchanging of gestural interactions, such as close-up avatar-to-avatar gazes. Close-up facial views of others and bodily proximity shared between people imply that there is a level of mutual involvement, attention, intimacy, and that close interpersonal relations are reciprocated (Jewitt, 2009). Reciprocity was also evident in the back-and-forth flows of social interactions as the students roamed, explored, and flew with other players across *Minecraft*® landscapes. These and other gestural potentials of online multiplayer games are considered significant for enhancing reciprocity, given the difficulties that students with an ASD may face with social reciprocity, as

well as with using and interpreting nonverbal modes for social interactions (American Psychiatric Association, 2013).

An implication from the findings is to target the games' virtual gestural potential to support students' ability to cooperate, and to share activities, resources, and information during their gameplay (Ewoldsen et al., 2012). Research suggests that gestures of cooperation may foster positive reciprocation of behaviours (Velez et al., 2016). However, gamers who play video games with others may be more motivated by reciprocal engagement in competitions, and by opportunities for collaboration and cooperation than gamers who play alone or offline (Hainey et al., 2011). Opportunities to enhance reciprocity through nonverbal modal elements, such as gestures of avatars, may also enhance the ability of students with an ASD to reciprocate the sending and receiving of meanings from nonverbal modes of social communication (Serret et al., 2014).

**5.3.4.5 Potential for reciprocity in affinity spaces.** Analysis of the data revealed that engagements with the semiotic resources of online multiplayer games facilitated opportunities for the students to reciprocate the sharing of virtual affinity spaces such as secret hideouts, and physical spaces, such as homes. These findings are relevant to broaden understanding of how the reciprocity of students with an ASD can be enhanced in online and offline contexts. Previous research has shown that some students with an ASD have few successes with peer relationships in classrooms settings, with only 20% of students with an ASD having reciprocated friendships (Kasari et al., 2011). However, it is argued that, when in a face-to-face group setting, students can be motivated and can feel an obligation to facilitate each other (Hannaford, 2012, Chapter 12). Furthermore, as gamers, they may reciprocate through the shared gaming experience in virtual spaces and, therefore,

directly be impacted by meanings made for shared resources and the social presence of all the players (McCreery et al., 2015; Stagner, 2013).

The findings highlight the importance of scaffolded opportunities to enhance students' reciprocity through the sharing of virtual and physical affinity spaces (Hayes & Duncan, 2012). Opportunities to enhance reciprocated participation and engagements in social interactions are essential in inclusive educational settings (Saggers et al., 2012, Chapter 9). Through these opportunities students may solve problems, cooperate, and compete in virtual contexts (Velez et al., 2016). They may develop self-awareness and turn taking skills in conversations, sustain relationships, and enhance their abilities to make meanings in multimodal ways from their own mental states and from those of other individuals (Paul et al., 2009; Rodrigues et al., 2013, Chapter 11).

**5.3.4.6 Conclusion to section 5.3.** This section discussed the potential of online multiplayer games to enhance the reciprocity of students with an ASD. The findings suggested that support for enhancing reciprocity in online and offline social interactions was facilitated through a configuration of modal elements such as speech, writing, gestures, and images. They support the theoretical perspectives that meaning is made in multimodal ways (Jewitt, 2017, Chapter 2). Findings support the notion that the literacies of online multiplayer games offer newer perspectives and broader contexts to analyse, describe, and understand verbal and nonverbal forms of social communication that are accessed and used during social interactions (Gee, 2015b). An implication is to target the multimodal potentials of online multiplayer games to enhance the reciprocity of students with an ASD. The assumption is that multimodal scaffolded support through inclusive literacies of new technologies may enhance students' reciprocity in virtual contexts, and meet

students' needs in diverse ways (Boche & Henning, 2015; MCEETYA, 2008; Oakley, 2017, Chapter 10).

The findings of this study, taken together with multimodal perspectives (Kress, 2013), D/discourse perspectives (Gee, 2015b) and video game research (Beavis et al., 2012), provided the understanding that, when online multiplayer games are played, some students with an ASD may enhance their reciprocal skills through a configuration of social communication modes. The study has also supported the notion that, within the interactive Discourse community of online multiplayer games, students can be reciprocal through their learning to engage with others and share things such as the content that they created and videos of their play experiences (Gee, 2007b; Trundle, 2012, Chapter 14). Given the difficulties that some students with an ASD may face with reciprocity in social interactions, and considering the possible affinity for engagements with online multiplayer games, these findings strengthen the implication to target the multimodal semiotic potentials that are within the Discourse and affinity spaces of online multiplayer games (Gee, 2015b; Leach & LaRocque, 2011; Mazurek & Engelhardt, 2013a).

#### **5.4 The Potentials of Multiplayer Games [RQs 1, 1a, 1b, and 1c]**

The growth of the video game industry is believed to be the major impetus for new forms of social interactions in increasingly complex material and virtual worlds (Gee, 2015b). New technologies, such as online multiplayer games, present novel potentials and different possibilities for social interactions particularly through a diversity and a repertoire of social communication modes (Jewitt, 2017, Chapter 2; McCreery et al., 2015). Therefore, students with an ASD are engaging in long-term high interest literacy activities, such as online computer video games, outside the formal educational setting of schools (Mazurek & Engelhardt, 2013a). For example, findings by Kuo et al. (2013) reveal that the most common activity that adolescents with an ASD engaged in with their friends was playing video games.

This chapter discussed the enabling features of online multiplayer games for the social interactions of students with an ASD. A main finding (see Figure 13), which emerged in relation to the research questions, were that students displayed contextual and repeated uses of oral, written, visual, and gestural forms of social communication as they engaged with *Minecraft*® and other online multiplayer games, within online and offline affinity spaces. In addition, there were three main enabling features of online multiplayer games for the social interactions of students with an ASD. These potentials are:

- Support for initiating and sustaining social interactions through a configuration of modal elements, such as speech, writing, and gesture within offline and online social spaces.
- Multimodal opportunities to develop and maintain friendships in virtual and physical spaces.
- Virtual and physical platforms, and multimodal semiotic resources to enhance reciprocity.

1. Contextual uses of oral, written, visual, and gestural forms of social communication, within online and offline affinity spaces	2. Multimodal support for initiating and sustaining social interactions
<b>The Potentials of Online Multiplayer Games for the Social Interactions of Students with ASD</b>	
3. Multimodal opportunities to develop and maintain friendships	4. Virtual and physical platforms, and multimodal semiotic resources to enhance reciprocity

Figure 13. Social interaction potentials of online multiplayer games.

These findings summarised in Figure 13 were common across the at-screen and peer face-to-face interactions, and the student, parent, and teacher interviews.

The findings support research that indicates that a growing number of students with an ASD engage with video games, particularly in online contexts (Gallup et al., 2016; Howard & Patti Ducoff, 2008; Mazurek et al., 2012; Orsmond & Kuo, 2011). According to Orsmond and Kuo (2011), 98% of youths with an ASD used semiotic resources, such as computers and televisions, to play video games and make meanings of video games. The findings are consistent with research that indicates that video games are recreational (Spriggs, Gast, & Knight, 2016). However, they are also digital texts that allow opportunities for social interactions across multiple contexts, through regularly repeated practices and literacies (Beavis, 2014).

A variety of online multiplayer games that the students engaged with offer implications for embracing regularly repeated literacies for social interactions within formal and informal settings, and across virtual and physical social-communication landscapes. High interest literacy texts are accessible across multiple settings (Gallup et al., 2016). Works by Feiler et al. (2017) and Vigdor et al. (2014) highlight the urgency to make strong links between home and school literacies, given that the digitalisation of literacies is transforming students' daily lives. As Warschauer and Tate (2017, Chapter 5) also argue, the potentials of digital technologies must be accessible and used in sound ways to support students' needs and reflect the contexts of the communities to which they belong. Drawing on research by Ito et al. (2009), it is understood that students are more likely to be better at social interactions with peers and friends when they are given a level of autonomy and opportunities to engage online with new media and robust technology, such as video games.

Speech, writing, images, and gestures had separate systems of semiotic resources that contributed partial and unique messages about social interaction potentials. These available semiotic resources although distinctive in functions, were seen as a collective, coherent, and integral domain

of meaning making resources (Kress, 2012, Chapter 3). They highlight that the boundaries for contemporary play and communication in social interactions have been extended through an integration of online, offline, virtual, and physical spaces (Marsh et al., 2016). The findings match the theoretical understandings that literacy texts can influence social interactions, through differentiated ways that were multimodal (Kress & Van Leeuwen, 2006) and metafunctional (Halliday & Matthiessen, 2014). Various social communication modes functioned together as communication channels (Unsworth, 2008). These modes enabled the students to make meanings about their virtual worlds and about online relationships with others.

The modal elements had their own distinct potentials for supporting social interactions, developing and sustaining friendships, and enhancing reciprocity. This finding is significant because students with an ASD may often experience difficulties in the contexts of verbal and nonverbal social communication; social relationships; reciprocity; and behaviours, interests, and activities, across various contexts (American Psychiatric Association, 2013). Moreover, scaffolded support and interventions are often provided to enhance social interactions, social relationships, and reciprocity in social contexts (Boyd et al., 2015; Leach & LaRocque, 2011; Sansosti, 2010).

Given the social interaction difficulties that may be experienced by students with an ASD (Deckers et al., 2014), particularly in the areas of friendship (Bauminger, Solomon, Aviezer, Heung, Brown et al., 2008) and reciprocity (Leach & LaRocque, 2011), the findings may help us to understand how to provide some scaffolded social interaction support within the context of online multiplayer games. The findings offer implications for supporting social interactions in multimodal ways (Sharpe, 2006) including (a) multimodal support for initiating and sustaining social interactions, (b) multimodal ways to develop and sustain peer friendships, and (c) multimodal ways to enhance reciprocity within inclusive settings. This perspective is considered important because inclusive education is about embracing different modal elements to ensure that students receive

appropriate differentiated social interaction support relevant to their social needs, providing opportunities to develop and enhance relationships, and using social platforms to enhance social understanding and social reciprocity (Carrington & MacArthur, 2012). Additionally, this perspective is guided by the notions of students' right to inclusive education, and support for diversity in inclusive education (Booth & Ainscow, 2011; CRPD, 2016;).

To conclude, there is a growing affinity by students with an ASD to technology and video game engagements (Mazurek & Wenstrup, 2013), particularly in online contexts (Gallup et al., 2016). However, this research is the first empirical study on the social interaction potentials of online multiplayer games through multimodal perspectives (Jewitt, 2017, Chapter 2) and D/discourse perspectives (Gee, 2015b). The findings add to the literature by enhancing knowledge about the correlation between the enabling multimodal features of online multiplayer games, social interaction support, friendship development, and enhanced reciprocity for students with an ASD. The data also highlight the potentials of online multiplayer games as inclusive new literacies in online and offline affinity spaces (Gee, 2007a).

The literature indicates that, because of the social interaction challenges that some students with an ASD face, these students may experience difficulties in social cognition, despite their efforts in tasks (Schaller & Rauh, 2017). They may also face challenges in virtual contexts despite the games' potential to support reciprocated socialisation and social interactions with friends (Gallup et al., 2016). An implication of these findings is to target the games' multimodal potentials within formal inclusive educational contexts. Scaffolded support may be needed by students to improve their levels of performance and to meet their learning needs (Boche & Henning, 2015; Foreman & Arthur-Kelly, 2017). Recommendations for multimodal scaffolding through online multiplayer games are offered in Chapter Seven.



The aim of this research was also to understand the constraining features of online multiplayer games for the social interactions of students with an ASD. Part two of the descriptions and discussions are extended in Chapter Six to give insights into the social interaction constraints. As Jewitt (2017, Chapter 2) notes, aspects of modal meaning may be distinct, contradictory, or in tension.

## Chapter Six: Social Interaction Constraints of Online Multiplayer Games

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Chapter Five described and discussed the potentials of online multiplayer games for the social interactions of three students diagnosed with an ASD. The findings revealed that online multiplayer games facilitated multimodal support for initiating and sustaining social interactions, developing and sustaining friendships, and enhancing reciprocity. Data also reflected that despite the social interaction potentials associated with online multiplayer games, the students experienced social interaction constraints associated with their multimodal repetitiveness, and difficulties in relationships. These constraints were common across the data sets, in relation to the research questions. Chapter Six describes and discusses the findings that emerged about the social interaction constraints.

This chapter presents the findings in three sections. Findings of social interaction constraints that are associated with multimodal repetitiveness are described in section 6.1. Section 6.2 describes and discusses relevant findings about difficulties in relationships. Multimodal analysis and D/discourse analysis of the data showed that the themes were consistent among the data sets (Gee & Handford, 2012; Jewitt, 2017, Chapter 2). Each section ends with a discussion that contributes to answering research question 1 and subquestions 1a, 1b, and 1c (see Chapter Five for the research questions). Section 6.3 synthesises the findings and discusses the social interaction constraints. Table 15 below, summarises the findings on the social interaction constraints that students received through their engagements with online multiplayer games. These findings were common across the data sets.

Table 15

*Social Interaction Constraints of Online Multiplayer Games*

Multimodal repetitiveness	
The students with an ASD	<ul style="list-style-type: none"> <li>• Spent excessive time in highly repetitive behaviours and activities at the screens</li> <li>• Were perceived as addicted to and obsessed with online multiplayer gaming</li> <li>• Were perceived as physically isolated</li> <li>• Missed opportunities to make meanings from social communication modes in face-to-face interactions</li> <li>• Displayed diverse sensory reactions to the multimodality of online multiplayer games</li> <li>• Restricted by physical boundaries and lacked semiotic resources for meaning making and reciprocity</li> <li>• Experienced technical and network difficulties</li> <li>• Experienced adult and institutional restrictions to access the games' semiotic resources</li> </ul>
Difficulties in relationships	
The students with an ASD	<ul style="list-style-type: none"> <li>• Missed opportunities to socially interact in virtual and physical spaces</li> <li>• Demonstrated difficulties with social understanding, such as with the multimodal contributions and perspectives of others in conversations and play</li> </ul>

- 
- Engaged in written discourses that were considered unsafe and inappropriate
  - Seemed to have an “obsession” with themes of ‘death’ and ‘damage’ to avatars and difficulties with understanding of prosocial behaviours
  - Disrupted shared social interactions due to conflicts with social partners and repetitive attention to semiotic resources
  - Felt at risk of being perceived by peers and adults as weird and abnormal if they mimicked and represented multimodal aspects of online multiplayer games in physical contexts
- 

The findings summarised above in Table 15 were common across the at-screen and peer face-to-face interactions, and across the student, parent, and teacher interviews. Table 15 supports the discussions in sections 6.1 to 6.3.

The approach to this chapter draws on the notion that meaning is expressed through a multiplicity of semiotic categories and communication forms, then is understood collectively through a multimodal configuration (Jewitt, 2017, Chapter 2; Kress, 2012, Chapter 3; New London Group, 1996). This approach is also based on a perspective that integrates multiple meanings and perspectives of students, teachers, and parents, within the contexts of meeting learners’ needs and inclusive education (Ravet, 2011). Findings on social interaction constraints that were revealed through multimodal repetitiveness are now described.

### **6.1 Multimodal Repetitiveness [RQs 1, 1a, 1b, and 1c]**

According to the DSM-5 (American Psychiatric Association, 2013), students with an ASD display fixed interests and repetitive behaviours through (a) repetitive or stereotyped patterns of

play engagement with objects or motor movements; (b) inflexibility in routines and rituals, and preference for sameness of speech and behaviour; (c) restricted and intense patterns of interests, and focus that preoccupy and consume an unusual amount of time and attention; and (d) diverse response to sensory input or sensory aspects. Repetitive behaviours may interfere with the abilities of students with an ASD to attend to and make meanings from the worlds they engage in (Richler et al., 2010). The term multimodal repetitiveness was introduced in Chapter Three, section 3.3.1.3. It is coined to refer to the repeated uses of two or more social communication modes, during virtual or physical social interactions.

Drawing on the works by Jewitt (2017) and Gee (2015b), several forms of social communication were distinguished as separate systems of semiotic resources, but were also acknowledged for their contributions to meaning making about social interaction constraints within the Discourse of online multiplayer games. Multimodal repetitiveness was revealed by the students through a configuration of verbal and nonverbal forms of social communication, including oral, written, visual, gestural, and audio modes (New London Group, 1996). See Figure 14 for highlighted examples of verbal and nonverbal forms of social communication that were coded from the at-screen transcription excerpts. The description of the students' engagements with oral, written, gestural, visual, and audio modes is the focus in this section.

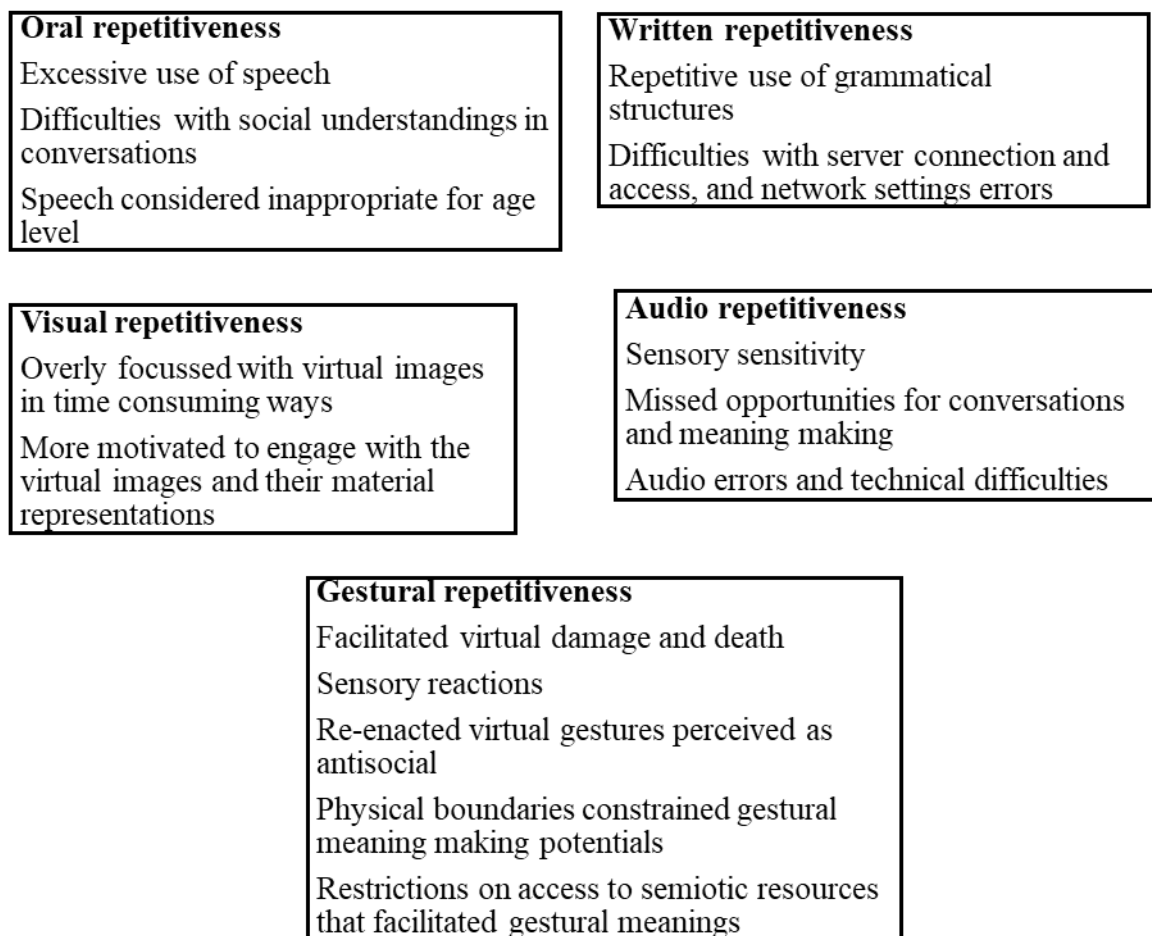


Figure 14. Multimodal repetitiveness and social interaction constraints.

The findings presented in Figure 14 are enriched with data from peer face-to-face observations, and from the student, parent, and teacher interviews. The at-screen findings are presented below.

**6.1.1 At-screen findings: Multimodal repetitiveness.** Ethan’s, Mason’s, and Noah’s at-screen play included discussions with the researcher about their engagements with *Minecraft*® and other online multiplayer games on screen-based platforms including “*Xbox 360*™” and “PC”. According to the students, they gained “lots of” gaming experiences before and after school, on weekends, and during school holidays. These findings are important for understanding the social interaction constraints revealed through multimodal repetitiveness. Observed instances of at-screen

social interactions were coded in the data to reveal patterns of multimodal repetitiveness as the students engaged with the written texts, gestures, images, and sounds within *Minecraft*®.

The findings provided evidence that the students' repetitive patterns of selecting and typing the same written texts constrained the potential for a higher speed to make, send, and receive meanings for social interactions. To give an example, Noah expressed his "love" of repetitively typing '10/10' pages of 'g's in a *Minecraft*® "book and quill". The alphabetical letter functioned as a sign to bid for Steve's shared engagement with him in "*Minecraft*® Hide and Seek". As he typed, he uttered the letter sound over 100 times and remained focused on completing the pages. His spoken words "go hide and seek" would have been quicker and more effective in conveying his intended meaning if they were written as a sign.

Further analysis of the students' repetitive engagements with the written mode revealed external restrictions on social interactions that were beyond their control. To demonstrate, the digital writing indicated that the students 'failed to connect to' servers and were 'kicked whilst [while]' they were waiting for server connections. Students seemed disappointed when an 'error occurred while [they were] contacting login servers' and when they experienced 'network problems'. They frowned, groaned, and mumbled comments, including "yeah, not working", "Oh! I cannot join", "I don't like it", "I'm going to go on a different server", and "darn it!"

Moreover, students shared that, although at times they "really wanted to" play "*Minecraft*®" and "join someone's [*Minecraft*®] world", sometimes there was "no one to play" with. Responses such as only ". . . one person's playing *Minecraft*®" and "Okay, I need someone to play *Minecraft*® with me", were made after their repeated clicking and typing of digital writing, for example, 'friends list'. Digital texts, including '0 /12 slots' and 'you cannot join this game because it is limited to players who are friends of the host' confirmed that, at times, there were restricted social interactions in *Minecraft*® games. The at-screen data revealed that the students displayed

repetitive patterns of engagements with digital texts and that their social interactions were, at times, restricted by technical difficulties and network errors.

Multimodal repetitiveness was also observed through visual, gestural, and audio modes. Students' repetitive engagements with these modes revealed social interaction constraints. Students repeatedly focused their attention on *Minecraft*® images instead of engaging with other online players in *Minecraft*® spaces. A notable example was when Ethan repetitively created “snowmen” with *Minecraft*® pumpkins and “double” “snow” blocks (see Figure 15).



Figure 15. Ethan's army of snowmen.

Ethan's continual creation of snowmen functioned to “shoot snow balls”. His creation through the visual mode was simultaneous to his repetitive use of speech: “Making an army of them . . . Making an army! Behold my army of snowmen! . . . I just like building them”. Ethan's interest “to make more of them” was so strong that although many of the snowmen melted in the “daylight”, he still made “up to a hundred . . .” of them.

Noah also displayed engagements in highly repetitive behaviours with *Minecraft*® images. He repeatedly showed his interest in looking “at the [*Minecraft*®] bats”. As he spawned them, he expressed his “love” for them. Repeated displays of digital writing, for example, ‘Can't spawn eggs at the moment. The maximum number of bats in a world has been reached’, provided additional



evidence of his highly repetitive engagements with the images. Comments including “I need a lot of details here”, and “Oh my god. It took forever” suggested that the students repeatedly engaged in time consuming activities with *Minecraft*® images.

At times, after students disengaged from the highly repetitive engagements with *Minecraft*® images, they could not “find Stevatar anywhere”, even with the aid of a “map”. Questions such as “Where’s Steve?” and “Okay, where is he?” signified missed social interaction opportunities while students repeatedly engaged with *Minecraft*® images. There were times when students demonstrated a modal preference for *Minecraft*® images instead of socially interacting through face-to-face speaker-responder conversations. To illustrate, some of the researcher’s questions, including “Are you trying to be the last person surviving?” and “Why do you need diamonds?”, went unanswered by students as they looked at virtual images.

Attention is now focused on the students’ at-screen repetitive engagements with gestures. The findings showed that the students repeatedly moved body parts, such as their fingers, to tap, click, press, and manipulate semiotic resources. They repeatedly pointed to the screens with their hands. Their repetitive physical gestures functioned for them to repeatedly engage in virtual gestures. Virtual gestures facilitated jumping from tree tops, and diving head first into lava and flames. Written text such as ‘You died!’ confirmed that the gestures facilitated virtual suicides and virtual self-injurious behaviours.

Data analysis provided insight into how fascinated students were with dying “a lot of times”. They made comments including “Yeah, I like committing suicide. I love doing that. One of my favourite things” and “I am going up to kill myself [my avatar] again”. Expressions, including “wee!”, “aw!”, “my head”, and “that would hurt” conveyed a level of sensory connection to the repetitive self-injurious gestures that their virtual bodies experienced. Repetitive killing of their own avatars resulted in less shared interaction than other prosocial gestures such as sharing virtual

resources. Screen text displayed that sometimes other players ‘left the game’. At times, students complained that they were left with “no one to play with”.

The findings indicated that the students experienced gestural constraints that were separate from the characteristics of ASD. They were unable to reciprocate meanings from physical gestures because of the boundaries of separate physical spaces between them and other online players. Students also lacked semiotic resources to transmit gestural meanings from physical gestures of other gamers. To demonstrate, their frowns and pouted lips communicated anger and disappointment when other online players destroyed their creations. Their smiles suggested that they were happy when they cooperated with other players and won challenges. Despite these semiotic potentials facilitated by the gestural mode, meanings from physical gestures were not reciprocated between the students and other online gamers.

The students’ interactions with *Minecraft*® sounds suggested that they had different preferences of in-game sound. For example, Ethan constantly played with the in-game volume at ‘mute’ and used a head set to listen to his own music as he played *Minecraft*®. His opportunities to make and share meanings about *Minecraft*® sounds in conversations seemed less than those afforded to Mason and Noah, who played *Minecraft*® “with the sound [in-game sounds]” on. Mason and Noah discussed the *Minecraft*® sounds that “you can hear” and mimicked *Minecraft*® sounds. They described sounds as “something broken up and times six”, “the noise of lava”, and “the sound of when an avatar fell from a high place”. They also asked questions beginning with “Why can I hear . . .?” and made comments such as “This does not sound right” to communicate that they were trying to make meaning. Without access to *Minecraft*® sounds, Ethan demonstrated no evidence of mimicking, comparing, describing, and contrasting in-game sounds at the screen. With the game’s ‘audio’ potentials turned ‘off’, he could not make meanings from *Minecraft*®

audio cues and audio signs, such as exploding creepers, exploding TNT and decoy grenades, and the groaning, hissing, snarling, and sweeping of the Ender Dragon.

The data also communicated that the students' repetitive uses of the offline at-screen sounds included engagements in speech, the movements of their furniture, and the touch of semiotic resources, such as the clicking of keyboard buttons. They made nonverbal sounds from their physical bodies. For example, they constantly expressed nonverbal tones with varied volumes when they spoke, hummed, laughed, grunted, sighed, and yelled. Despite these audio potentials, the students' abilities to send audio signs and receive possible audio potentials for social interactions were restricted by the physical boundaries in which they played, as well as by the unavailability of semiotic resources that functioned for them to hear, interpret, and respond to the sounds that might have been produced by other gamers.

To demonstrate, Mason experienced technical difficulties with his sound system and was not "able to hear" Steve's voice or sounds that Steve produced from an unknown physical location. His comments, such as "Oh man! Why isn't it working? Oh man!", communicated his disappointment with the difficulties. Mason repeatedly told Steve to "write down a [*Minecraft*®] sign" while he tried to confirm whether Steve could "hear" him. He constantly selected digital writings to 'test' and 'find and fix [the] problem', even thought it was at the risk of ending his 'current session' and losing his 'unsaved [gaming] progress'. Mason tactilely and visually examined his microphone to find out if it "was broken". He moved his body and the microphone "closer" to the screen.

In summary, the findings revealed that, as the students repetitively engaged with virtual images, gestures, and sounds, there were hindrances to their sustained social interactions. Overall, the at-screen data revealed that the students repeatedly engaged in verbal forms of social communication, such as oral and written modes, and nonverbal forms of social communication, such as visual, gestural, and audio modes. Social interaction constraints were revealed through

analysis of these modes. The next subsection describes how multimodal repetitiveness within the Discourse of online multiplayer games was observed during the peer face-to-face interactions and revealed through interview discussions with the students.

**6.1.2 Multimodal repetitiveness: Peer observations and student interviews.** Evidence of the students' repeated engagements with online multiplayer games and social interaction constraints emerged from face-to-face interactions with peers, and from their discussions about video gaming experiences. During a peer face-to-face interaction, students identified themselves as “pros [professional gamers]” rather than “noobs [new *Minecraft*® players]”. Mason told his peers that he had been playing *Minecraft*® for almost five years. Data also indicated that, at times, the students spoke repetitively about *Minecraft*® gaming concepts and material resources. However, the peers were not always interested in participating in those conversations, nor were they always fascinated with the students' topics of interest. Similarly, the students ignored the peers' verbal and nonverbal bids for social interactions as they engaged with *Minecraft*® material semiotic resources. To demonstrate, a peer stated the interactions were “. . . getting a bit boring” for him and added, “No one wants to play with me”. Ethan disagreed, “What? What's getting a bit boring? This is not boring! I like it!” He communicated that he was enjoying his play with the *Minecraft*® resources so much that he wanted “to do” that activity “for the whole afternoon” and “to stay . . . forever”.

At times when the peers were engaged in conversations and play with each other, the students disrupted them so that they could talk about their own interests in *Minecraft*® experiences and *Minecraft*® resources. Contrarily, at other times the students repeatedly ignored some peers' spoken bids for attention if they were speaking with other peers about their own gaming interests. For example, as Ethan engaged with *Minecraft*® material resources and discussed what he was building with one peer, another peer asked him to play a card game that was not *Minecraft*® related. Ethan did not respond and seemed to ignore the peer's bids to play with the cards. He

continued his speech about blocks that looked like *Minecraft*® “fire” and “lava”. Many minutes after, Ethan finally responded to the peer’s persistence with, “Arm, no, I don’t really play [the card game] . . . that much”. He added that he did not “want to lose focus” on what he was building. The peer face-to-face findings revealed that social interaction constraints were evident during the students’ repetitive multimodal engagements with the discourses and material semiotic resources of online multiplayer games with their peers.

Data gathered from the student semistructured interviews revealed similar findings. Students were asked about their online multiplayer games interests and experiences. They said they played *Minecraft*® on semiotic resources, including the personal “computer” and “Xbox™”. When asked, “How long have you been playing *Minecraft*®?” their responses indicated they had two to five years of experiences with *Minecraft*®. The students shared they played *Minecraft*® and other online multiplayer games before school and “as soon as” they got “home until bed time”. On the weekends and during the school holidays they liked playing their games “through the whole entire day”. They wished that, they could play them for “longer lengths of times”.

The students were also asked “How does playing *Minecraft*® make it difficult for you to socially interact with others?”. Their responses included “somehow I am addicted to playing *Minecraft*® . . . I know I’m addicted to it. I am addicted.” The term *addicted* was explained as when “you can’t” instantly “stop” doing “something” that “you do” or that “you like”. They added that they missed opportunities for offline social interactions. “Sometimes” they were “really focused on playing *Minecraft*®”. Students felt “really disappointed” about breaking promises to visit their friends’ homes and feared that their peer friendships would end as a result. Similarly, when they were “in the middle of a game”, their responses to their siblings’ requests for interaction included comments like, “No! I’ll play in like an hour”, “be quiet”, and “please leave”. Likewise, in

classrooms settings, they were sometimes reluctant to “listen” to nongaming discourses and got “bored of doing stuff” for teachers. They preferred “to stay home and play” video games.

Data indicated that students experienced external constraint to their social interactions. They seemed to think that their “school . . . access” to certain “online games” was “blocked” “because of” gaming discourses such as “real zombies”, “swearing”, “killing”, “guns”, and “violence”. Games that did not have these discourses were considered more appropriate for school contexts. Similarly, the students shared that, in home contexts, they had time restrictions and parental “rules” about the duration and time “to play” online multiplayer games. These were described as “bad” ideas. They also stated that they may have interacted more often online if they were not limited by the games’ financial affordability, inaccessibility to some newly “released” games and their updated editions, and the incompatibility of their semiotic resources, such as gaming consoles, with those of other gamers.

Data from the students’ face-to-face interactions with peers and discussions with the researcher enriched the at-screen findings about multimodal repetitiveness within the context of online multiplayer games. The findings consistently revealed a correlation between the students repeated engagements with online multiplayer games and social interaction constraints. Some of these constraints were also influenced by external factors in home and school environments. The next subsection describes parent and teacher perspectives of multimodal repetitiveness within the Discourse of online multiplayer games.

**6.1.3 Multimodal repetitiveness: Parent and teacher interviews.** The parents and teachers were asked to share their knowledge about the online video gaming experiences of the students and their perspectives about some disadvantages of online gaming for the children’s social interactions. Parents described their sons as being “too” “absorbed” at times with their gaming to “get off” and “socialise” through physical activities, such as jumping on “trampolines” and riding

“bikes”. Comments such as “If he had the chance he would sit on there from 5 o’clock in the morning till 9:30, 10 o’clock at night” and “He would sit on it constantly all day”, suggested that the students engaged repetitively with online multiplayer games. Parents seemed concerned that, if their children were “centred in front of” the screens and the “Internet 24/7 [24 hours a day, seven days a week]”, they could miss opportunities to develop social interactions skills such as “empathy”, “loyalty”, and “honesty” in “face-to-face” contexts with “other kids”.

Further analysis revealed that they enforced rules and regulations that “limited” the students’ excessive online multiplayer engagements. For example, Mrs Jones shared that Mason was “allowed” to play “in the mornings if he [got] up early” and finished his “before school” preparation “by 7:30 [am]”. Similarly, Mrs Smith said that, after school, it was a “must” that Noah finished his “homework” before he played his video games.

The parents also highlighted their sons’ tendency to have a persistent and “one-sided sort of talk” about their games, even when others were not “interested in” gaming, nor wanted to “talk about” the games. Parents were concerned that their sons did not “pick up on” the inappropriateness of some written conversations that other online gamers engaged in. Therefore, they had to “sit” with the boys and explain that “what” the online “person” was “saying” was “inappropriate”. Comments such as “you shouldn’t be talking like that”, indicated parental efforts to redirect their sons from imitating inappropriate discourses that they were exposed to through the games’ semiotic resources. Parents “had to block” some of those players from engaging with their sons. They discouraged their sons from joining games and servers where certain online players engaged.

Similar responses were shared by teachers. Teachers reported that “*PlayStations*<sup>TM</sup>” and “*iPad*<sup>TM</sup>”, were some of the semiotic resources and platforms that students used for online multiplayer gaming experiences. “*Minecraft*®” was mentioned as “the big one” that had recently “taken over”, due to its popularity among the students. They used of words such as “downfall”,

“bad”, “cons”, “negative”, “problems”, “barriers”, and “restricting”, to describe students’ engagements with online multiplayer games. Teachers referred to the students’ relationship with the games as “their go to”, “a hobby”, and a “passionate interest”. Their students were described as often being “glued to” screens, and being “a little obsessed”, “fixated”, and “infatuated” with the games and their semiotic resources.

Teacher responses suggested that students were repeatedly “thinking” about and “breathing” for playing online multiplayer games. Their students asked “the same thing over and over again”. For example, “Can I play this game?”. They also talked about the games that they played “before school”, “after school”, and “on weekends”. Some of their students expressed that they could not “wait to go to the shops” to purchase new games. At times, their students grabbed peers and spoke to them about their gaming, although some peers did not “want to hear about certain types of games”. “Gaming wasn’t a big a thing” for some peers, so they got “bored”, “pulled back” the frequency of interactions, or found “someone else to play with”.

Teachers perceived that “the biggest risk” to the students’ physical social interactions was their “over use” of video gaming time. Their responses revealed that “a lot of” their students preferred engagements with the games than “. . . to involve themselves” and “to socialise” “. . . in physical activities” that were in “classroom” or “playground” settings. They suggested that being “focused on” the screens and losing “interest” and awareness of their physical world seemed “antisocial” and “very socially restricting”.

According to teachers, it was “really important” for students with an ASD to receive “social modelling” separately from the “very rigid, robotic, and structured” ways of gaming consoles. Modelling of “social cues” from humans was important because students with an ASD demonstrated they had “a lot of trouble” understanding social interactions. Some students needed to develop their “skills” with “verbal and nonverbal cues”. Teachers said that some students with an



ASD experienced difficulties with displaying a “sense of empathy towards their peers, based on visual cues”. They perceived their students needed to make meanings in multimodal ways to interact “properly” and “function in society”, to deal “with people in society”, and to “be successful later on” in life.

Responses given by teachers indicated that some students displayed a “continuous . . . overstimulation” from the semiotic resources of online multiplayer games. One student was described as having “a three-day bender” with a game. Teachers were concerned that some of their students were experiencing “nightmares” after playing “some of these games” very late at night. The stimulation from “playing...at night” seemed to roll “into the next [school] day” and showed when the students were “heightened”, “wired”, “tired”, and unable to “concentrate” and “interact” sometimes “for at least a day”. Teacher responses also provided insight into their concerns about the “effect” of excessive gaming, students’ resistance to “take turns” and “transition” their interactions, and how “very quickly” students can get “upset” when they have to disengage from the games.

Suggestions for supporting students with these difficulties included having “very clear” “boundaries”; communicating “expectations”; and setting time limits through “timers”, “timetabling”, “timeframes”, and verbal countdowns that signal transition from engagements. Furthermore, the teachers also believed that it was important for parents to have responsibilities in “controlling and monitoring the amount of time” students with an ASD were engaged with the “technologies” of online “multiplayer games”. Teachers noted “schools” did not “allow online gaming” with discourses about “violence”, “swearing”, and “shooting . . . and killing” because they were considered “inappropriate” for the students’ “age level”. “M rated games” and “MA rated games” were perceived as designed for mature audiences. Certain online multiplayer games were “not allowed” or viewed as “acceptable” in schools although they were played in students’ homes. Teachers explained that families may have different “beliefs”, “values”, and “rules”. They believed

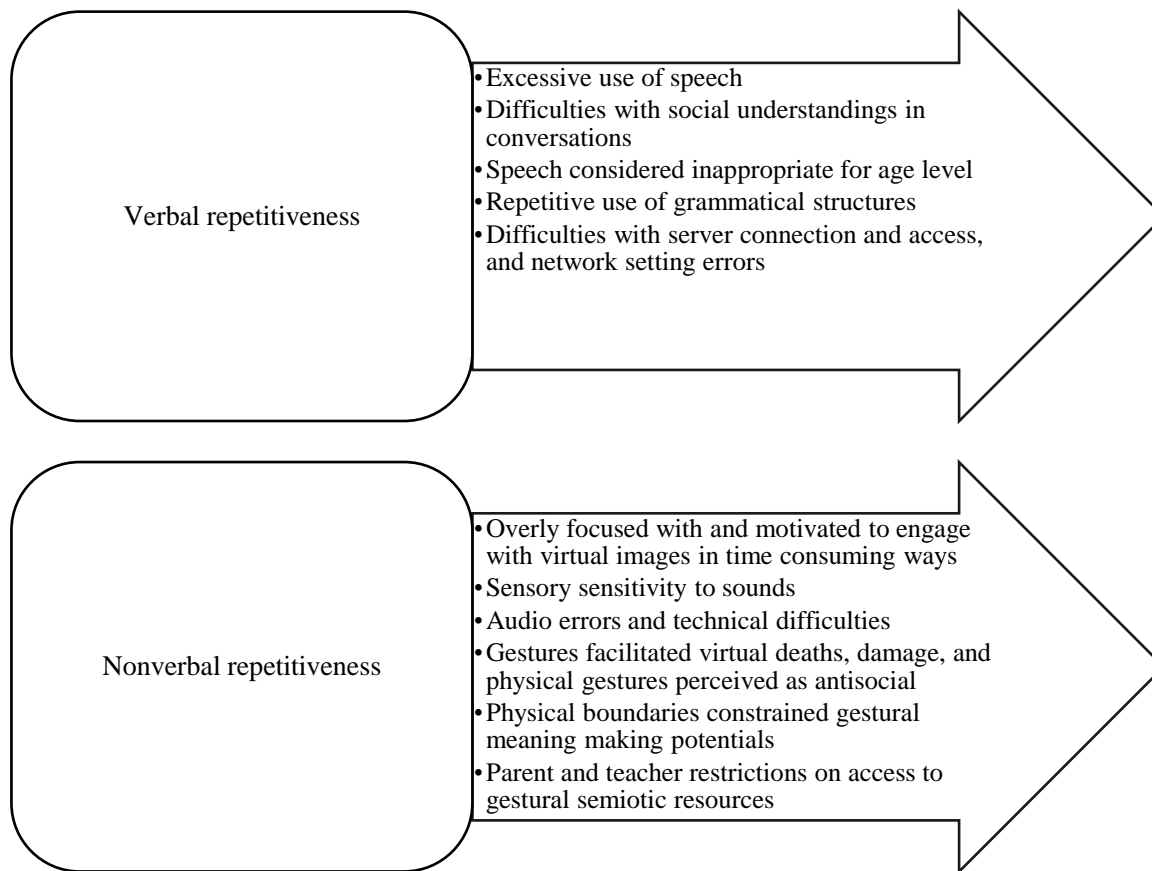
it is necessary to teach students “what’s appropriate” across different settings and the “societal expectations within a game framework”.

The main aim of subsection 6.1.3 was to describe the perspectives of parents and teachers about the constraints of online multiplayer games for the social interactions of students with an ASD. The findings consistently revealed that the students repetitively engaged with the semiotic resources of online multiplayer games in online and offline contexts. The following discussion in subsection 6.1.4 synthesises the findings from the at-screen observations, peer face-to-face observations, and the student, parent, and teacher semistructured interviews. It centers on the social interaction constraints revealed in the descriptions above and on the implications to target the potential of online multiplayer games to support the social interactions of students with an ASD.

The discussion extends beyond linguistic semiotic perspectives (Halliday & Matthiessen, 2014). It draws on multimodal perspectives, D/discourse perspectives, and notions of literacies, inclusion, and repeated patterns of interconnection among social communication modes (Foreman & Arthur-Kelly, 2017; Gee, 2015b; Jewitt, 2017, Chapter 2; Unsworth, 2013). These theoretical perspectives and notions broaden understandings of the repetitive uses of various semiotic resources across situated contexts. The body of literature on the restricted and repetitive behaviours, interests, and activities of students with an ASD also framed the discussions (Bishop et al., 2013; Leekam et al., 2011; Troyb et al., 2016).

**6.1.4 Multimodal repetitiveness: Summary and discussion of the findings.** This study describes the affordances of online multiplayer games for the social interactions of students with an ASD. Section 6.1.4 extends Chapter Five’s discussions on the potentials of online multiplayer games for supporting social interactions, developing and sustaining friendships, and enhancing reciprocity. This subsection discusses the findings on the multimodal forms of repetitiveness that

were introduced in Figure 14, and described in subsection 6.1.1 to subsection 6.1.3. Figure 16 illustrates the findings, given their relevance to the discussion.



*Figure 16.* Social interaction constraints through social communication modes.

Figure 16 highlights the students' repetitive verbal and nonverbal engagements within the context of online multiplayer games. The findings supported understandings of verbal and nonverbal social communication forms that may be displayed in the social interactions, and repetitive interests, behaviours, and activities of students with an ASD diagnosis (American Psychiatric Association, 2013). The findings suggest implications for supporting students with an ASD through multimodal forms of social communication within the Discourse of online multiplayer games (Gee, 2015b; Jewitt, 2017, Chapter 2). What follows is a discussion of social interaction constraints revealed through repetitive engagements with verbal forms for social communication.

**6.1.4.1 Constraints: Repetitive verbal social communication.** The analysis and understanding of spoken and written discourses provides insights into truths about social groups, and about interactions and relationships with others within our worlds (Bazerman, 2012, Chapter 16). Previous research has shown that the characteristics of ASD can be understood through speech (So et al., 2014). When some children with an ASD speak during conversations, they sometimes appear to have difficulties with turn-taking skills (Paul et al., 2009). The data discussed in Chapter Five broadened understandings of multimodal ways that online multiplayer games support social interactions, develop and sustain peer friendships, and enhance reciprocity for students with an ASD.

On the contrary, further analysis of the data showed that the students' social interactions were inhibited when they repetitively and excessively engaged with speech about the semiotic resources of online multiplayer games. There seemed to be a correlation between the students' excessive use of speech and factors such as difficulties with social understandings in conversations; and (b) peer boredom, disinterest, and inactivity. The findings suggested that the students engaged in speech that was considered inappropriate for their ages. They showed that despite the oral social interaction potentials associated with online multiplayer games, some students with an ASD have difficulties appropriately engaging with speech, and in conversations without appropriate support.

Consistent with the literature, the findings indicated that some students with an ASD have difficulties in displaying conversational reciprocity and identifying boredom in others (Doody & Bull, 2011; Paul et al., 2009). Data confirmed that some students with an ASD have difficulties with displaying social understanding, social awareness, and empathy for peer boredom (Kimhi, 2014; Mitchell et al., 2007; Ruffman, Garnham, & Rideout, 2001; Schaller & Rauh, 2017). The findings provided some support to develop the ability of students to better understand the thoughts, desires, intents, feelings, and perspectives of others, and to understand that these thoughts, desires, intents,

and perspectives may be different from their own (Baron-Cohen et al., 2013; Mazza et al., 2017). There are implications to target the modal potentials of speech in conversations, to reflect mental and social realities, and to highlight activities and ways to say things that are associated with online gameplay. Gee (2015b) discusses the importance of conversations and reciprocal speech in the Discourse of online multiplayer games.

In addition, the findings have implications for facilitating opportunities to develop students' conversational skills and oral language skills when they speak about these games and their semiotic resources. Scaffolded support may be necessary, given that online multiplayer games are high interest activities for some students with an ASD and considering that some students with an ASD face difficulties in conversational speech and with conversational behaviours (Charlop-Christy & Kelso, 2003; Gallup et al., 2016; Paul et al., 2009). Research shows that, middle-primary-school students who are *Minecraft*® players can have reciprocal conversations with their peers about social processes such as play, learning, and identity construction with affinity groups in school (Dezuanni et al., 2015).

The literature indicates that, in addition to spoken language, written language is used for communicative purposes and meaning making (Gee, 2014). Written discourse may therefore, be well suited to uncover narrated information about interactional experiences and contextualised issues associated with students with an ASD (Solomon et al., 2016). Furthermore, elements of the written mode have potentials to facilitate gathering and sending of written information, meaning making, and time and space that may be required for social communication (Crystal, 2008; Cvitic, Leko Simic, & Horvat, 2014; Halliday & Matthiessen, 2014). Writing is also a core modal component in the multimodal ensembles of screen-based texts (Beavis, 2014). The data discussed in Chapter Five contributed new understandings that the written semiotic resources associate with

online multiplayer games facilitated sustained social interactions, development of friendships, and enhancement of reciprocity for students with an ASD.

Further analysis of the students' repetitive engagements with the digital texts indicated that despite these potentials for social interactions, the students' lost time and missed opportunities for social interactions with others. This finding is relevant considering that the expressive uses of the written texts may be a challenge for some students with an ASD (Zajic et al., 2016). Some students often require support to develop and enhance their writing skills (Asaro-Saddler, 2016a). There are implications that students with an ASD may need support to efficiently send and receive meanings from written semiotic resources during virtual interactions with their peers.

In addition, students repeatedly experienced social interaction difficulties associated with server connection and access, and network settings errors. These limitations were out of their control. This finding is important because it supports previous research that has suggested that some students with an ASD may become disappointed with the difficulties that they experience in connecting socially with others (Milner & Haslam, 2013). Being prohibited, kicked, or blocked from online multiplayer games may cause distress to players (Kowalski et al., 2008). Moreover, servers influence how players are linked and socially interact with each other (Fuster et al., 2013). Even if servers are established for social interactions between friends, there is a chance that people may seldom be on those servers (Dezuanni et al., 2015). The implication from these findings is that support may be needed to help students deal with and resolve these issues. They may need to develop resilience for these issues when social interactions in their online gaming are not accomplished according to their plans.

This subsection discussed the social interaction constraints revealed through students' repetitive engagements with the written and spoken discourses of online multiplayer games (Gee, 2015b). However, understandings of social interaction constraints and multimodal repetitiveness

extend beyond analysis of spoken and written language. There are multiple verbal and nonverbal forms of communicating and transmitting meaning, in social contexts, including spoken, written, visual, gestural, and audio modes (New London Group, 1996). In addition, an inclusive perspective (Loreman et al., 2011), guides understanding that students have a diverse range of verbal and nonverbal needs. Therefore, they need to be supported through a multiplicity of social communication modes.

**6.1.4.2 Constraints: Repetitive nonverbal social communication.** Multimodality guided recognition that meaning making and representations are comprised of multiple social communication forms that are copresent and central to students' online and offline social interactions (Jewitt, 2017, Chapter 2; Kress, 2013; Norris, 2017, Chapter 6). Through this theoretical lens and the work by Gee (2015b), this subsection discusses how the repetitive uses of images, gestures, and sounds contributed to meaning making about social interaction constraints within the Discourse of online multiplayer games.

Acknowledgement for the potentials of images in aspects of social interactions is increasingly prevalent (Kress & Van Leeuwen, 2006). More recently, there has been attention paid to the correlation between restrictive and repetitive patterns of visual behaviours, visual expertise, and the strong attachments of children with an ASD to images, objects, and activities (Foss-Feig et al., 2016). The findings in Chapter Five expanded the existing research findings. Data showed that virtual images and their material representations facilitated social interaction support, friendship development, and enhanced reciprocity for students with an ASD.

Further analysis of the data was guided by multimodal analysis (Jewitt, 2017, Chapter 2) and understandings of ASD (American Psychiatric Association, 2013). Data analysis extended understandings of the students' repetitive engagements with virtual images and their material representations. The findings revealed that, at times, the students were focused with these semiotic

resources in time consuming ways. They seemed not concerned about the boredom of their social partners, and seemed unresponsive to the social and attention bids of others. Rather, they seemed more motivated to engage with the virtual images and their material representations. Their visual preoccupations with semiotic resources resulted in the exclusion of other social communication modes and daily activities that were relevant for sustained social interactions with their social partners.

The findings showed that, despite the social interaction potentials that are offered through virtual images and their material representations, students with an ASD may need scaffolded support to ensure that social interactions are reciprocated and prosocial skills learned. These findings are important because the existing research indicates that some students with an ASD may demonstrate challenges regarding constructing, perceiving, and evaluating social stimuli (Schaller & Rauh, 2017). They may find it challenging to disengage from their focus of interest (Landry & Bryson, 2004). In addition, some students may experience difficulties giving their attention to stimuli that may be on their peripheral (Mostert-Kerckhoffs et al., 2015). This study extends previous understandings that students with an ASD may require support to develop social understanding that is manifested through eye gaze (Ruffman, Garnham, & Rideout, 2001). It adds to research that indicates that students with an ASD may require support to disengage from visually interesting stimuli, as attention to nonvisual stimuli may be relevant for their social interactions (Sasson & Touchstone, 2014).

Given the difficulties that students with an ASD may face when they engage visually with the semiotic resources of online multiplayer games, the findings may help to broaden understanding of how to provide scaffolded support through the visual mode. Some students with an ASD may have unique abilities in visual tasks and enhanced visual processing skills (Samson, Mottron, Soulières, & Zeffiro, 2012). The visual mode is sometimes dominant in social communication



(Mills, Unsworth, & Exley, 2017, Chapter 2). The findings also have importance to broaden understandings of how the dominance and duration of attention to the special interests of students with an ASD may become problematic over other social interaction activities and social contact with others (Attwood, 2006). Moreover, the data suggested that some students with an ASD may require visual support if, as research implies, they tend to decrease their attention to stimuli that are relevant for their social interactions, display behaviours associated with aloofness, and gravitate towards peers with whom they have shared interests, such as online multiplayer games (Gallup et al., 2016; LeGoff, 2004; Sasson & Touchstone, 2014).

The discussion turns to the social interaction constraints revealed through repetitive engagements with gestures. Gesturing is a meaningful aspect of human activities associated with bodily movements, such as those of the hands (Bezemer, 2017, Chapter 25; Cienki, 2008; Lemke, 2012, Chapter 6). Previous studies indicate that some students with an ASD may display repetitive gestural behaviours, including hand, finger and whole-body actions and movements, and sensory manipulation of objects through fiddling, tapping, and banging (Harrop et al., 2014; Troyb et al., 2016). The findings presented in Chapter Five contribute broadened understandings that the gestural semiotic resources associated with online multiplayer games facilitate support for sustaining the social interactions, friendships, and reciprocity of students with an ASD. Different findings to those discussed in Chapter Five also emerged from the data.

Some constraints associated with gestural repetitiveness were that the students (a) spent more time engaged in virtual spaces than they did making meanings from physical gestures of humans; (b) used the gestural mode to facilitate avatar damage and death, and virtual property damage; (c) had sensory reactions to virtual deaths and self-injurious behaviours; and (d) reenacted social virtual gestures, which were perceived as antisocial, in physical and material ways. Social interactions were restricted or shortened because of these factors. Findings on external restrictions

also emerged from the data. Notably, the students were unable to reciprocate gestural meanings beyond the physical boundaries that separated them from other online players, and there were parental, teacher, and school restrictions on their access to some semiotic resources that facilitated the sending and receiving of certain gestural meanings.

Data analysis showed that even though the students benefited socially from the gestural potentials of online multiplayer games, social interaction constraints were still evident. These findings are significant, given that existing research shows that some students with an ASD may spend more time with friends playing video games than they may playing with friends in physical activities, and engaging in conversations and in education-related activities with friends (Kuo et al., 2013). Moreover, some students with an ASD may demonstrate delay in producing gestures, gesture less frequently, and use fewer gestural types than their peers without an ASD (So et al., 2014).

The findings have implications for scaffolded support and explicit instructions of prosocial behaviours, given the difficulties that some students with an ASD may experience through the gestural mode across different environments (American Psychiatric Association, 2013). Support may also be required, given the possibility of misinterpretation and miscommunication during social interactions, if opportunities to infer gestural meanings are lacking (Kruger, Epley, Parker, & Ng, 2005). The results indicated students with an ASD may require support in virtual contexts, particularly if they display sensory responses to aspects of environments for self-stimulation as a source of pleasure or to reduce anxiety (Attwood, 2006; Bogdashina, 2003; Cuccaro et al., 2003). Moreover, it seems that support for prosocial gestures in online and offline spaces may be required. This consideration is necessary given the correlation between playing violent content in online multiplayer games, and subsequent aggressive behaviours (Ewoldsen et al., 2012). The data offer important and timely implications for mitigating the social interaction constraints associated with online multiplayer games, within educational contexts.

Meaning potentials were revealed through the audio mode. Sounds, for example, were understood in combination with other modal elements such as vibration, speech, and music (West, 2017, Chapter 30). They have different affordances for different societies and the members within them (Kress, 2013). Research has attended to the responses of students with an ASD to elements of the audio mode (Fernández-Andrés, Pastor-Cerezuela, Sanz-Cervera, & Tárraga-Mínguez, 2015; Kern et al., 2006). The findings from this current study provided new insight into how in-game sounds facilitated symbolic play, conversations, and meaning making in social interactions for students with an ASD. They also revealed that, with the in-game sound voluntarily muted, opportunities for conversations and meaning making from audio cues were limited. Analysis showed that time for social communication was spent trying to fix technical difficulties associated with audio semiotic resources. These difficulties left the students frustrated and disappointed. The ability to reciprocate meanings from vocally and physically produced sounds was constrained by the boundaries of physical spaces, and by limited semiotic resources to reciprocate meanings through sounds.

These findings are relevant; first, because sensitivity to sounds is one of the most common sensory experiences for some students with an ASD (Attwood, 2006). Students with an ASD who are observed frequently blocking out unwanted sounds and frequently making repetitive sounds could be hypersensitive to environmental sounds (Baranek, Boyd, Poe, David, & Watson, 2007). The data suggested that, despite the social interaction potentials associated with in-games sounds, some students may experience social interaction audio difficulties. It was inferred that, if students are intolerant of certain online multiplayer in-game sounds they may perceive as loud or startling, they may require adjustments of semiotic resources to make audio meanings for social interactions (Bogdashina, 2003).

Second, the findings also have significance for facilitating students with an ASD with semiotic resources to transmit sounds, particularly if they have the tendency for one-sided conversations (Rodrigues et al., 2013, Chapter 11). The ability to make audio meanings from semiotic resources, human bodies, and mediums that transmit audible quality sounds may be beneficial for students who fail to make meaning from visual cues that signal the need for conversational shift (Callaghan, 2007; Paul et al., 2009). The technical difficulties that students experienced indicate that, some students may require support to be resilient if audio semiotic resources are inaccessible or do not function as students planned.

Multimodal perspectives were essential to make sense of the social interaction constraints that were revealed as the students used nonverbal forms of social communication. Student engagements with visual, gestural, and audio semiotic resources of online multiplayer games provided metafunctional, communicative, representational, and interactional meanings about their social interactions (Kress, 2013). The data suggest scaffold support within inclusive virtual contexts. Next, subsection 6.1.4.3 discusses the social interaction constraints that were revealed through multimodal repetitiveness, within virtual and physical affinity spaces (Gee, 2015b).

**6.1.4.3 Constraints: Repetitive engagements in affinity spaces.** The existing research has suggested that repetitive and restrictive behaviours, activities, and interests is a core feature of an ASD diagnosis (American Psychiatric Association, 2013). This characteristic affects the daily functions and social interaction processes of students with an ASD (Hundley, Shui, & Malow, 2016; Leekam et al., 2011). Previous research has also indicated that video game engagement time for boys with an ASD is approximately twofold that of boys without an ASD (Mazurek & Engelhardt, 2013b). The engagements of youths with an ASD with online multiplayer games are

likely to continue (Gallup et al., 2016). There may always be activities to repeat and undertake in online multiplayer games (Fuster et al., 2013).

The data revealed that the students' continual and excessive engagement with the games' semiotic resources constrained social interactions. This type of engagement caused concerns for obsessive and addictive tendencies, and isolating behaviours from other people. Time limits and restricted access were perceived as necessary for parents and teachers to develop routines and regulate the students' online play within virtual affinity spaces. Data analysis reflected that, despite the social interaction potentials, the students experienced social interaction constraints and may require scaffolded support within this context.

These findings are important, given that there may be a correlation between addiction, and an excessive frequency and duration of video game play (King, Delfabbro, & Zajac, 2011). Additionally, words such as obsession and compulsion have been used to describe the repetitive and restrictive behaviours of students with an ASD (Zandt, Prior, & Kyrios, 2007). The findings are consistent with previous studies that have shown the monitoring of students with an ASD's at-home electric screen media use, and that regulating of hours and days of video game play are sometimes required (Howard & Patti Ducoff, 2008; Mazurek & Engelhardt, 2013b).

Given the significance of the findings as well as the unique appeal of video games for students within online contexts (Gallup et al., 2016; Kuo et al., 2014; Mazurek & Engelhardt, 2013a), some students may require multimodal support as they repetitively engage with the semiotic resources and inclusive new literacies of online multiplayer games. Literacies are considered inclusive if they facilitate opportunities for repeated practice and technology-based engagements, such as with digital texts and virtual adventures (Boon et al., 2013). The findings also suggest that the affinity spaces of online multiplayer games can not only increase understanding of social interaction difficulties of students with an ASD across various contexts, but also broaden

understanding of students' restricted and repetitive interests, behaviours, and activities (American Psychiatric Association, 2013; Hayes & Duncan, 2012).

**6.1.6.4 Conclusion to section 6.1.** This section discussed the social interaction constraints associated with the multimodal repetitiveness of students with an ASD as they engaged with online multiplayer games. The findings showed that students frequently engaged with the semiotic resources of online multiplayer games for an extended amount of time. They engaged through oral, written, gestural, visual, and audio forms of social communication, with modal elements including speech, written texts, gestures, images, and sounds, and in offline and online affinity spaces (Hayes & Duncan, 2012).

Analysis of the data revealed that the students missed opportunities for social interactions not only with online players, but also with their friends, peers, and siblings when they (a) repetitively and excessively engaged with high-interest multimodal elements including excessive speech about gaming topics, and repeated writing and viewing of digital texts, and (b) frequently sustained levels of modal preference to virtual images. Students' repetitive engagements with the semiotic resources of online multiplayer games were associated with words, such as addicted, obsessed, infatuated, and isolated. Findings of their repetitive and continual modal preferences for the semiotic resources of online multiplayer games expand previous work on problematic game play patterns as well as literature on the restrictive and repetitive patterns of behaviours, interests, and activities of students with an ASD (Kuenssberg, McKenzie, & Jones, 2011; Mazurek & Engelhardt, 2013b).

The data presented in Chapters Five and Six were consistent in revealing that, despite multimodal potentials associated with the semiotic resources and literacies of *Minecraft*® and other online multiplayer games, the students still experienced social interaction difficulties within the context and affinity spaces of these games. Implications are discussed regarding the importance of providing scaffolded support and explicit instructions to meet the social interaction needs of

students with an ASD within online and offline contexts. The findings have also highlighted that social interactions through the semiotic resources of online multiplayer games were externally constrained. External constraints included physical boundaries between students and other gamers, technical errors, and unavailability and lack of access to semiotic resources. Adult rules, school regulations, and time restrictions also constrained online gaming interactions. The results offered implications for supporting students with an ASD in online and offline contexts and removing barriers to education (Gillies & Carrington, 2004).

The literature on repetitive behaviours of students with an ASD (Leekam et al., 2011)—along with literature on the increasing interest of students with an ASD in video gaming (Gallup et al., 2016; Mazurek & Engelhardt, 2013a), multimodal research (Baldry & Thibault, 2006; Jewitt, 2017, Chapter 2), and D/discourse studies (Gee & Handford, 2012)—has guided this research into analysing and describing the association between social interaction constraints, and the repetitive uses of social communication modes during engagements with online multiplayer games. This approach had not been in focus in the literature. Future research within the context of online multiplayer games may enable further descriptions of students with an ASD’s multimodal repetitiveness and may broaden understandings of external social interaction constraints associated with the semiotic resources of online multiplayer games such as *Minecraft*®. Section 6.1 discussed social interaction constraints were revealed through multimodal repetitiveness. Section 6.2 describes difficulties in relationships that the students with an ASD experienced within the context of online multiplayer games.

## **6.2 Difficulties in Relationships [RQs 1, 1a, 1b, and 1c]**

The literature reveals that the relationship discourses within the context of inclusive education and literacies have grown in importance. Relationships within inclusive classroom contexts, such as teacher-and-teacher relationships and teacher-and-student relationships, impact on social

interactions, classroom climates, and learning processes (Santos et al., 2016). Researchers in new literacies studies have highlighted that difficulties can arise in relationships and social interactions if there is limited understanding of digital literacies and if there is a limited amount of opportunities within formal instructional settings to discuss and value online gaming discourses (Garvis & Lemon, 2016; Steiner-Adair, 2015). Understanding the relationships of students with an ASD from these perspectives is therefore relevant.

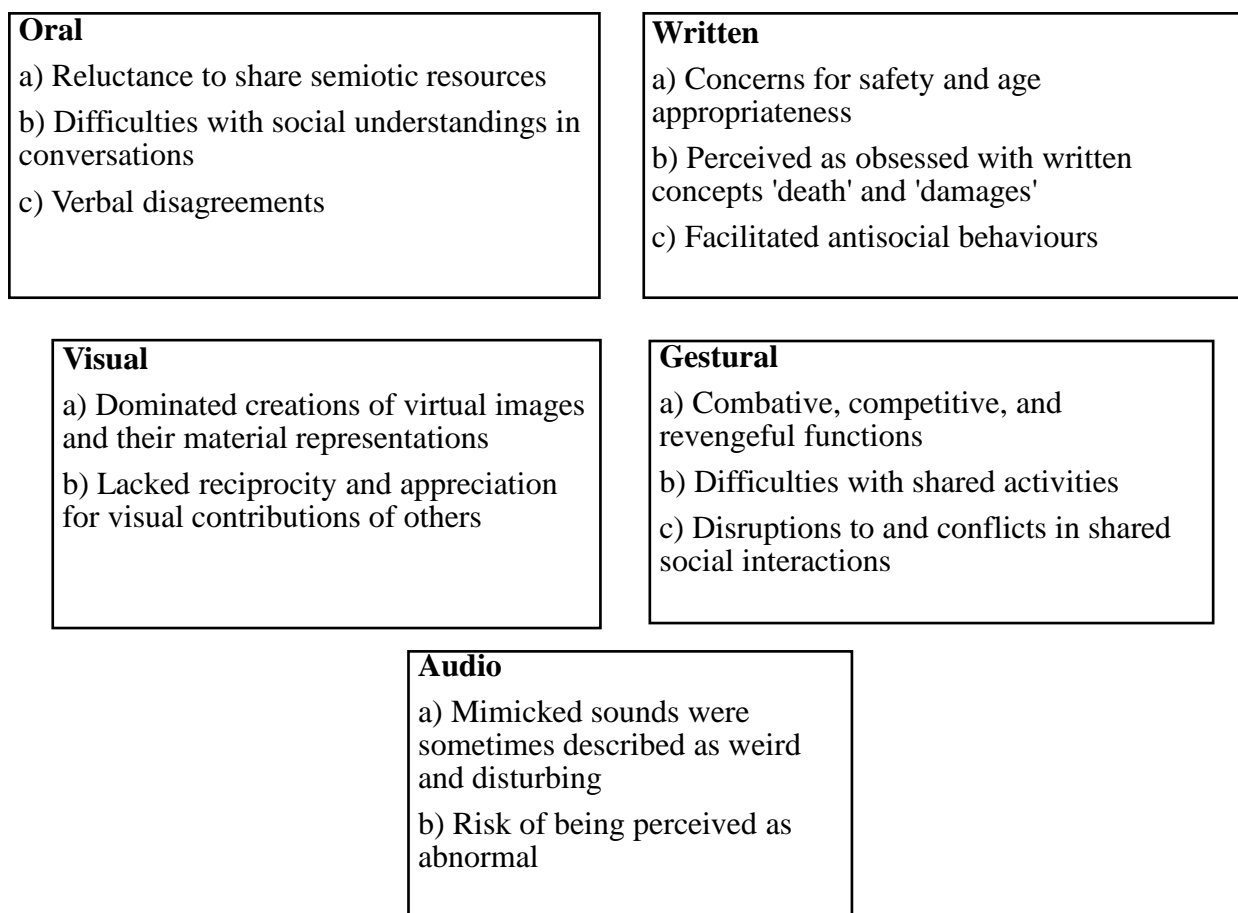
Some students with an ASD may experience challenges in developing and sustaining relationships across several contexts (American Psychiatric Association, 2013). Social relationships for students with an ASD may be signified through membership, friendships, and partnerships, as well as through peer relationships, and family relationships (Bennett & Hay, 2007; Boyd et al., 2015; Kasari et al., 2011). Given the possibility for difficulties in relationships, research has indicated that some students with an ASD may require support to learn about developing and maintaining relationships, such as friendships and peer relationships (Al-Ghani & Al-Ghani, 2011; DiSalvo & Oswald, 2002). Some students with an ASD may also benefit from support to manage appropriate behaviours to suit diverse social contexts (Colvin & Sheehan, 2012).

As students with an ASD increase their interest in and use of video gaming (Mazurek & Engelhardt, 2013a), it seems that only a few studies have explored the relationships of children and youths with an ASD within the context of online multiplayer games (Gallup et al., 2016; Kuo et al., 2014). Section 6.2 contributes to this area of research by describing the difficulties in relationships that three students with an ASD experienced within the Discourse of online multiplayer games. This section first describes the data about difficulties in relationships that were revealed through multimodal analysis of the students' at-screen uses of modal elements such as written text, gestures, and images (Kress, 2013). It is enriched with descriptive data from the peer face-to-face



observations, and the student, parent, and teacher interviews. The discussion of these findings is presented below in subsection 6.2.4.

Figure 17 illustrates the difficulties in relationships that the students experienced within the context of online multiplayer games. The discussion and implication of these findings are presented in subsection 6.2.4.



*Figure 17.* Relationship difficulties.

These findings summarised in Figure 17 were common across the at-screen and peer face-to-face interactions, and the student, parent, and teacher interviews. The at-screen findings are now presented.

**6.2.1 At-screen findings of difficulties in relationships.** The descriptions of the at-screen findings are framed by a multimodal design (New London Group, 1996) and the notion of repeated

patterns and interconnection among linguistic and nonlinguistic social communication modes (Unsworth, 2013). Figure 17 illustrates the multimodal forms of social communication—such as oral, written, visual, gestural, and audio—that contributed to meanings about the students’ relationship difficulties, within the Discourse of online multiplayer games. The difficulties in relationships, as revealed at the screens through speech and written texts, and images, gestures, and sounds are now presented.

Analysis of the students’ interactions with digital texts, virtual images, and virtual gestures revealed social interaction difficulties with other gamers. As discussed above, students interacted with the digital texts during their at-screen engagements. For instance, the written phrase ‘host options’ was used to strategically influence the activities of other players. However, at times the social interactions between the students and the other players ended because there were differences between what the students wanted to do as server hosts and what other online players were doing during those times. The students used digitally written texts to facilitate the strategic changing of creative play to survival-type play, and to enable the teleporting, falling, hurting, and killing of avatars. Student comments suggested that, at times, other gamers wanted to engage alone or with different online players in “*separate*” environments of *Minecraft*®, instead of their gaming being influenced or directed by students’ use of host options.

A variety of written clauses were frequently displayed on the screens. Examples included, ‘exit game’, ‘remove friend’, ‘kick player’, and ‘turn off console’. These digital and other texts implied that social interactions were restricted if students did not ‘restart’ play in their virtual worlds. Social interactions were constrained if the students did not reinvite the other players ‘to re-join [their] servers’, and if other online players did not ‘respawn’ after the students killed them. Student discussions and digital writing continually gave insight that the students selected activities associated with discourses of ‘death’ and ‘damage’. Examples of written texts associated with the

themes of ‘death’ included ‘the loser will be executed’, ‘shoot the criminals’, ‘was killed’, ‘was shot by a skeleton’, ‘was slain by a zombie’, ‘bitten to death’, and ‘blew up’. Examples of written texts associated with the concept of ‘damage’ included ‘take damage’, ‘become infected’, ‘attack them’, ‘attack damage’, and ‘decoy grenade’.

Difficulties in relationships were also revealed through analysis of the students’ interaction with virtual images. Notably, they demonstrated resistance to other online players’ virtual contributions and disapproval of them. To demonstrate, Mason engaged with Stevatar to create a “Five Nights at Freddy’s” “pizzeria” “mat” (see Figure 18).



*Figure 18.* Mason’s Five Nights at Freddy’s pizzeria mat.

Shortly after building began with a square black and white checker pattern, Mason complained, “Oh my God. He keeps on building. No more building, no more building! No more building! Is he still building? Er . . . he keeps building it wider”. Analysis of his avatar’s virtual-spatial proximity to Stevatar, his avatar’s repetitive movements, and his repetitive speech reinforced his disapproval and his insistence on preventing Stevatar’s latest contributions. To demonstrate, Mason repeatedly positioned his avatar between the Five Nights at Freddy’s mat and Stevatar. He continually

destroyed the ‘black and white stained clay’ blocks that Stevatar added. Mason repeated the word “enough” 18 times, as in “That’s enough! Okay?”.

The findings revealed that, although students displayed disapproval of other players’ visible contributions and creations, they did show visual processing biases and favouritism for images that they personally created. For example, they directed comments such as “Oh my god! . . . Okay dude. I don’t like it like that. I don’t like this” to other online players, but praised their own creations with comments such as “awesome me! Yeah”, “Hey dude, another better restaurant than you [yours]. I think”, “looks really good so far”, and “yeah, it’s perfect”. Students revealed that online players may have become bored when the students displayed rejections of other online players’ contributions. Students contradicted themselves when they made comments such as “None of them are helping me”, “. . . he is just sitting there and relaxing”, and “. . . finish the job!”.

Further multimodal analysis of the virtual images indicated that the students destroyed some images of other players’ virtual properties and that some images of their virtual creations were destroyed by other online players. Destruction occurred through “griefing” and “trolling”. The students also commented that, sometimes, when they committed these acts gamers walked away and ran away from the spaces occupied by the students’ avatars. Gamers made themselves “hard to find” as well as left the *Minecraft*® servers. Furthermore, students shared that, at times, they were “kicked from” servers when they engaged in these behaviours. Alternately, when they viewed a “troll” or “griefer” destroying their property, they “kicked” these gamers from their servers and made comments, including “Get out of my life . . . Bye, bye. Disappeared . . . Bye. Bye, bye”.

Analysis of the students’ repetitive engagements with virtual gestures revealed that they engaged in activities that were combative, competitive, and revengeful in nature. During these types of play, the students repetitively demonstrated virtual gestures such as shooting and hitting towards other avatars. They also ran to avoid being ‘hit’ or ‘shot’ by other players. Verbal exclamations

such as “Oh no! Oooh no. I am so screwed! Am so screwed! I’ screwed!” and “I’ve got to survive from all the other fellows who were trying to kill me . . .” implied conflicts during play with their ‘friends’ and ‘enemies’. Gestures such as pushing and hitting were also repeatedly used as “punishment” and “to get revenge” because the other players caused injury to their virtual properties and death to their avatars.

With regards to sounds, the students frequently produced sounds that could seem to be meaningless patterns and repetitive utterances (Bogdashina, 2003). Examples of repetitive sounds included “bedebedebede . . .” while students scrolled through online friends list. Sounds such as “denene . . .”, “don, don, don, don, . . .” and “that, that, that, that, . . .” were made while students scrolled through inventories and dragged items. While exploding a “nuke” and buildings students made noises such as “bebebebapbap . . .”. In the discussions that follow, it will be argued that the repetitive mimicking of these and similar sounds caused difficulties in relationships, within physical contexts. To conclude, difficulties in relationships were revealed through verbal and nonverbal modal elements, such as speech, writing, gestures, and sounds. Having described the findings from the at-screen interactions, the following subsection describes the difficulties in relationships that were revealed through the peer face-to-face observations and the student interviews, within the Discourse of online multiplayer games.

**6.2.2 Findings from peer interactions: Difficulties in relationships.** With respect to peer face-to-face interactions, students were, at times, reluctant to share certain *Minecraft*® material resources and accept the material contribution of peers during play activities. Ethan, for example, repeatedly refused to share engagements with his peers and continually refused the “help” that his peers offered. His comments, “I am sorry but I just don’t actually trust you that much”, “Do not go near this one”, and “go away” signified that he did not reciprocate trust for a shared engagement and the social understanding that was required for social interactions. Student comments including

“It’s taking me a long time to do . . .” indicated that their social interactions with their peers were restricted because of the time that they took engaging alone with *Minecraft*® material resources. Peer comments such as “are you going to let somebody play with you?” and “you are being selfish if you don’t let anyone help you” also provided insight into the students’ difficulties with social understanding. The students showed visual processing biases and favouritism for images that they personally created and praised their own creations with comments such as “no, this is being done perfect [perfectly] by me”.

Also, some of the peers perceived the mimicking of *Minecraft*® sounds by the students with an ASD as meaningless and strange. To demonstrate, students with an ASD made sounds such as the cry of zombies, “gasp” of “ghasts”, and grunt of villagers. They made noises such as “hhherher”, “huhhuhuh”, “boong!”, and “wee! ptssh!” as they engaged with *Minecraft*® material resources. Peers described the students’ mimicked sounds as “wrong” and “super weird”.

The peer face-to-face interactions showed that the students engaged with their peers in offline gestural behaviours similar to gestural behaviours in online play. For example, they regularly tapped, dropped, hit, banged, and projected *Minecraft*® material resources as they pretended to “damage”, “destroy”, “hurt”, and “kill” things. As they displayed these gestures, they made repetitive comments such as “I’m going to kill myself. I’m trying to kill myself” and “It’s like I killed you and you dropped the sword. You usually drop your stuff when you die”. Additionally, the students’ repeatedly snatched *Minecraft*® resources from their peers’ grasps and took resources that they observed the peers engaging with. To demonstrate, Noah repeatedly tried to take a peer’s *Minecraft*® horse so that he could “tame” it. At the same time, he made comments such as “you’re [*Minecraft*® horse] coming with me”. The peer told Noah not to “steal” his “driving” horse and held on tightly to the horse while Noah repeatedly attempted to snatch and “tame” it.

The students and their peers had several disagreements and different interest about video gaming discourses. For example, Mason laughed and chatted to his peer about his like of *Minecraft*® “slime” and pretended to be a “slime block”. However, the peer’s response, “I hate slime...Slime is bad . . . you can’t be slime” implied that he disagreed with Mason and was not as interested in *Minecraft*® “slime” or the material resource that represented it. In a similar example, Noah commented, “We haven’t even built the [*Minecraft*®] house yet” and asked for help to build it. However, his peer was not as interested in that activity and commented, “Who cares about the house?”. The data analysis also showed that the students and their peers frequently engaged in disagreements about whether or not “Endermen” can “kill” a player. They had different views about and whether “Herobrine is real”. Sometimes they could not agree with their peers about what a player “can” or “can’t do . . . on *Minecraft*®”, and about the accurate pronunciation of *Minecraft*® sounds. Data from the peer face-to-face observations revealed that the students experienced social interaction constraints that were reflected in multimodal ways.

Findings from the student semistructured interviews extended understandings of the difficulties in relationships that the students experienced within the Discourse of online multiplayer games. The students with an ASD were asked to tell if there were any disadvantages to and difficult things about playing *Minecraft*® with others. Notably, the students explained that they “spent” from “one hour”, up to “two weeks” creating their “best builds ever” and works “of art”, such as a “giant fortress”, “houses”, and “pictures”. Despite the potential to create, other online players “messed up” and wrecked their personal virtual properties. Students were reluctant to socially interact with other “online” players who cheated and were “a bit mean”.

The students explained that “too much griefing” and “hacking” was “bad” and made them “afraid” and “angry”. Therefore, sometimes their responses during virtual conflicts were to “get revenge” and “destroy” what other players had built. Some online social interactions were “cut”.

Likewise, players got “kicked” and “barred” from servers when they did not “follow” the servers’ “rules”. Difficulties between them and their siblings, were associated with a reluctance to take turns with the games’ semiotic resources. The students’ responses also revealed difficulties in relationships that were manifested within the school context. They indicated that sometimes “big” fights occurred in physical *Minecraft*® play with their “good friends”. They fought about the ownership of “valuable” properties, cheating acts, and hosts privileges. The students communicated that they felt discomfort when they mimicked certain virtual sounds and gestures, within the school setting. They did not want to “feel weird”, risk being teased, be perceived as strange, nor “disturb” classroom learning. Instead they wanted to be viewed as “normal”.

The students’ responses suggested that although they engaged in conversations with some teachers about online multiplayer games, they felt that other teachers were not “interested in that type of stuff”. Similarly, more opportunities to be able to write about their gaming experiences would have been appreciated. In this subsection, the difficulties that the students experienced within the Discourse of online multiplayer games were explained. Subsection 6.2.3 describes parent and teacher perspectives of relationship difficulties that students experienced within the affinity spaces of online multiplayer games (Gee, 2007a).

**6.2.3 Parent and teacher perspectives: Difficulties in relationships.** The parents were asked questions such as “What are your views of online multiplayer games for developing meaningful, rich and reciprocal friendships?”, “How does playing *Minecraft*® make it difficult for your child to socially interact with others?”, and “What difficulties does your child experience when he plays online multiplayer games with others?”. Their responses revealed that the students experienced difficulties in their virtual-world relationships. A notable example was Mrs Brown’s report that, when Ethan “first” began “playing a multiplayer” game, he “kept killing” other players’ avatars. She shared that he became “upset” when “the other gamers...ganged up on him” and “kept



killing him” in retaliation. Mrs Brown emphasised that she said to him, “You just can’t keep doing that sort of thing...You’ve got to play fair . . .”. Additionally, the parents discussed that their sons are “not allowed to play” games with images that “depreciate women . . .” and are about “putting people down”. The responses indicated that gaming features such as rewarding “points” for gestures like “hitting” were not perceived by the parents to be “great” for social interactions.

Parents’ “biggest fear” was “how many weirdos” there were online with “fake” gaming profiles and “preying on” children. They explained that their sons’ interaction with strangers was a “big risk” to their safety, “because” their sons did not always “know who” they were “playing with”, nor were the parents able to “see who” their sons were “actually interacting with”. The parents’ responses indicated that their sons assumed that “everyone” online was in their “age group” or their “friend”. Mason’s mother shared that she “had to explain to him” that a 50-year-old “man” could pretend to be a 10-year-old child. The parents explained that their sons needed to “understand” why they should not “give out” their addresses or other “personal details” to “online” players. It took “a little while” for their children to understand how to use written text safely while online. Moreover, the parents took measures “to keep an eye on” the people they were “playing with”.

The teachers were asked “What are your views of online multiplayer games for developing meaningful, rich, and reciprocal friendships for your students with an ASD?”, and “How does playing online multiplayer games make it difficult for your students with an ASD to socially interact with others at school?”. Their responses indicated that social interaction constraints were associated with the students’ “relationships”, the online players with whom they were “interacting with”, and “how often” students are “interacting with people”. Teachers used words such as “experts” and “advanced” to describe the students’ knowledge about *Minecraft*®, and revealed that the students’ gaming “talk” was at times “beyond” their understandings. They added that there were

“issues” and “problems” when students refused to “back down” in arguments with their peers.

Additionally, teachers observed that some students demonstrated “frustration” when they tried “to communicate with” and teach peers who were new *Minecraft*® players.

Questions such as “I wonder if those ideas would be there if they did not have those games? If it would be to that level of aggression?” provided evidence of concerns that the teachers had about the “connection” between “an overuse of” “more aggressive games” and students’ “ideas to harm”, students’ displays of “aggressive” and “violent” gestures, anger, and “anxiety”. Although some teachers wondered about the correlation, other teachers shared that they had “seen” a “spike” in the “level of violence” by some students who played games with aggressive and violent content. Some students seemed to constantly seek attention and stimulation.

Teachers recalled that students brought these discourses “into the classroom” context through their own physical behaviours. They had “seen” occasions when some students with an ASD appeared to be “fixated on” and “caught up in” roleplaying the “mannerisms and behaviours” of the games’ characters. Some students pretended “to shoot the guns all the time”. Teacher responses suggested that some students held objects in their “hands” and gestured with a stabbing “motion towards” other persons. Comments, including “I am going to go kill myself” were made by some of their student gamers. Teachers considered that students with “ASD are different” and will “react differently to the games”. However, they were worried about the “toll” that being “visually stimulated by violence all the time” had on students’ futures. There was concern that their students could commit a “violent act because of that level of anger [and] aggression” associated with “the games they are playing”. Teachers suggested that students may need support to “decipher” how to “respond” during “difficult times”.

To conclude, the parent and teacher interview responses gave consistent data about the difficulties that students with an ASD experience in their relationships. Findings discussed in this

subsection enriched the data from the at-screen observations, peer face-to-face observations and student interviews. Subsection 6.2.4 elaborates on these findings. It is framed by the theoretical perspectives of multimodality (Jewitt, 2017, Chapter 2) and D/discourse (Gee, 2015a) to broaden understandings of the difficulties that students experienced in their online and offline relationships. The discussion is also guided by understandings that students with an ASD can be supported through digital technologies and within virtual contexts (Grynszpan, Weiss, Perez-Diaz, & Gal, 2014).

**6.2.4 Summary and discussion: Difficulties in relationships.** This subsection synthesises and discusses the findings described above about difficulties in the online and offline relationships of students with an ASD. Data revealed that, regardless of the potentials of online multiplayer games for supporting social interactions, developing friendships, and enhancing reciprocity (discussed in Chapter Five), difficulties were still evident in relationships, in multimodal ways. The findings are relevant, given that students with an ASD may experience difficulties in developing, sustaining, and understanding relationships (American Psychiatric Association, 2013). Establishing peer relationships may be second nature to children without an ASD (Mazurek & Kanne, 2010). However, difficulties in social interactions make it challenging for some students with an ASD to establish peer relationships (Humphrey & Symes, 2010b).

The findings are elaborated in the discussions below. They suggest implications to provide relationship support, within virtual contexts. Recent research within the context of inclusive education (Santos et al., 2016) and new literacies (Steiner-Adair, 2015) has highlighted the importance of relationships and understanding them. Research suggests that, with this understanding, students may be supported to develop their friendships and social networks (Kasari et al., 2011), build restorative relationships (Razer, 2017), and sustain peer social relationships (Koegel et al., 2012). From these theoretical perspectives, the focus of the discussions below is to

understand difficulties in relationships through speech, digital texts, images, gestures, and sounds, within virtual and physical affinity spaces. Within the discussions, there are also implications for developing and sustaining the peer friendships and relationships of students with an ASD, within online and offline affinity spaces.

**6.2.4.1 Difficulties in relationships: Speech and writing.** Previous research has revealed that the difficulties that students with an ASD experience in social interactions can be understood through spoken and written modes. For example, research by Gallup et al. (2016), suggests that students with an ASD can orally share about the difficulties that they experience in their virtual and physical relationships. Spoken language and conversational reciprocity are significant in communicating meanings and sustaining social interactions (Paul et al., 2009). The data presented in Chapter Five have provided new insight into how oral language associated with online multiplayer games enabled sustained social interactions, development of friendships, and enhanced reciprocity for students with an ASD.

However, further analysis of speech across the data sets revealed that despite the potentials associated with online multiplayer games, the students experienced problems in their relationships with online players, peers, and siblings. Difficulties in relationships included (a) a reluctance to share virtual and material semiotic resources; (b) difficulties with social understandings regarding reciprocated trust, and acceptance of the multimodal contributions and perspectives in conversations and play; and (c) verbal disagreements about video gaming discourses. These findings reflect that, despite the potentials of the games, students with an ASD may require support to develop understanding of the need for two-way social interactions as they orally engage with semiotic resources of online multiplayer games.

These findings are consistent with previous studies that have shown that when children with an ASD speak during conversations, they sometimes demonstrate difficulties with turn-taking skills

(Paul et al., 2009). They may often be on the sideline of their social groups (Kasari et al., 2011) and may experience difficulties forming relationships for their developmental age (Heflin & Alaimo, 2007). Consistent with this research findings, previous gaming research has shown evidence that primary-school students may experience resistance from peers about *Minecraft*® discourses in the form of arguments (Dezuanni et al., 2015). Dezuanni et al. (2015) also found that, conflicts may arise if students assert themselves as gaming experts.

Given these difficulties, students with an ASD may require oral support for developing their social understanding and conflict management skills when there are conversations and disagreements, within the context of online multiplayer games. There are also implications to develop reciprocity in student relationships through the potentials of online multiplayer games. Reciprocity and social understanding in relationships may include the intrinsic motivation to take turns, share, and appreciate the speech, perspectives, and conversational responses of others within various Discourses (Gee, 2015a; Mitchell et al., 2007; Schaller & Rauh, 2017). Support to develop these literacies skills is encouraged for students with an ASD who may have difficulties in these areas (Lanter & Watson, 2008). The descriptions above showed that, in addition to the meaning making potentials of the spoken mode, the written mode revealed meanings about difficulties in relationships.

The written texts of online multiplayer games are produced through the interaction of semiotic resources and players, and through the intertwining of modes (Beavis et al., 2012). Written text could assist in identifying members of video gaming Discourse communities through gamers' situated uses of language (Gee, 2015b). Making meaning from written discourse is beneficial for communication in social interactions (Randi, Newman, & Grigorenko, 2010). Hence, a small, yet growing, number of studies have shown interest in enhancing the writing skills of children with an ASD (Asaro-Saddler, 2016a) and improving the performance of adolescence with an ASD in

vocabulary development and written language through video self-modelling (Delano, 2007).

Chapter Five's discussions of the research findings provided new insight into how written semiotic resources associated with online multiplayer games functioned to enhance reciprocal skills, develop and sustain friendships, and support social interactions of students with an ASD.

Analysis of the findings reflected that, despite these potentials associated with online multiplayer games, the students still experienced difficulties in relationships within the same contexts. Notably, students engaged in written discourses that were considered unsafe and inappropriate. They continuously and strategically engaged with the written concepts associated with the themes death and damage. Students also sought out activities associated with these themes and seemed to have been an obsession with them. They seemed to have difficulties understanding prosocial behaviours and difficulties of social understanding. These findings reflect that some students with an ASD may require support to sustain prosocial engagements with peers through written text within virtual environments.

These findings are important, given that some students with an ASD tend to spend nearly twice as much time engaged with video games that are associated with problem behaviours than their peers without an ASD (Malinverni et al., 2014; Mazurek & Engelhardt, 2013a, 2013b). There is correlation between violence in video games and an increase in aggressive behaviours, aggressive thoughts, and angry feelings (Schmierbach, 2010; Velez et al., 2016). Violence in video games may be associated with decrease in empathic feelings and in prosocial gestural behaviours, such as helping others (Anderson et al., 2010). There are implications to provide students with scaffolded support for their uses of the written mode within virtual contexts. Scaffolded support and explicit instructions may be vital also because it is common for engagements with online multiplayer games to be of a competitive or cooperative nature (Greitemeyer, 2013). Written support for student gamers may enhance their ability to make meaning about strategies and progression through video

games, particularly if they socially interact privately and publicly with known and unknown online gamers of all ages (Finke et al., 2016; Fuster et al., 2013).

The discussion so far has focused on spoken and written modes for meaning making. It evoked the notion that the Discourses to which individuals belong may reflect relationship difficulties such as conflict because of how social communication modes are used in the interactional style of members within those communities (Gee, 2015b). The discussion also draws on the meaning making potentials of images, gestures, and sounds to broaden understandings of relationship difficulties that were experienced through the semiotic resources of online multiplayer games.

**6.2.4.2 Difficulties in relationships: Images, gestures, and sounds.** Images have meaning potentials (Machin & Mayr, 2012), and in digital multiplayer games, players operate and interact with each other through the meaning potentials of images (Twining, 2010). The data presented in Chapter Five broaden understandings of how virtual images and their material representations, supported reciprocal social interactions and friendships in virtual and physical spaces. Subsection 6.2.1.2 presented contrary evidence that the students consistently had a tendency to (a) dominate shared creations of virtual images and their material representations; (b) reject the contributions of online players, friends, and peers; and (c) make negative comments about the contribution of others while they showed a visual preference for their own images. Findings suggested that their social partners felt unappreciated, ceased contributing, became bored, and sought to socially interact in other spaces or with other people. Results showed that, regardless of the social interaction potentials offered by interaction with virtual images and their material representations, difficulties in relationships were still evident. The findings are significant in that they reflected difficulties understanding the need for others to contribute to social interactions. These difficulties were experienced despite the games being engaging and supportive platforms for developing friendships

and social interactions (Gallup et al., 2016). It is likely that difficulties with theory of mind impacted students' social cognition as well as their understandings of friendships and peer relationships (Schaller & Rauh, 2017).

The findings have implications for providing them with support, scaffolding, and explicit teaching as they interact with visual semiotic resources and their material representations. This type of support may be effective for students with an ASD who have unique abilities in visual tasks and enhanced visual processing skills (Samson et al., 2012). Visual support may benefit students if there is evidence that they do not understand other people's desires, feelings, and perspectives, and if they are unaware that those desires, feelings, and perspectives may differ from theirs (Carpendale & Lewis, 2006; Baron-Cohen et al., 2013; Hughes, 2011).

Another implication is that if students show resistance to change and display visual processing biases, opportunities to acquire social interaction skills and engage in social interactions may be missed (Cihak et al., 2010; Samson et al., 2012; Troyb et al., 2016). Therefore, they may require support through the literacies of information and communication technology to meet their targeted goals (MCEETYA, 2008). Research indicates that targeted support may assist students who experience learning difficulties and disadvantages to achieve their optimum potentials (Boche & Henning, 2015).

A multimodal perspective also embraces meaning making through gestures (Bezemer, 2017, Chapter 25; Colletta & Guidetti, 2012). From this perspective, the discussion proceeds to elaborate on the meanings that were enabled through analysis of gestures. Previous studies have shown that children with an ASD often experience difficulties in their reception, meaning making, and production of nonverbal social communication modes during social interaction (Grossman & Tager-Flusberg, 2012; Kaartinen et al., 2012). The ability to make meaning from a nonverbal mode, such as gesture, is significant for communicative competence in social interactions. Gestural meanings in



virtual contexts of online multiplayer games can be made through human-controlled avatars (Gallup et al., 2016). As explained earlier, Chapter Five contributed new understandings to literature. It showed that the gestural semiotic resources associated with online multiplayer games have the potentials to support social interactions, develop and sustain friendships, and enhance reciprocity for students with an ASD.

Conversely, the attention that the students repetitively paid to the combative, competitive, and revengeful functions of virtual gestures resulted in disruptions in shared activities, boredom for other online players, disruptions to shared social interactions, conflicts with social partners and them being kicked from accessing virtual spaces. Regardless of the benefits that were afforded through gestural semiotic resources, the characteristics of ASD did disappear. Rather, the students experienced social difficulties in relationships as they interacted through the gestural mode. These findings are significant, because some students with an ASD may experience difficulties in their production of gestures, and frequency of gestural use for meaning making (So et al., 2014). Furthermore, virtual environments promote social understandings of behavioural consequences, skill learning, and participation (Mitchell et al., 2007). However, there are risks that these environments may reinforce antisocial behaviours, such as bullying, harassing, ostracising, and aggressive thinking (Kowalski, 2012; Schmierbach, 2010).

Given the importance of the data, the findings have implications for supporting students to use gestural semiotic resources associated with online multiplayer games, in prosocial ways. This support may be considered for students with an ASD who may be at risk for displaying unsociable and disruptive behaviours (Eilers & Hayes, 2015), and play video games that involve shooting and killing (Kuo et al., 2013). As students engage in virtual contexts, they may require support to limit problems that could arise in relationships such as aggressive and problem behaviours, hostility,

reduction in empathic feelings, and decrease in prosocial outcome (Anderson et al., 2010; Eastin, 2007; Ewoldsen et al., 2012; Greitemeyer & Cox, 2013; Mazurek & Engelhardt, 2013b).

As discussed earlier, the students interacted differently with elements of the audio mode. From a multimodal perspective, the findings evoked that sounds are embedded in social interactions, and carry meanings in contextual and situated ways (New London Group, 1996; West, 2017, Chapter 30). Some students with an ASD may demonstrate difficulties in audio-visual integration and filtering irrelevant sounds, and may display insufficient behavioural responses to sounds (Boddaert et al., 2004; DePape et al., 2012). Certain sounds may not make sense linguistically, but sounds entail semiotic processes and even though they seem mundane should not go unnoticed or dismissed as uninteresting. A growing body of research has attended to the responses of students with an ASD to elements of the audio mode (Fernández-Andrés et al., 2015; Kern et al., 2006).

Some in-game sounds mimicked by the students were sometimes described as weird by their peers. Analysis of the findings also indicated that the students felt at risk of being perceived by peers and adults as abnormal if they verbally reproduced virtual sounds in physical spaces such as classrooms. This perception compounded social interaction difficulties and opportunities to sustain social interactions. Despite the social interaction potentials afforded by the sounds associated with online virtual games, the students still experienced social interaction difficulties as they tried to interact through virtual sounds.

These findings are consistent with the existing research suggesting that repetitive utterances made by students with an ASD may be interpreted by people in the same physical spaces as seemingly meaningless, strange, intolerable, noise-making, nonsense, trifling, or idiosyncratic (Bogdashina, 2003). The perception of being labelled weird, annoying, or different may compound challenges associated with social interactions such as developing relationships (Gallup et al., 2016).

The findings are also important, considering that some students with an ASD who are often on the periphery of their classroom social networks may have fewer reciprocal and meaningful friendships than their peers without an ASD (Kasari et al., 2011).

Given the new contribution of the data, the findings have implications for supporting students to develop peer relationships through engagements with virtual sounds. It stands to reason that children with an ASD who mimic multimodal aspects of electronic screen media, including sounds (Howard & Patti Ducoff, 2008) may not desire or feel comfortable to socially interact within peer social networks with those who do not share appreciation of mimicked sounds from virtual worlds. Students with an ASD are more likely to spend time with the peers with whom they have shared interests (Boyd et al., 2007). Drawing on the work by Gee (2015b), some sounds may be more relevant, meaningful, and accepted in one Discourse community than another. The findings also have implications for providing opportunities for students with an ASD to rehearse discourses associated within the games' Discourse and subsequently project these audio discourses with other Discourse members, such as their peers and friends. Time spent with peers who have common interests could increase comfort and confidence levels in relationships as well as navigate students with an ASD from the periphery of their classroom social networks (Gallup et al., 2016; Kasari et al., 2011).

**6.2.4.3 Conclusion to section 6.2.** To conclude, section 6.2 discussed the difficulties in relationships that students with an ASD experienced as they engaged with the multimodal semiotic resources of online multiplayer games. Despite the potentials to support social interactions, develop friendships, and enhance reciprocity, the students with an ASD experienced difficulties in multimodal ways that constrained social interactions with online players, peers, friends and siblings. Notably, students experienced verbal disagreements with regards to semiotic resources, displayed difficulties with social understanding through uses of digital written text, and displayed evidence of

unappreciation for the visible contributions of others. They used virtual gestures that functioned for aggressive and self-injurious behaviours, and they imitated in-game sounds that were sometimes described as weird. If engagements with the multimodal semiotic resources of online multiplayer games reflect difficulties in online and offline relationships, then multimodal scaffolding and support may be required to minimise and manage the difficulties (Ishii, 2010). Support to develop and maintain relationships within an inclusive context may have a positive impact not only on relationships, but also on social interactions, classroom climates, and learning processes (Santos et al., 2016).

The literature on relationship difficulties experienced by students with an ASD (American Psychiatric Association, 2013; Kasari et al., 2011), the relationships of youths with an ASD in online gaming environments (Kuo et al., 2013), multimodal perspectives (Jewitt, 2017, Chapter 2), and D/discourse (Gee, 2015b), has guided understandings of difficulties in the online and offline relationships of students with an ASD. This approach enabled broadened insight about social interaction constraints within the context of online multiplayer games. Future research within the context of online multiplayer games may enable further descriptions of the multimodal ways students with an ASD experience social interaction constraints, such as difficulties in relationships. Having discussed the relationship difficulties associated with online multiplayer games, the following section synthesises the findings on the social interaction constraints of online multiplayer games for the social interactions of students with an ASD. This discussion follows below.

### **6.3 The Constraints of Multiplayer Games [RQ 1, 1a, 1b, and 1c]**

This study has aimed to describe the multimodal forms of social communication used by students with an ASD and social interaction affordances within the context of online multiplayer games. Chapter Six described part two of the findings, which focused on the social interaction constraints associated with online multiplayer games. Section 6.1 reported the findings on

multimodal repetitiveness and section 6.2 reported the findings on the difficulties in relationships. Section 6.3 now synthesises the key findings on the social interaction constraints that were common across the data sets. The key findings are illustrated below in Figure 20.

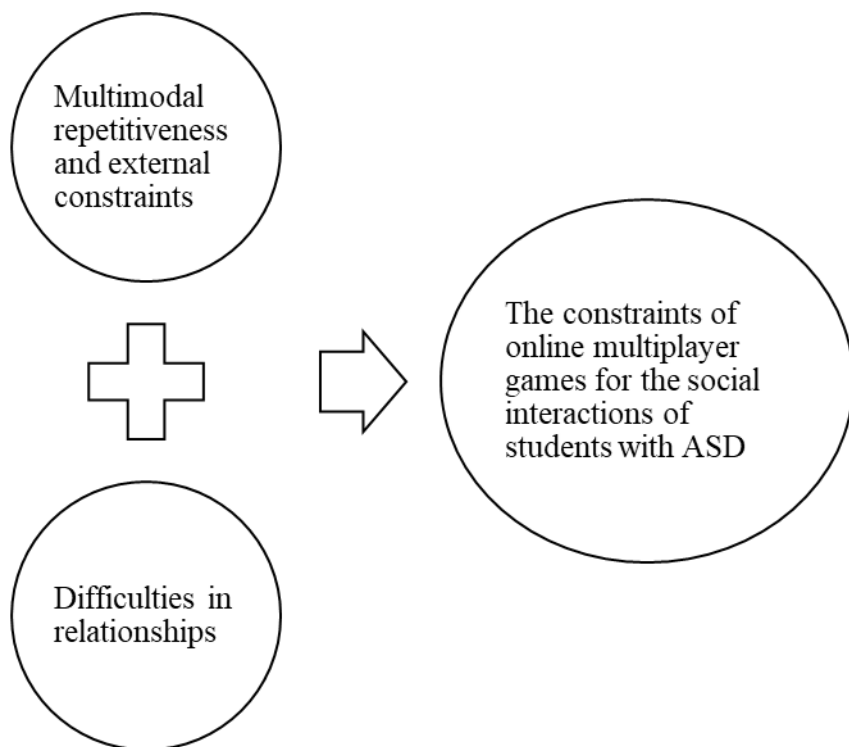


Figure 19. Constraints of online multiplayer games.

The data revealed that the students used a configuration of oral, written, gestural, visual, and audio forms of social communication as they engaged with the semiotic resources of *Minecraft*® and other online multiplayer games, within online and offline affinity spaces, and home and school environments. There were two main constraining features of online multiplayer games for the social interactions of students with an ASD. These constraints are

- Repetitive engagements with the semiotic resources of online multiplayer games. The students also experienced external barriers to participation in virtual and physical environments, including physical, technical, geographical, and financial restrictions on their access to semiotic resources.
- Difficulties in relationships within online and offline contexts.

The findings revealed that, despite the potentials of online multiplayer games to support social interactions, develop and sustain friendships, and enhance reciprocity, modal elements of social communication forms conveyed multiple meanings of social interaction constraints. These results also add to previous studies that have described student, parent, and teacher views about the interest of students with an ASD in video games (Gallup et al., 2016; Winter-Messiers, 2007). This study advances previous understanding of the verbal and nonverbal forms of social communication that students with an ASD use by researching social interactions within the context of online multiplayer games (American Psychiatric Association, 2013).

Given the social interaction constraints that were discussed in the study, there is implication to target the verbal and nonverbal modalities that are embodied within online multiplayer games (Vance, 2017). Previous research has shown that children with an ASD may be supported through verbal elements of social communication such as speech in conversations (Kissine et al., 2015; O'Reilly et al., 2016), and through nonverbal communicative behaviours, such as gestures through direct gaze and body movements (Braddock & Hilton, 2016; Kaartinen et al., 2012). By building on gaming research as well as notions of contemporary literacies research and inclusive education (Ashman, 2014; Quandt & Kröger, 2014; Street, et al., 2017, Chapter 16), the findings suggested that students with an ASD may benefit from scaffolded and differentiated social interaction support through the multimodalities of online multiplayer games. It is argued that online and offline social interactions are more multimodal than they used to be (McCreery et al., 2015). Therefore, newer opportunities should be embraced for students to socially interact through a variety of communication forms and social communication modes (Kress, 2017, Chapter 4).

The results of this study are significant given their consistency with the existing body of research on the repetitiveness in activities, behaviours, and interests of students with an ASD (American Psychiatric Association, 2013; Bishop et al., 2013; Boyd et al., 2007; South, Ozonoff, &

McMahon, 2005). The findings contribute to the growing research by showing that video game play may have subsequent negative impact on the face-to-face interactions of gamers, including primary-school students with an ASD and without an ASD (Dezuanni et al., 2015; Greitemeyer & Mügge, 2014; Mazurek & Engelhardt, 2013b; Suárez et al., 2013). The results supported the understanding that the social interaction difficulties and differences experienced by students with an ASD are caused not only by the characteristics of ASD (American Psychiatric Association, 2013), but also by external barriers that may be institutional, semiotic, parental, technical, and physical (Oliver, 2013).

The data also suggested that multimodal social interaction support can be connected to students' repetitive traits as well as mitigating external constraints in students' physical and virtual worlds. Inclusive education moves towards maximising the potentials of multiple meanings to meet the needs of students, and reducing all constraints, barriers, and exclusive practices (Gillies & Carrington, 2004; Ravet, 2011), such as within the Discourse of online multiplayer games and social interactions (Gee, 2015b). Previous studies in the general population have suggested that understandings of the potentials of online multiplayer games may direct parents to limit external constraints to the games (Bourgonjon et al., 2011; Finke et al., 2015). With this understanding, teachers may provide students with scaffolded support when it is needed within the context of online gaming (Beavis et al., 2012; Marcon & Faulkner, 2016). These considerations may be steps towards building multimodal bridges through inclusive new literacies, and between school and home contexts (New London Group, 1996).

In terms of difficulties in relationships, the fluctuation of affordances associated with relationships enhance understanding that, despite the potentials of online multiplayer games for developing friendships, social interaction difficulties in relationships may still be evident under environmental situations that are similar or the same. The relationship potentials of online

multiplayer games may need to be targeted, given that some students with an ASD may have some unilateral friendship relationships and may face difficulties that are obstacles to their ability to transfer their friendships from the virtual context to various contexts (Gallup et al., 2016; Kasari et al., 2011). In general, the findings suggested that students with an ASD may require scaffolded support and explicit teaching to sustain relationships in prosocial ways.

The findings discussed in this chapter revealed that despite the social interaction potentials associated with online multiplayer games, the students experienced social interaction constraints associated with their multimodal repetitiveness and difficulties in relationships. These constraints were common across virtual and physical spaces. This chapter embraced theoretical understandings that social interaction constraints associated with online multiplayer games may be revealed materially, physically, and socially (Kress, 2013). They may be revealed through the repetitive uses of conceptual and material semiotic resources, and through social interactions, relations, and processes that are discursively shaped from the perspective of research participants and within online and offline Discourses (Gee, 2014; Jewitt, 2017, Chapter 2). Social interaction constraints may also be understood through a multimodal design and through repeated patterns of interconnection and intersemiotic relationships among social communication modes (New London Group, 1996; Unsworth, 2013). The chapter was guided by understandings that distinctive meanings revealed through the analysis of social communication modes could align and be complementary or they may conflict with each other and reveal tensions within the context of communicative events (Jewitt, 2017, Chapter 2).

Although other studies have highlighted concerns about video game use among students with an ASD (Mazurek & Engelhardt, 2013b), this is the first empirical study on the social interaction constraints of online multiplayer games through multimodal perspectives (Jewitt, 2017, Chapter 2) and D/discourse perspectives (Gee, 2015b). The findings add to the literature by enhancing



knowledge about the correlation between factors such as social interaction constraints, multimodal repetitiveness with the semiotic resources of online multiplayer games, external restrictions, and difficulties in relationships. They have implications for future research from the theoretical perspectives of multimodal analysis (Jewitt, 2017, Chapter 2) and D/discourse analysis (Gee & Handford, 2012). Having discussed the social interaction potentials and constraints of online multiplayer games, the focus moves to Chapter Seven, which briefly restates the aims of the research, summarises the research findings, reintroduces the conceptual and theoretical frameworks, and makes recommendations for practice and future research.

## Chapter Seven: Summary, Limitations, and Recommendations

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This study investigated the affordances of online multiplayer games for the social interactions of middle-primary-school students with an ASD. It is framed against a backdrop of developments within two fields of education: (1) NLS (Mills, 2010a), and (2) inclusive education (Booth & Ainscow, 2011). The study's aims, as outlined in Chapter One, are restated here and were achieved:

- To describe the potentials and constraints of online multiplayer games for the social interactions of students with an ASD.
- To describe the multimodal forms of social communication that students with an ASD use when they engage with online multiplayer games.
- To describe parent perspectives of the enabling and constraining features of online multiplayer games for the social interactions of their children with an ASD.
- To describe teacher perspectives of the enabling and constraining features of online multiplayer games for the social interactions of students with an ASD within formal educational settings.

This is the first study to draw together multimodal and D/discourse perspectives of the semiotic resources within the context of online multiplayer video games, and within a descriptive ethnographic case study methodological approach (Gee, 2015b; Jewitt, 2017; Robben & Sluka, 2015; Simons, 2009). The study contributes the conceptualisation of inclusive new literacies within the fields of NLS and inclusive education, particularly for students with an ASD. This notion is discussed further below in section 7.3. As described in Chapter Three, the theoretical framework embodies a multimodal approach that offered a lens to describe and understand how the social interactions of students with an ASD can be supported and hindered by the following: semiotic resources, such as discourses, social communication modes, actions, communication media, digital

tools, material resources, artefacts, signs, symbols, systems, and observable features, within the context of online multiplayer games (Bjorkvall, 2017; Gee, 2015b; Jewitt, 2017; Kress, 2012, Chapter 3; O'Halloran, 2005). This framework also enhanced understanding that social interactions may be supported or hindered by personal, virtual, physical, social, historical, environmental, institutional, and cultural factors (Bainbridge & Marchionini, 2010; Waltz, 2013; Woods, 2017).

Through an inductive approach to coding and data analysis (Thomas, 2006), the themes that emerged on the affordances of online multiplayer games for the social interactions of students with an ASD are illustrated below in Figure 21. Three major themes represented social interaction potentials and two major themes represented social interaction constraints. The potentials of online multiplayer games for the social interactions of students with an ASD are (a) support for initiating and sustaining social interactions, (b) developing and sustaining friendships, and (c) enhancing reciprocity.

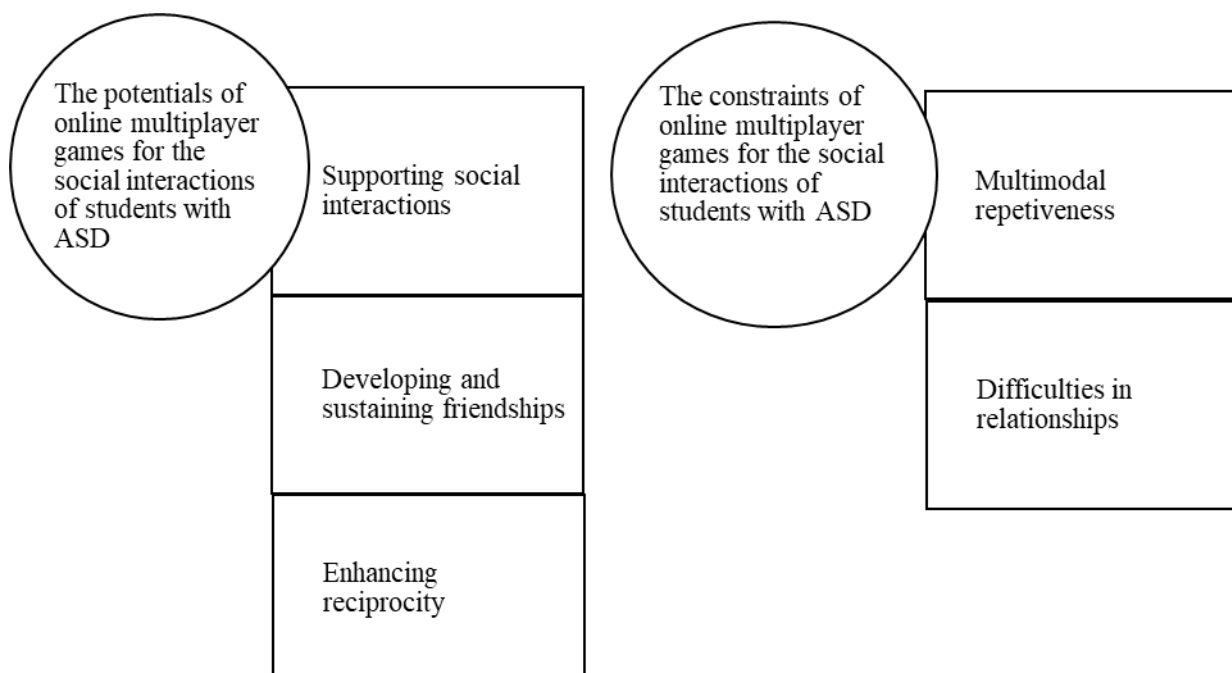


Figure 20. Social interaction affordances of online multiplayer games.

As illustrated in Figure 21, the two major themes that emerged as social interaction constraints associated with online multiplayer games for students with an ASD are multimodal

repetitiveness and difficulties in relationships. Some of these constraints were caused by external factors, including adult restrictions, and technical difficulties. Together, the major themes were described as the affordances of online multiplayer games for the social interactions of students with an ASD. Figure 21 illustrates these affordances. The theoretical lenses of multimodality and D/discourse contribute to ongoing understandings of the physical, material, virtual, and social potentials and constraints that are associated with semiotic resources, and environmental and institutional offers within the Discourse of online multiplayer games (Gee, 2015a; Gibson, 1977, Chapter 3; Jewitt, 2008, 2017; Kress, 2013).

In summary, the findings reflected, that regardless of the potentials of online multiplayer games and semiotic resources used to socially interact, social difficulties were still evident for the students with an ASD. Additionally, given that the characteristics of ASD were evident despite their participation in a motivating socially engaging platform, it is argued that students with an ASD could require appropriate support to engage socially with and through the semiotic resources of online multiplayer games. From these findings that were discussed in Chapters Five and Six, and the conceptual framework that was presented in Chapter Three, comes a proposed model that recognises online multiplayer games as inclusive new literacies. The proposed model is discussed below in section 7.3 and illustrated below in Figure 22. It supports the recommendations to use online multiplayer games as inclusive resources in formal educational settings. These recommendations are discussed below in section 7.4. They are focussed on targeting the multimodal social interaction potentials that were discussed in Chapter Five, and on reducing the constraints to social interactions that were discussed in Chapter Six.

## **7.1 Limitations of the Study**

The researcher intended to recruit five students with an ASD, five peer students without an ASD, five parents of students with an ASD, and five teachers of students with an ASD. However,

only four students with an ASD were recruited. At-screen data were only collected from three students with an ASD, given that the researcher did not have access to the fourth student's home for at-screen data collection. For consistency among the at-screen, peer face-to-face, and student interview data, only the data from three students were reported on in this thesis. Additionally, four parents participated in the research. However, to be consistent with the student data, this study described and reported the data from only three parents. Given the richness and consistency of the data that were collected through the at-screen observations of the three students, the face-to-face peer interactions of three students and five peers, and the semi-structured interviews of three students, three parents, and five teachers, this limitation did not impact on the strength or the appropriate interpretation of the findings. Further findings from the student and parent participant groups will be reported in future research publications.

The study was limited with its use of observing student interactions with one online multiplayer game. Other primary students on the autism spectrum may not have had an interest in *Minecraft*® but in other online multiplayer games. Nonetheless, the research data reflected information about a variety of online player games that were platforms for the students' social interactions. Furthermore, caution was exercised not to make generalisation from at-screen *Minecraft*® play to other online multiplayer games. As newer technology develops, no one online multiplayer game will be locked in time. Moreover, *Minecraft*® may not be relevant in future contexts of the social interactions of students with an ASD. The use of *Minecraft*® as the online multiplayer game of focus within this study adds new understandings about the affordances of online multiplayer games for the social interactions of students on the spectrum.

Another limitation of the study concerns the number of multimodal forms of social communication and modal elements that were transcribed, described, and reported. To explain, during their at-screen interactions with *Minecraft*®, the students used other forms of social

communication that were tactile, spatial, and sensory for meaning making. For example, they used modal elements such as touch, proximity, and taste during virtual social interactions. These forms of social communication have meaning making for social interactions and have been discussed in the existing literature (Mills, 2015; Moore, 2015). However, due to the richness of the data and the time restrictions in which to analyse and report the findings, attention was focused on the oral, written, visual, gestural, and audio modes. The analysis and reporting of oral, written, visual, gestural, and audio modes enabled new understanding of the multimodal nature of the students' virtual and physical social interactions (Kress, 2013; Lemke, 2017, Chapter 11). These multimodal forms of social communication that the students used during engagements with online multiplayer games, revealed affordances for their social interactions (Jewitt, 2017, Chapter 1).

The limitation of transcriptions of video-recorded observations was acknowledged in that the transcripts are only a reduced representation of observed reality of the actual interactions (Flewitt et al., 2017, Chapter 3). Consequently, some modes of communication were prioritised and presented while others are absent. The representation of the data in this thesis was restricted to written and visual forms. These forms of representation were used despite the descriptions of multimodal meanings that were represented through speech, gestures, and sounds. Despite this limitation, the use of a manual verbatim manner of transcription revealed multimodal affordances through the theoretical lenses of multimodality and D/discourse (Evers, 2011; Gee, 2014; Halcomb & Davidson, 2006; Kress, 2013).

Another limitation is that the complexity of the multimodal transcription process was time consuming and required repeated viewing, listening, and reading. Due to the magnitude of data that were transcribed, some social interaction affordances could not be reported in the study. Additional findings will be reported in future research publications. These limitations revealed implications for

future research into social communication modes and social interaction affordances within the context of online multiplayer games.

## **7.2 Recommendations for Future Research**

This study contributes new understandings to the literature on gaming, ASD, and literacies within the fields of NLS and inclusive education. Given that research on the multimodal affordances of online multiplayer games for students with an ASD is relatively new within these fields, it is important that further research be conducted to include students with an ASD as a social group, whose online and virtual literacies need special recognition. Even though previous studies have described the social interactions (Deckers et al., 2014; Owen-DeSchryver et al., 2008), literacies (Francis et al., 2013; Lanter & Watson, 2008), and online engagements of students with an ASD (Gallup et al., 2016), this study offers implications for future research to embrace the conceptual framework of inclusive new literacies. A conceptual framework of inclusive new literacies may be necessary to integrate discourses, concepts, and theoretical assumptions from the fields of NLS and inclusive education that may seem disparate. For example, there is potential for a future study to integrate medical and social discourses to describe how students with an ASD as a social group display social understanding in inclusive virtual environments.

The affordances of online multiplayer games for the social interactions of middle-primary students with an ASD were described. Expanding this research topic to other levels of primary school could deepen understandings of how engagements with online multiplayer games influence the social interactions of younger (5-to-8-year-old) and older (10-to-12-year-old) primary-school students with an ASD, in offline and online contexts, and in home and school settings. Additionally, further research from the perspectives of upper and lower primary-school students with an ASD could provide deeper insights about how to increase the social interaction potentials and reduce the social interaction constraints associated with online multiplayer games, for these groups of students.

Future research may also investigate the perspectives of secondary school teachers about the enabling and constraining features of online multiplayer games for the social interactions of students with an ASD within formal educational settings.

The findings support previous research that has indicated that online multiplayer games are played among gamers in local and international contexts (Bainbridge & Marchionini, 2010; Fuster et al., 2013; Gallup et al., 2016; Suárez et al., 2013). Hence, the online gaming engagements of primary-school students with an ASD with other students, peers, and friends from various local private, independent, and state schools may be further investigated. There may be additional forms of social communication that other students on the spectrum use when they engaged with online multiplayer games that were not addressed within this study. Therefore, this study also has implications for national and international research with students with an ASD to describe other multimodal forms of social communication that they use during online multiplayer gaming. Further research may investigate how students' use of multimodal forms of communication extend beyond their school and local contexts with peers to other affinity spaces with online national and international players (Gee, 2015b). There is abundant room to expand the research topic to other online multiplayer games that are played within Australian and across international contexts.

Future comparative studies could investigate the differences between how the social interactions of students with an ASD and without an ASD are supported through their engagements with *Minecraft*® and other online multiplayer games. Further research may explore how social interactions may be supported through other video gaming platforms with a wider range of online multiplayer games, including those played in the school contexts and home contexts. For example, future research may explore the affordances of virtual reality for the social interactions of students with and without an ASD. A study of this topic could add to research that seek to understandings the engagements, symbolic play, and social cognition of students with an ASD in virtual reality



environments and through virtual reality tools (Bekele et al., 2013; Herrera et al., 2008; Kandalaft et al., 2013).

The participants of this research included three male students with an ASD and their mothers. Although there have been previous studies on the engagements of students with an ASD with video games (Gallup et al., 2016; Mazurek & Wenstrup, 2013), the topic of girls with an ASD and their engagements with online multiplayer games is underexplored. Female students with an ASD could be purposefully selected as participants for future research into the affordances of online multiplayer games. Purposeful sampling could provide new understandings of this topic from female students with an ASD who have high levels of interest in online multiplayer games and experiences with online multiplayer games (Patton, 2015; Suri, 2011). Future research could include fathers and add new understandings of parent perspectives of the enabling and constraining features of online multiplayer games for the social interactions of their children with an ASD. Further research with other family members, such as siblings, may reveal additional social interaction potentials and constraints of other online multiplayer games across home and school settings for students with an ASD. A body of literature highlights the importance of accessing knowledge into students' home and online literacies practices from their family members, given the influence of these literacies on continuous learning, social understanding, and social interactions (Bourgonjon et al., 2011; Comber & Barnett, 2003; Martini & Sénéchal, 2012; Mazurek & Wenstrup, 2013; Nebel et al., 2016; Wernholm & Vigmo, 2015).

Further research should explore dominant discourses, in addition to discourses such as social interaction support, friendships, reciprocity, multimodal repetitiveness, and conflicts in relationships. For example, another possible topic of future research could be to investigate the use of the written discourses in the context of online multiplayer gaming for students with an ASD. Additional research on this topic is needed, especially because the engagements of students with an

ASD with online multiplayer games (Gallup et al., 2016), and screen-based written texts and digital texts seem to be on the increase (Mills et al., 2017, Chapter 2). Research on the expressive writing samples of students with an ASD about their interests in online multiplayer games is lacking. There needs to be a broadened understanding of the repetitive uses of written modal elements in the domain of restrictive and repetitive interests, behaviours, and activities (American Psychiatric Association, 2013).

Given that students with ASD may engage in restricted and repetitive behaviours, interests, and activities and in video gaming activities, a future study could explore the motivational benefits of engagement with online multiplayer games for students on the spectrum (Fuster et al., 2013; Hailey et al., 2011; Kryzak & Jones, 2015; Winter-Messiers, 2007). Further research on this topic could broaden understandings of the correlation between (a) students' repetitive behaviours, interests, and activities within online multiplayer gaming contexts and (b) students' motivational levels for engagement and participation with peers within educational contexts. Some students with an ASD may display diverse sensory responses across physical environments as they engage in restricted and repetitive behaviours, interests, and activities (American Psychiatric Association, 2013). Researchers of ASD have highlighted the need for further research into sensory modalities and the correlation of social communication modes to the human senses (Ashwin, Ashwin, Rhydderch, Howells, & Baron-Cohen, 2009; Boyd et al., 2009). In addition, the value of the multisensorial aspect of social communication modes and literacies practices are recent areas of interest (Mills, 2015). A variety of playful potentials for students' sensorial literacies learning with digital media are available (Mills et al., 2017, Chapter 2). Mills et al. (2017, Chapter 2) suggest that sensory literacies have opened potential ways for students to gain meanings not just from pressing buttons but also through human breath, tapping, swiping, dragging, tilting, and shaking. Therefore, a study that describes the correlation between multimodal repetitiveness and sensory reactions of

students with an ASD in online gaming contexts may broaden understandings of multimodal forms of social communication that students with ASD use during online multiplayer gaming and understandings of the multisensorial aspect of online multiplayer gaming. A study on this topic may provide insights into how to support the sensory sensitivities and sensory needs of students with an ASD in multimodal ways as they engage in virtual environments. Such a study should attend to how repetitive uses of a multimodal configurations reveal new social interaction affordances through the students' bodies and senses. Future studies could analyse students' diverse sensory responses in virtual environments through specific multimodal forms of social communication, such as tactile and gestural.

Finally, there is abundant room for framing further research on students with an ASD's engagements with online multiplayer games, through the theoretical perspectives of multimodal analysis (Jewitt, 2017, Chapter 2) and D/discourse analysis (Gee & Handford, 2012). For example, future research may fuse theories of multimodality (Kress, 2013) and D/discourse (Gee, 2015b), with research that highlights how the repetitive interests, behaviours, and activities influence the social interactions of students with an ASD (Bishop et al., 2013; Troyb et al., 2016). Future studies with the application of multimodal analysis and D/discourse analysis may provide broader understandings of other affordances of inclusive new literacies for students with an ASD.

### **7.3 Online Multiplayer Games: A Model of Inclusive New Literacies**

The central claim of this research is that online multiplayer games are inclusive new literacies that provide multimodal support for social interactions and social understanding in online and offline affinity spaces. The conceptual framework and findings of this study draw on the notion of inclusive education such as that outlined in *Article 24, Comment Number Four* of the UNCRPD (CRPD, 2016). They underline the need for a model of inclusive new literacies that highlights the potential for using online multiplayer games as inclusive resources within the classroom setting. As

highlighted in Chapter One, within the field of NLS, there is a lack of literature related to the potentials and constraints of online multiplayer games for the social interactions of students with an ASD. This topic has not been adequately researched despite research indicating that the popularity of online multiplayer games among students has soared over the past two decades (Beavis, 2014; Nagygyörgy et al., 2013). Moreover, a growing number of students with an ASD are likely to be more interested in playing online multiplayer games as opposed to playing offline single player games or engaging in physical play with peers (Gallup et al., 2016; Kuo, Orsmond, Coster, & Cohn, 2014).

The gap in the NLS literature draws attention to the need for a model to better understand the online and virtual literacies practices of students with an ASD and to address students' literacies needs through inclusive principles. This proposed model is timely, given that it expands understandings of the online and offline literacies practices of 21<sup>st</sup> century students with an ASD (Reynolds, Wheldall, & Madelaine, 2011; Woolley, 2016). It is significant because the NLS literature does not explicitly address how to make reasonable accommodations for all learners, including students with an ASD, according to the inclusive educational principles of the UNCRPD *Article 24, Comment Number Four* (CRPD, 2016).

Figure 22 illustrates a proposed model of how online multiplayer games can be used as inclusive new literacies. The concept of inclusive new literacies highlights that social interactions and social understanding are multimodal, and challenges previous conventional assumptions of what literacy is or is not. There are implications to support all students, including those on the autism spectrum, as they engage with affinity groups in virtual and physical affinity spaces.

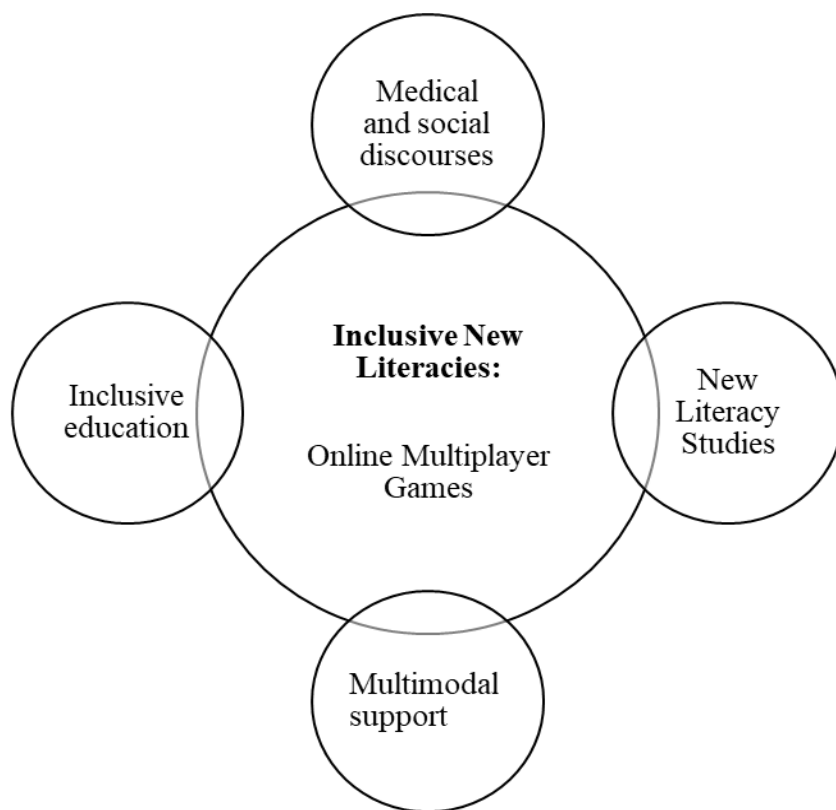


Figure 21. Model of online multiplayer games as inclusive new literacies.

*Article 24, Comment Number Four* of the UNCRPD protects the right to the inclusive education of students with disabilities (CRPD, 2016; De Beco, 2014). Drawing on the social model perspective of the UNCRPD, the proposed model (see Figure 22) illustrates the perspective that there are social, physical, and virtual barriers to all students participating in social interactions. The model is proposed in consideration that all students with and without disabilities or medical diagnoses have rights to support and participation within inclusive educational contexts (CRPD, 2016). The differences or difficulties students with and without disabilities or medical diagnoses experience in literacies practices should not be discriminated against. In contrast, the focus of proposing this model is to highlight the multimodal ways that all students can be supported within inclusive environments. The notion of multimodal support is reflected in the proposed model of inclusive new literacies, emphasising that all students should be supported in multimodal ways within inclusive environments.

The CRPD (2016) promotes that within the framework of inclusive education (a) all students have a right to participate through all available resources, (b) barriers are illuminated and removed, and (c) changes be made to provide appropriate and necessary accommodations and adjustments for students' needs. Additionally, De Beco (2014) argues that a lack of resources is an obstacle to inclusive education. Inclusive education within the proposed model, therefore, reflects the notion of making accommodations for social needs to ensure that students can participate in social interactions and quality literacies experiences through making appropriate semiotic resources accessible. The proposed model is created to promote a perspective of acknowledging students' right to inclusive education and taking the necessary steps to support their social interactions within this context. It reflects that accommodations are made to meet the individual needs of students with an ASD, thereby enabling them to achieve the social interaction potentials of online multiplayer games, as afforded to other students. To support student means, for example, technologies that afford various forms of social communication need to be accessible and available for students' use (CRPD, 2016; MCEETYA, 2008).

A 21<sup>st</sup> century description of literacies encompasses the ability to use modes of communication in a variety of contextual forms for social interactions (Street et al., 2017, Chapter 10; Tompkins, 2014). Contemporary understandings of literacies include a recognition that students gain meaning and communicate through visual, oral, gestural, linguistic, musical, kinaesthetic, and digital ways (Alvermann, 2009, Chapter 1). Similarly, the proposed model provides a framework for embracing the multimodal potentials of online multiplayer games within the context of NLS, particularly for students with an ASD. While NLS claims to be inclusive, more research is needed to understand the multimodal literacies practices of students on the spectrum. The proposed model reflects that there is a broadened and newer innovative way of defining and understanding the contemporary nature of different literacies, such as gaming literacies (Garcia, 2017, Chapter 16),

technology literacies (Thomas, 2011), digital literacies (Jones, 2012), and virtual literacies (Merchant et al., 2014). As Apperley and Beavis (2013) state, digital literacies, such as those in video games, prepare students to actively participate out of school and create lasting bridges between contemporary curricular and students' out-of-school literacy experiences. The proposed model evokes that the new literacies that are found in online multiplayer games have contributed to the shift from the autonomous model of literacy. It embraces integration of a broad and flexible group of skills, abilities, strategies, and competencies that motivates students to think critically, and to independently and collaboratively construct meanings in multimodal ways.

The proposed model presented in Figure 22 underscores the notion that students' online literacies practices can be linked to their social interaction development (Merchant et al., 2014). Students' engagements with online multiplayer games reflect that the contexts of social interactions are being broadened to online contexts and are manifested in virtual and physical environments (Gee, 2015; Prensky, 2001). Descriptions of social interactions must, therefore, include multimodal aspects of online social interactions instead of solely relying on behavioural observations in physical spaces. As the patterns and practices of 21<sup>st</sup> century social interactions of students shift beyond the boundaries of physical affinity spaces to online activities and digital contexts (Hayes & Duncan, 2012; Marsh et al., 2016; Richards & Burn, 2014), inclusive support for students needs to be reconceptualised to embrace the social interaction affordances offered by the literacies of online multiplayer games. Without this broadened understanding, perspectives of support for the social interactions of students with an ASD may be inhibited to physical environments and may ignore the fact that some students with an ASD do spend quite a lot of time socially interacting through video games (Gallup et al., 2016). The proposed model is presented for use in literacies curricula with digital video games, including those that are played online. It provides a timely framework for how teachers and other educators can capitalise on the multimodal potentials of the games, for example,

how speech, written texts, images, gestures, and sounds within the games' context support social interactions as students navigate virtual and physical spaces.

The proposed model of online multiplayer games as inclusive new literacies draws on findings of this research, the contemporary notions of inclusive education and new literacies, and the works of video gaming scholars to emphasise that online multiplayer games are inclusive new literacies that have multimodal potentials to support student social interactions (Beavis, 2014; CRPD, 2016; Ferguson et al., 2013; Garcia, 2017, Chapter 16). D/discourses of social interactions extended deeper than words and physical contact among peers for enjoyment, and focused on multimodal aspects of social interactions through the semiotic resources of online multiplayer games (Gee, 2015b). This research embraced the notion of supporting social interactions across virtual and physical contexts, for all students with and without medical diagnoses. This notion is consistent with the developments in the fields of inclusive education and NLS (Apperley & Beavis, 2013; Bourgonjon et al., 2010; Boyd et al., 2015; Ferguson et al., 2013; Wijnhoven et al., 2015).

#### **7.4 Recommendations to Use Multiplayer Games as Inclusive Resources**

The data described in this research were based on students' gaming experiences outside and within school contexts. The proposed model draws on these findings and leads to several recommendations for social interaction support so that students, including those with an ASD, can participate in multimodal ways in virtual and physical affinity spaces, within school settings. A visual framework is provided below in Figure 23 to support the recommendations. The recommendations for practice extend the findings presented in Chapters Five and Six. Hence, the findings are briefly reviewed below. Due to the considerable amount of time that students with an ASD spend in the school environment, and engaged with video games (Mazurek & Engelhardt, 2013a), the recommendations move beyond the findings that were gathered outside of the school setting.



Researchers in game studies have argued for the literacies practices of digital games, such as *Minecraft*® to be incorporated into the English curriculum and to be used to motivate student classroom social interactions, literacies practices, and extracurricular activities (Beavis et al., 2015; Marcon, 2013; Marcon & Faulkner, 2016). Insights from this study might be incorporated in practical ways into curricula for all students, including those with an ASD. The literature is drawn on to recommend how educators can use the results of this research to multimodally support students' social interactions within school settings. This study offers recommendations for educators, such as teachers, who are continually searching for multimodal and practical ways to support students with an ASD to initiate and sustain social interactions, develop and sustain friendships, and enhance reciprocity, particularly with their peers. The recommendations presented below apply to educators who may seek a multimodal approach to mitigate the social interaction constraints associated with online multiplayer games, such as multimodal repetitiveness and difficulties in relationships.

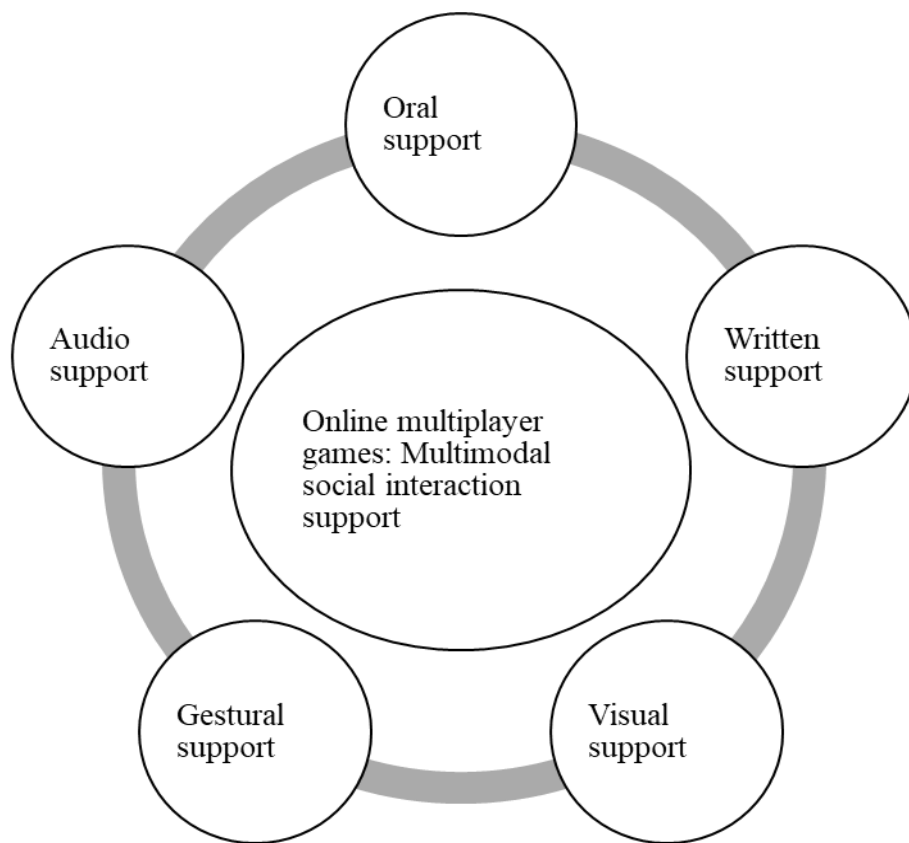


Figure 22. Framework to use multimodal potentials of online multiplayer games.

The framework presented in Figure 23 illustrates the proposed multimodal ways that online multiplayer games can be used as inclusive resources within formal educational contexts. Educators are encouraged to pay more attention to these multimodal potentials for social interactions because their knowledge of the interests, in-and-out-of-school relationships, and social interaction skills of students is crucial to student positive social interactions within an inclusive classroom setting (Beavis et al., 2012; Carrington & MacArthur, 2012; Gee, 2015b; Plows & Whitburn, 2017, Chapter 1).

**7.4.1 Recommendations for educators to target oral potentials.** The recommendations for practice extend the findings on the social interaction affordances that were revealed through the oral mode and draw on the existing research. As was discussed in Chapter Five, online multiplayer games facilitated the students' abilities to use oral skills, such as the use of speech in greetings, and

enabled them to share information with their school friends, peers, and adults about their online gaming experiences. Additionally, parents and teachers perceived that students with an ASD became friendlier over time when they had opportunities to talk with their social partners about a shared interest in online multiplayer games. Common online gaming play interests served as contexts for friendly discussions and reciprocal conversations as students spoke about their gaming.

On the contrary, the data presented in Chapter Six showed that, regardless of the oral potentials afforded to the students with an ASD by online multiplayer games, difficulties with the oral mode of communication were still evident. To demonstrate, the social interactions of the students were hindered at times when they used speech to talk excessively about online gaming experiences and engaged in one-sided conversations about their online gaming interests. In addition, their discussions of certain gaming discourses were at times considered inappropriate for their developmental ages, by their teachers, and within the school contexts. A lack of semiotic resources to transmit speech also restricted the potential for reciprocal conversations between students with an ASD and their online friends. The findings implied that students may need appropriate scaffolding for excessive use of speech within the context of online multiplayer games.

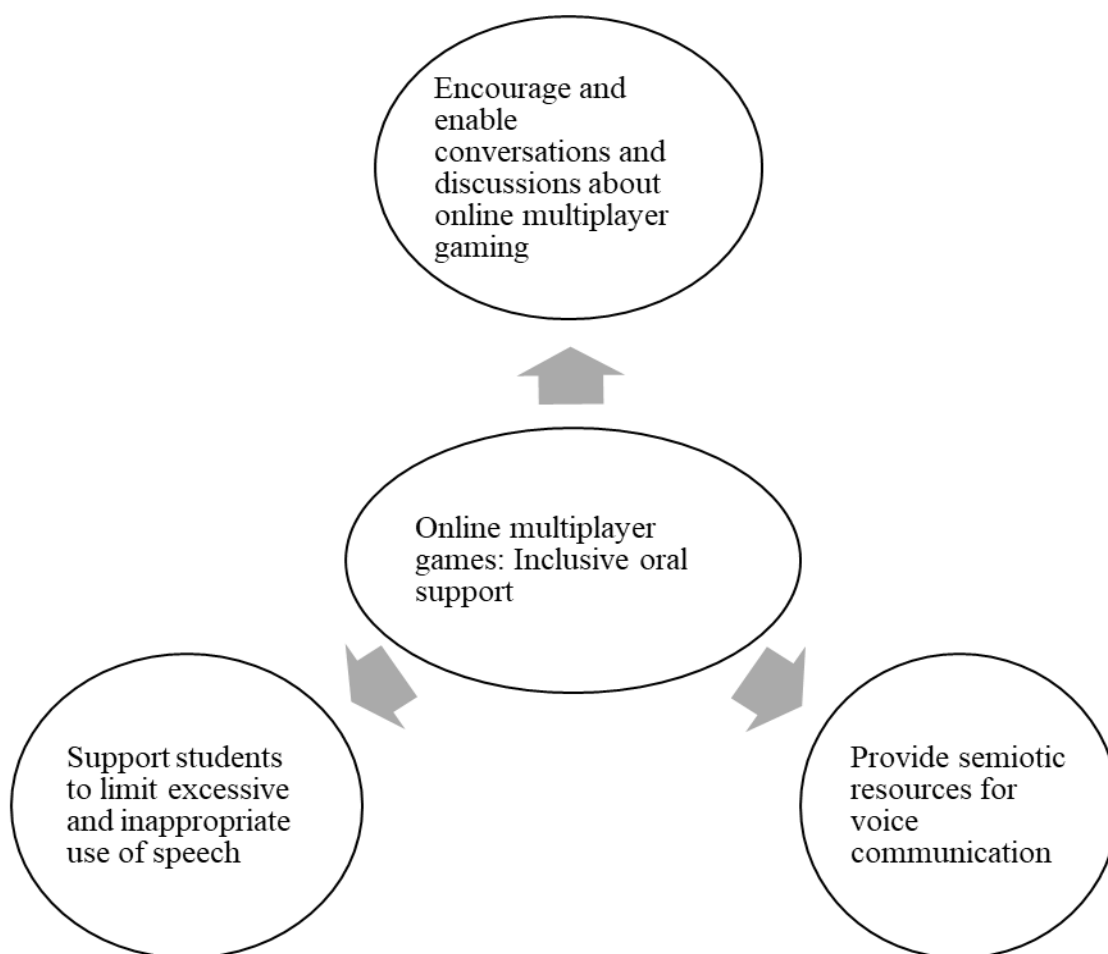


Figure 23. Framework for inclusive oral support.

Figure 24 highlights the recommendation that students should be allotted special times to engage in reciprocal speaker-responder conversations and discussions about their gaming interests with their friends and peers who may be interested. Within the context of online multiplayer games, the interrogative, imperative, and declarative uses of speech (Halliday & Matthiessen, 2014) could be targeted to encourage students to have speaking roles in which they orally give, seek, or demand information about online multiplayer games; and to increase participation in social interactions through making offers and requests, giving commands, and directing and greeting others in virtual contexts. *Minecraft*® has facilitated conversations in which primary-school students discussed their online gaming experiences and social interactions with their peers (Dezuanni et al., 2015).

Additionally, providing students with opportunities to engage in conversations about their online interest-driven and friendship-driven activities and the affinity spaces in and around video games could support their natural flow of speech in social interactions (Gee; 2012; Ito et al., 2009).

Conversations with peer friends may be supported through opportunities to speak about the games' characters, actions, settings, sequence of events, and about strategies that are used during gameplay (Apperley & Beavis, 2011; Beavis et al., 2015; Bradford, 2012, Chapter 13).

Another important oral potential of online multiplayer games that should be targeted is the ability to use voice communication and video calls communication with other online players who may be in separate physical environments. The potential to use voice programs and semiotic resources between two or more peers who may be playing online multiplayer games, for example *Minecraft*®, is encouraged (Dusmann, 2013). During online gaming, programs such as *Skype*™ and *Kinect*™ and other semiotic resources, such as headphones and microphones, could enable students to transmit and receive speech at comfortable listening levels.

Meaning making from speech and opportunities to engage in reciprocal spoken language while playing online could also be facilitated by seating students with an ASD within proximity to their friends or peers in the same physical spaces. Video gaming in the same physical spaces with peers, within a comfortable level of physical proximity, could foster positive relationships, such as friendships, and social skills, such as reciprocity, for students with an ASD (Boyd et al., 2015). Whether students engage consciously or unconsciously in verbal exchanges and speech acts, these forms of oral communication should be regarded as relevant to their daily social interactions (Luke, Sefton-Green, Graham, Kellner, & Ladwig, 2017, Chapter 20). A bidirectional and communicational connection between students and their peers, and digital technologies facilitate their capabilities to have dialogues, to listen, to recognise speech, and to use speech to assimilate and share information (Peres et al., 2008, Chapter 5).

Another key recommendation is that educators should take precautions about students' engagement in excessive and inappropriate speech about their gaming interests. The findings of this and other studies show that some students with an ASD may show enthusiasm, confidence, and motivation to speak about their special interests (Kryzak & Jones, 2015; Winter-Messiers, 2007). However, excessive personal engagements in narratives about one's interest can lead to peer rejection (Dean et al., 2013). Precautions to prevent students from engaging in excessive speech are essential so that peers do not become bored, disengaged, or uninterested when students with an ASD talk about online multiplayer games. Drawing from recent literature in NLS (Luke et al., 2017, Chapter 20), it is argued that scaffolded support to build an awareness of a speaker's intent and of the consequences associated with speech acts may help to minimise these possible social interaction constraints. Additionally, if student engagements with some oral discourses of online multiplayer games are perceived as inappropriate, what may also be required is scaffolded support through discussions, guidelines, and guidance on the inappropriateness of certain spoken discourses within the school environments.

**7.4.2 Recommendations for educators to target written potentials.** Returning briefly to the written potentials discussed in Chapter Five, the findings highlighted students' use of written grammatical units to invite and join their friends on *Minecraft*® servers and in virtual spaces, attract the attention of others, and direct and greet other players. Written grammatical units were used to send and receive messages, communicate rules for playing *Minecraft*®, and maintain engagements with other online players. In addition, the students engaged in the discourse of online multiplayer games through drawing virtual images, reading printed texts based on the games they played online, and writing about their gaming experiences. Despite the digital texts facilitating highly engaging activities for social interactions, the students' engagements with the digital texts reflected excessive

and inefficient use of written texts, conflicting and unsafe online communication with other gamers, and technical difficulties that constrained their virtual social interactions.

Figure 25 presents a framework for how the written potentials of online multiplayer games could be implemented into the school context to support students with an ASD in their social interactions.

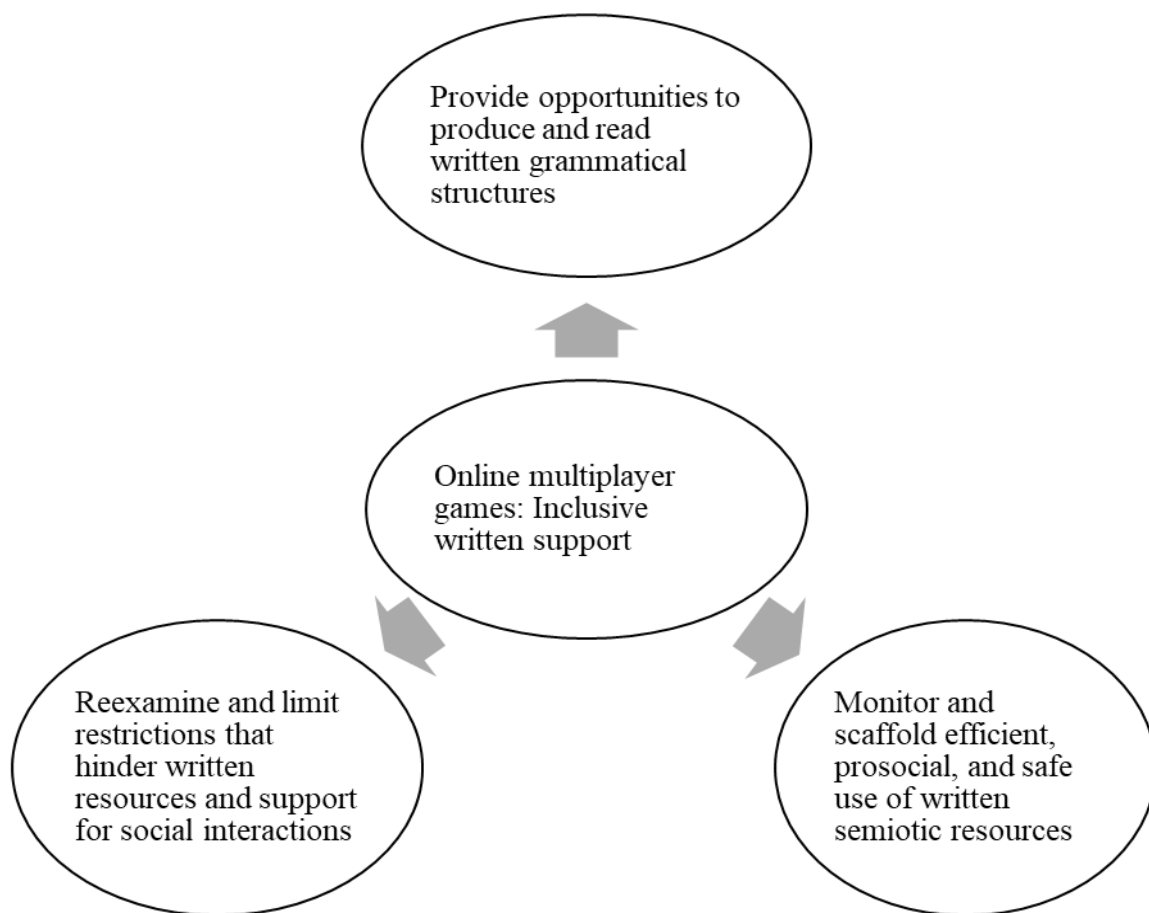


Figure 24. Framework for inclusive written support.

The framework presented in Figure 25 highlights the recommendation of how to facilitate the social interactions between students with an ASD and their peers through the production of written grammatical structures in virtual signs, virtual pages and books, and online message boxes and group chats. These written platforms within the contexts of online multiplayer games could be integrated into core academic areas, such as reading, production, and critiquing of screen-based

written texts in online gaming contexts. By gaining writing experiences with peers in a virtual environment, students could learn to communicate about their experiences, reflect on their perceptions of others and their own communicative behaviours, reciprocate written meanings and information through collaboration, and apply new understandings to future social interactions (Apperley & Beavis, 2011; Gee, 2007b; Leonard, Withers, & Sherblom, 2011).

The framework calls for educators to provide scaffolding and support for students' efficient use of written text, and safe and prosocial online interactions. It is suggested that if there is a tendency for repetitive preoccupation with the use of digital text, that students should be provided with scaffolded support to use grammatical written structures efficiently with time during online interactions with their peers and friends. Furthermore, if certain written discourses, such as destruction and death, are considered inappropriate for the students' age level and the school context, educators could provide scaffolded guidance and have discussions with their students about the meanings of the written texts and the possible negative influence on their social interactions. Gamers are more likely to demonstrate prosocial behaviours and reciprocity in virtual social interactions and subsequent physical interactions if they use screen-based written texts to engage cooperatively during video game play with others (Ewoldsen et al., 2012; Velez et al., 2016). In addition, if students are to interact privately and publicly with unknown online players, educators should take precaution that the platform of online multiplayer games enables gamers of all ages to socially interact through the written mode for extended periods of time. Students may require monitoring, explicit teaching, and scaffolding in the safe use of the written mode and discouraged from sharing personal information with strangers when engaging with the written semiotic resources of online multiplayer games.

Additionally, educators should be practical in illuminating, reexamining, and removing external barriers that hinder students from using written semiotic resources and receiving



appropriate written support for social interactions. For example, unnecessary and unreasonable restrictions on school-controlled servers, network settings, and navigational options that hinder written support for online social interactions should be removed. Students should have a level of autonomy and freedom to access the written semiotic resources of robust technologies and to participate safely in interesting online social interaction platforms with peers and friends (Ito et al., 2009). To deny students of reasonable access to these resources for social interactions may be considered as noninclusive and a form of discrimination within formal educational settings (CRPD, 2016).

**7.4.3 Recommendations for educators to target visual potentials.** The recommendations for practice extend the findings presented on the visual social interaction potentials and constraints of online multiplayer games. They also draw on existing research. As described in Chapter Five, the students with an ASD received social interaction support, developed and sustained friendships, and enhanced their reciprocity as they engaged with virtual images in online multiplayer games. Conversely, the data presented in Chapter Six revealed social interaction constraints associated with the students' repetitive engagements with virtual images and material resources of online multiplayer games. Specifically, the students displayed unresponsiveness to social initiations and a tendency for favouritism towards their own images. They experienced difficulties in relationships, including online griefing and destruction of their virtual images.

Based on the findings, it is proposed that educators embrace a framework for (a) targeting the social interaction potentials of visual-virtual representations, and (b) providing scaffolded visual support to students who may need to be socially reciprocal and to demonstrate prosocial behaviours during their engagements with online multiplayer games. This framework is illustrated in Figure 26.

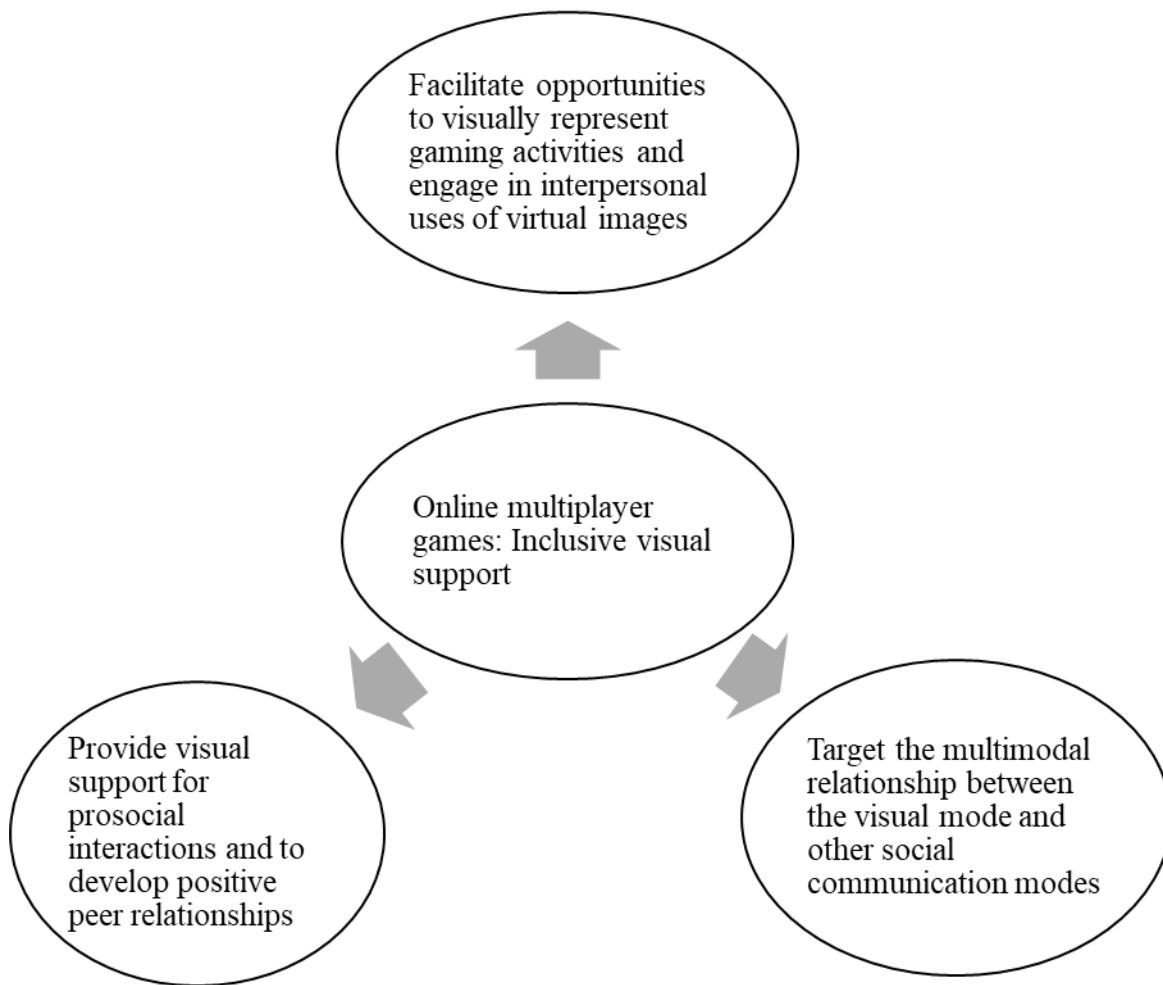


Figure 25. Framework for inclusive visual support.

Figure 26 highlights the recommendation to provide opportunities for students to produce drawings of images that represent gaming activities or virtual entities from their at-screen engagements with online multiplayer games. Such activities might increase the likelihood of their peers who have a common interest to gravitate towards them for social interactions and might enhance opportunities for students to engage in interpersonal use of images (Boyd et al., 2015; Gallup et al., 2016; Kress & Van Leeuwen, 2006). For example, students should be encouraged to engage in mutual viewing of virtual images, giving and receiving feedback about virtual images, and sharing of visual resources with their peers and friends.

Educators are also encouraged to target the multimodal relationship between visual elements and other multimodal elements to support social interactions. For example, students should be encouraged to create illustrated stories and written texts that convey visual information, meanings, and messages about their online gaming experiences. Similarly, if visual support is augmented with oral prompting, the configuration of social communication modes might enhance the contribution that students with an ASD can make to conversations (Leach & LaRocque, 2011). This recommendation is encouraged within the framework of inclusive visual support, given that some students with an ASD may demonstrate enhanced visual acuity (Ashwin et al., 2009). Visual support could be beneficial for students on the spectrum who are visual thinkers (Rogers, 2013). This recommendation evokes a multimodal perspective that interactions are comprised of multiple social communication forms that are copresent and central to meaning making (Jewitt, 2017, Chapter 2; Kress, 2012, Chapter 3).

The framework presented in Figure 26 illustrates that as students engage with the games' semiotic resources, they should receive visual support to engage in prosocial interactions and to develop positive peer relationships. To demonstrate, as students engage with the visual elements of online multiplayer games, they should be given opportunities to make meanings about the consequences of conflict causing behaviours particularly with peer friends, and scaffolded support to resolve relationship difficulties that they may experience. In addition, support for resilience might give students confidence to cope with potential bullying and to develop self-regulatory behaviours (Saggers & Strachan, 2015), especially when they experience grieving and other conflicts in the virtual context. Opportunities to positively engage in interest-driven and friendship-driven activities with virtual images should be encouraged to support negotiations between students, and their peers and friends (Ito et al., 2009).

A focus on this type of support is necessary given the consistency between this research findings and literature that indicates a link between video games and antisocial behaviours, problem behaviours, and conflicts in relationships (Coyne et al., 2016; Ewoldsen et al., 2012; Mazurek & Engelhardt, 2013b; Power, 2008). This framework draws on the understanding that positive social relationships impact on social interactions and learning within the context of inclusive education (Kasari et al., 2011; Razer, 2017; Santos et al., 2016). Students with an ASD may require support to develop and maintain relationships (Al-Ghani & Al-Ghani, 2011; DiSalvo & Oswald, 2002).

**7.4.4 Recommendations for educators to target gestural potentials.** Recommendations for practice draw on findings of the gestural affordances for social interactions and the existing research. From the discussions in Chapter Five it can be seen that the students with an ASD used virtual, digital, and physical gestures as they engaged with the semiotic resources of online multiplayer games. These gestures supported their abilities to initiate and sustain social interactions, to develop and sustain friendships, and to enhance reciprocity. However, as shown in Chapter Six, despite these potentials, the students' highly repetitive uses of gestures were associated with physical isolation and loss of opportunities for gestural meaning making. Furthermore, the boundaries of the physical spaces restricted opportunities for the students to reciprocate gestural meanings between themselves and online players who were their peers and friends. The students experienced difficulties in relationships, including virtual death and aggressive behaviours. Some of these gestural behaviours were reflected in their face-to-face engagements with peers. Thus, these data suggest that the social interactions of students with an ASD with friends and peers could be greater if gestural supports are in place to target students' gestural potentials of the games.

Figure 27 offers a framework with three recommendations to use online multiplayer games for social interaction support within the context of inclusive education.

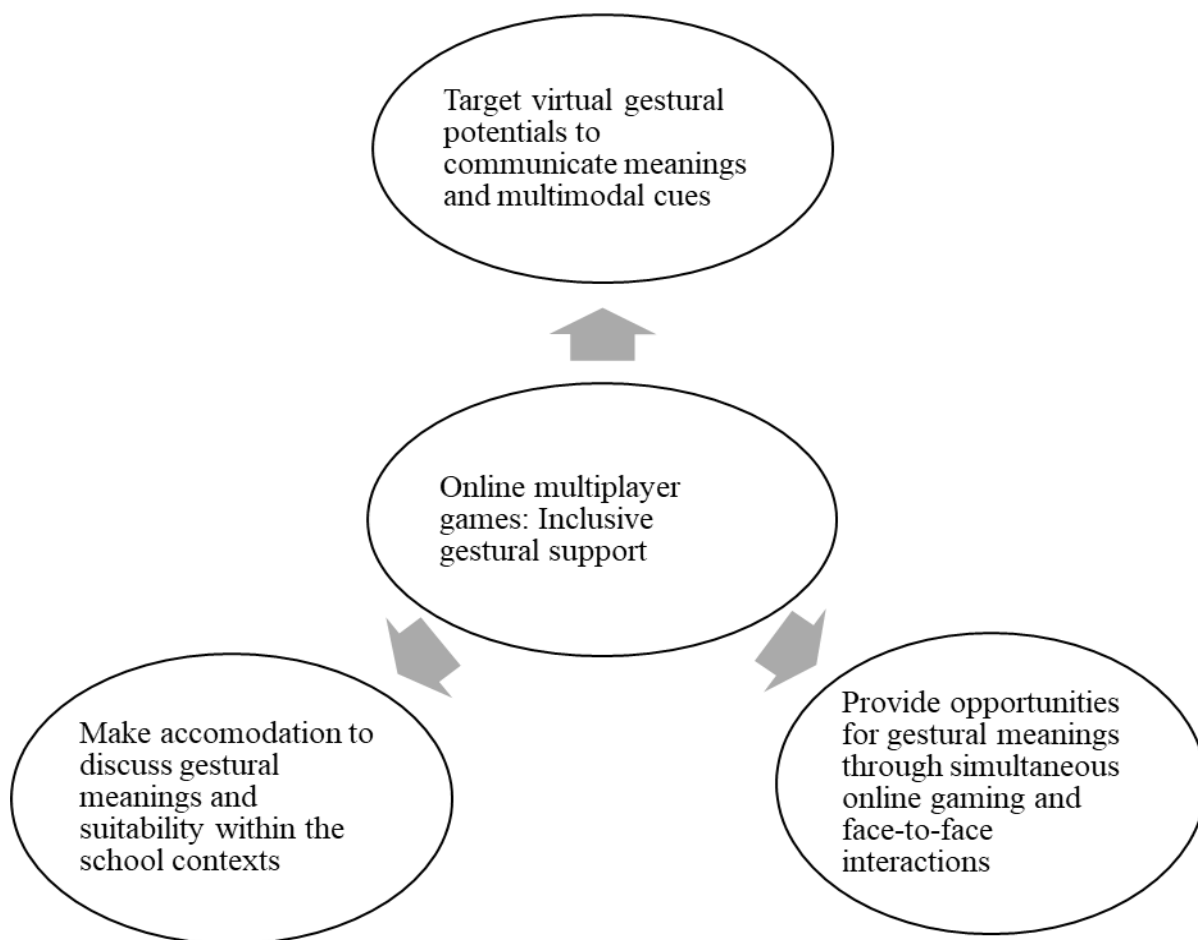


Figure 26. Framework for inclusive gestural support.

The framework illustrated in Figure 27 proposes that educators embrace the semiotic resources of online multiplayer games to facilitate student use of digital gestures for social interactions. It is recommended that educators target the games' virtual-gestural potential to support students' ability to cooperate, and share activities, resources, and information during their gameplay. Likewise, the potential of online multiplayer games to convey human gestures through avatars should be encouraged to initiate and sustain social interactions, share virtual resources, engage in cooperative and competitive activities, and roam, explore, and fly across virtual landscapes. Gestural potentials of online multiplayer games should also be encouraged to support students' abilities to recognise and execute actions and movements through their avatars (Beavis & Apperley, 2012, Chapter 2). In addition, students should be provided with opportunities to use digital gestures to communicate

multimodal cues to their social interaction partners. Digital-gestures such as through the use of a cursor can be used to increase pointing rates, facilitate declarative pointing, communicate positional cues about screen images and written texts, indicate directional cues, and give meanings about what type of interaction to anticipate (Blackman, 2013; Shih, Shih, & Wu, 2010). Educators should provide opportunities and semiotic resources for students to understand and reciprocate physical gestures as they interact with peers who may be in separate physical spaces. For example, meanings for social interactions may be made through the use of picture-in-picture livestream that enable the viewing of facial expressions, emotions, and body language during at-screen play (Finke et al., 2016).

Another recommendation presented in the framework of gestural support is that students, and their peers and friends should have opportunities to socially interact simultaneously in online gaming and face-to-face within the same physical spaces. This recommendation was reflected in the parent and teacher interview data. It emphasises that educators could use these occasions to explicitly teach the meanings of physical gestures as students, and their peers and friends interact together with the semiotic resources of the games. For example, educators should consider providing students with physical and virtual platforms to mutually make gestural meanings and reciprocate gestures that communicate body language, body cues, facial cues, and human emotions.

Educators are also encouraged to provide scaffolded support and guidance for the appropriate use of gestures during and after online gaming. Students should receive guidance in their use of prosocial, antisocial, virtual, and physical gestures given risks factors of engaging with video gaming. Some risk factors include online conflicts, subsequent aggression in physical play, self-injurious and destructive behaviours in virtual contexts and in subsequent offline contexts, and thoughts of suicide (Canossa, 2014; Rehbein, Kleimann, & Mössle, 2010; Rothmund, Gollwitzer, & Klimmt, 2011). The framework for gestural social interaction support acknowledges that conflicts

can be resolved in virtual and online contexts (Buote et al., 2009), and within online and offline relationships (Ishii, 2010). Additionally, online multiplayer games offer gestural potentials to understand behavioural consequences, promote social understandings, and develop skills such as complex problem solving, decision making, action taking, inferring, and conflict managing in social interactions (Gee, 2015b; Mitchell et al., 2007).

The framework of gestural social interaction potentials of online multiplayer games is encouraged for students who benefit from gestural scaffolding of social situations. These students may have preferences for limited physical touch during social interactions and may experience difficulties to use their physical bodies to engage in shared physical activities (Boche & Henning, 2015; Freeman et al., 2015; Riquelme et al., 2016; So et al., 2015). Gestural potentials should be targeted within the context of online gaming so that students can competently complete certain tasks and can effectively engage in activities through use of virtual gestures.

**7.4.5 Recommendations for educators to target audio potentials.** Recommendations for educators to target audio potentials to support and scaffold social interactions are guided by the research findings and supported by the literature. As pointed out in Chapter Five, the virtual sounds and other audio cues of online multiplayer games enabled opportunities for the students with an ASD to make meanings for online and offline social interactions, and to engage in symbolic play and conversations as they discussed and reduplicated virtual sounds with their peers and friends. Despite these potentials, the findings presented in Chapter Six showed that students still experienced social interaction difficulties, such as conflicts in social interactions, sensory reactions to in-game sounds, and difficulties and restrictions in transmitting and reciprocating sounds beyond the physical boundaries that they engaged in at the screens. Given the implication that students may

require support for their sensory and audio needs, and the use of appropriate audio semiotic resources, recommendations for inclusive audio support are illustrated in Figure 28.

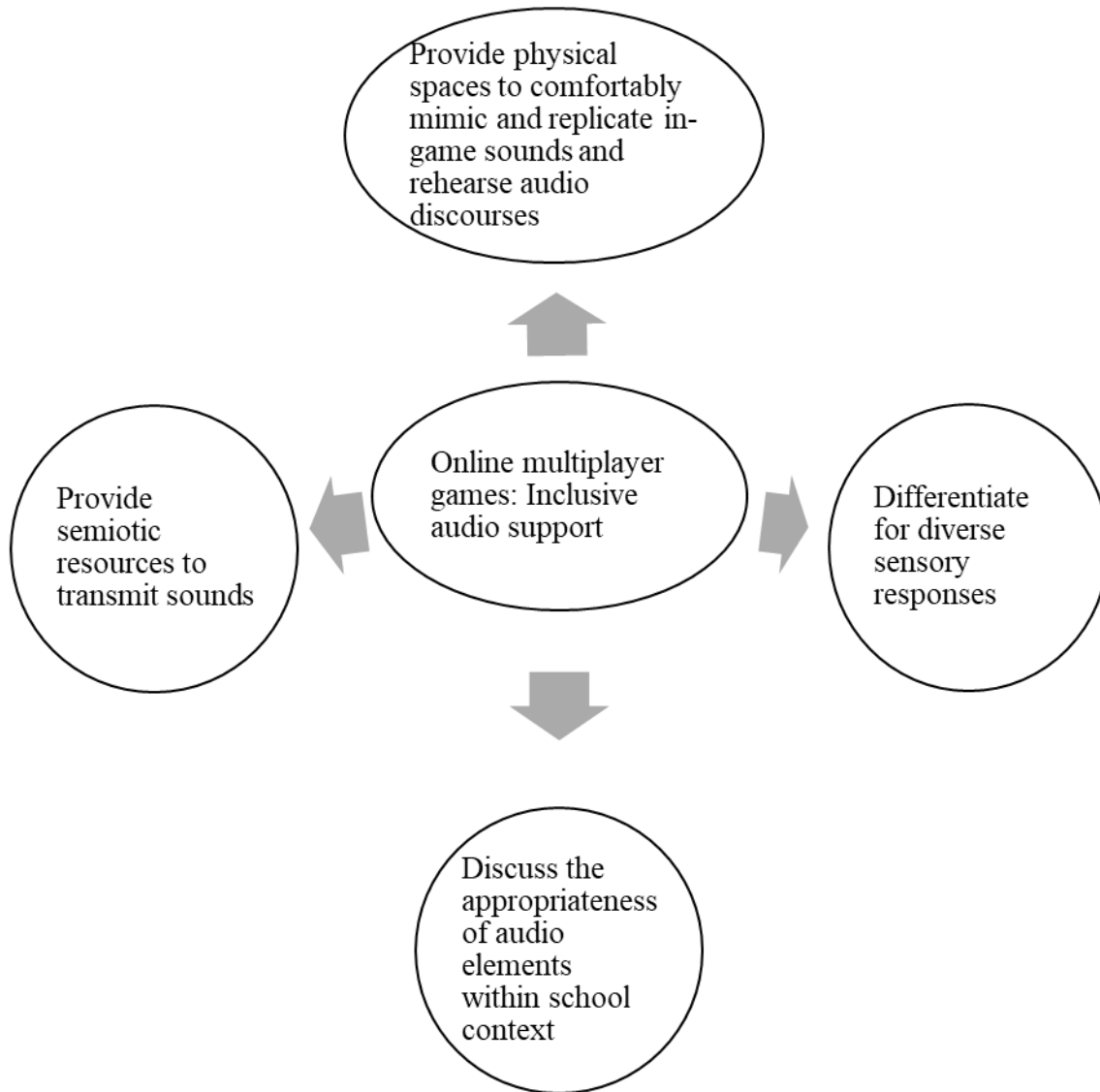


Figure 27. Framework for inclusive audio support.

The framework of audio support (see Figure 28) suggests that educators should consider physical spaces for students with an ASD to comfortably mimic and replicate in-game sounds, and to rehearse audio discourses associated with online multiplayer games during social interactions with their peers and friends. Opportunities to socially interact through the vocal rehearsal of in-game sounds in symbolic play or conversations with peers, is worth considering for students who



share an interest in the audio elements of online multiplayer games and may otherwise have being perceived and labelled as makers of strange, abnormal, and disturbing sounds. Educators may need to have discussions with the students about the timing and appropriateness of audio elements within the school setting. For example, the vocalised rehearsing of in-game-audio discourses, such as music or shooting sounds, during a classroom silent reading session may not be appropriate. These opportunities are necessary within the framework, because the development of symbolic and representational play could be an obstacle in the social communication of some students with an ASD (Freeman et al., 2015). Some students may be on the periphery of their classroom social network (Kasari et al., 2011). Furthermore, it may be common for student gamers to have an affinity and preference for each other's company and friendship, and vocally engage in the discourses of the games with each other subsequent to their gaming experiences (Eklund & Roman, 2017; Yee, 2014).

This framework is embraced to emphasise an understanding of students' unique and diverse sensory responses as they engage in the virtual spaces of online multiplayer games. It emphasises the need to differentiate for students given the possibilities that the same sounds may bring both discomfort and enjoyment in social interactions. Educators should be aware that students with an ASD may demonstrate sensitivity in hearing, and low sensory adaptability to audible elements across multiple environments (Fernández-Andrés et al., 2015). Students' hypersensitivity to certain in-game sounds that may be perceive as sharp, loud, or startling should be investigated and accommodations made to lower or mute the in-game volume. Given that background noise and sensory sensitivity may be barriers to social development within the context of inclusive education, the provision of audio semiotic resources to limit social interaction constraints is essential (CRPD, 2016). Other strategies for students who display sensory sensitivity to in-game or environmental sounds may include, desensitisation to increase enjoyment, tolerance, and meaning making from the

sounds and camouflaging the intensity of audio elements through listening to personal music through headphones. Although not specific to video gaming, Atwood (2006) and Bogdashina (2003) suggested similar accommodations for the sensory needs of students with ASD. If the students' excessive engagements with the games' audio features reinforce hyposensitivity to in-game sounds, students may need support and guidance so that their opportunities for social interactions with their peers and friends are sustained. In a broader sense, educators should be aware that multimodality is associated with the senses (Mills, Comber, & Kelly, 2013).

Within a framework of audio support there needs to be an availability of audio semiotic resources that are available within formal educational settings. Also, within this framework educators should enable opportunities for student interactions through the games' semiotic resources that transmit audible information about online gamers, virtual characters, and multimodal aspect within virtual environments. These semiotic resources may include earphones and microphones. This support may decrease the chances of students missing audio cues and audio warning that could help them avoid obstacles in social interactions, save their virtual lives, and sustain social interactions (Oren et al., 2008; Stevens, 2011). Making accommodations for students to have adequate access to these semiotic resources and to have opportunities to participate through these resources are essential elements of inclusion (Warschauer & Tamara, 2017).

This section contributed a framework with practical recommendations for educators to support social interactions through the multimodal potentials of online multiplayer games, within inclusive educational contexts. Within this framework, students need to access and receive appropriate educational services and social interaction support to identify and meet their individual needs. The existing research encourages scaffolded support in multimodal ways through the literacies of technologies and multimodal texts (Beavis et al., 2015; Boche & Henning, 2015; Oakley, 2017, Chapter 10).

## 7.5 Concluding Statements

The study contributes original and new understandings about how online multiplayer games influence the social interactions of students with an ASD, within the fields of NLS and inclusive education. Data showed that, online multiplayer games are platforms that afforded students on the spectrum potentials for supporting social interactions, developing and sustaining friendships, and improving reciprocity in virtual and physical environments. Furthermore, students with an ASD engaged through various social communication modes, including oral, written, visual, gestural, and audio.

Additionally, the use of new methodological approaches such as multimodal perspectives (Jewitt, 2017, Chapter 2) and D/discourse perspectives (Gee, 2012a, Chapter 26), contributed to new insights of how online multiplayer games are a Discourse in which students can socially interact in affinity spaces through immaterial and material semiotic resources. The study shows that, through a multimodal theoretical lens (Kress, 2012, Chapter 3; Scallon & Scallon, 2017, Chapter 14), many forms of social communication were combined into a single semiotic whole to understand the potentials and constraints of online multiplayer games. The multimodal potentials of online multiplayer games extended the social interactions of students with an ASD beyond offline, physical, and face-to-face contexts to online, virtual, and at-screen contexts.

This study is significant also because it shows that, regardless of these potentials and despite online multiplayer games being socially motivating platforms, social interaction difficulties for students with an ASD were still evident, within this context. Moreover, regardless of the multimodal benefits afforded to the students, the characteristics of ASD were still evident. The students engaged excessively in multimodal repetitiveness and experienced difficulties in relationships. They experienced external constraints associated with the games' semiotic resources, with technological and network difficulties, and with adult, school, and home restrictions on online

multiplayer games. Given the increase in the prevalence of an ASD diagnosis, and the high interest of students with an ASD with video games (Christensen et al., 2016; Finke et al., 2015; Mazurek & Engelhardt, 2013a), this study is timely. It offers implications to support the social interactions of students with ASD in multimodal ways and to reduce the social interaction constraints that they may experience.

New descriptions and understandings of the affordances of *Minecraft*® and other online multiplayer games for the online and offline interactions of students with ASD have been presented in this study. As a result, the study proposes a model to conceptualise online multiplayer games as inclusive new literacies. From this proposed model, a framework of multimodal support is created and includes recommendations to target the potentials of online multiplayer games and support students in inclusive, differentiated, and prosocial ways. The proposed model and framework evoke the notions that (a) there are multimodal ways and virtual and physical affinity spaces to support positive social interactions and social understanding of all students; (b) there are multiple verbal and nonverbal forms of social communication in human interactions; and (c) diverse semiotic resources are required for supporting students, fostering inclusion, and promoting accessibility to learning (CRPD, 2016; Gee, 2015a; Jewitt, 2017). Given the lack of research on the literacies practices of students on the autism spectrum, within the field of NLS, the proposed model is particularly significant within this field. The new contribution of this study to the fields of NLS and inclusive education, highlights the significance of online multiplayer games to support the social interactions, develop and sustain the friendships, and enhance the reciprocity of students with an ASD. A case is made that as the engagements of students increase within the Discourse and affinity spaces of online multiplayer games (Dezuanni et al., 2015; Dusmann, 2013; Gee, 2015b), other social interaction potentials need to be further understood, so that the multimodal potentials of the games

can be embraced as inclusive new literacies and inclusive resources for all students, with and without an ASD.

## Research Portfolio Appendix

### Refereed journal article

Stone, B., Mills, K., & Saggars, B. (2018). Online multiplayer games for the social interactions of children with autism spectrum disorder: A resource for inclusive education. *International Journal of Inclusive Education*. Advance online publication. doi:10.1080/13603116.2018.1426051

### Book chapter

Stone, B. (2017). Who am I?: Surviving the battle of the roles. In C. McMaster, C. Murphy, B. Whitburn, & I. Mewburn (Eds.), *Postgraduate study in Australia: Surviving and succeeding* (pp. 77-82). New York, NY: Peter Lang.

### Conference presentations

Stone, B. (2015, December). *Multiplayer games: An inclusive new literacy for the social interaction of students with an ASD*. Paper session presented at QUT-BNU-UC Doctoral Forum 2015, Beijing Normal University, Beijing, China.

Stone, B. (2015, November-December). *The potential benefits and risks of multiplayer games for the social interaction of students with an ASD*. Paper session presented at AARE 2015 conference, Perth, Australia.

Stone, B. (2014, October 11). *The affordances of multiplayer games for the social interactions of middle primary years children with an ASD*. Paper session presented at the Queensland University of Technology Higher Degree Research Student Conference in Brisbane, Australia.

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