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Adaptive Video Gaming in the Classroom

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A culminating capstone project submitted to the faculty of Dominican University of California in partial fulfillment of the requirements for the degree of Master of Science in Occupational Therapy.

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Abstract

Background: Limited resources exist to support adaptive gaming in school programming using Microsoft® Xbox Adaptive Controller for children. On the other hand, there is abundant evidence supporting motor, cognitive, and social benefits to gaming in rehabilitation.

Objectives: The goal of this program development project was to create a *virtual gaming toolkit* to support the interdisciplinary team's use of adaptive gaming during school programming.

Methods: Through our needs assessment and collaboration with our community partner, we discussed the parent and caregiver need for guidance in order to use the Microsoft® Xbox Adaptive Controller and facilitate gameplay with peers. Through an extensive review of the literature and in-depth activity analysis of the gaming console and games, we developed a resource website containing: informative game sheets, visual overlays, links to relevant California Common Core State Standards, and instructional videos.

Results: An in-depth survey was developed as part of the website. Ten surveyors analyzed the gaming toolkit had positive attitudes towards the content and the relation to the school criteria.

Conclusion: Literature identifies video games as a way to improve a child's motor, cognitive, and social skills. However, no research demonstrates the Microsoft® Xbox Adaptive Controller's role in-school programming. We designed a *virtual gaming toolkit* to promote the use of the controller so it can be used by the interprofessional team.

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Section I

Introduction

Occupational therapists (OTs) have a key role in addressing the occupations of children with disabilities, including the occupation of play, and specialize in implementing assistive technology (AT) (AOTA, 2016a; Schoonover, 2014). As video game play has become the modern form of play and leisure, game consoles have increased global participation in gaming across the lifespan (Gentile et al., 2017). Gaming can contribute to the development and improvement of motor and social skills in users, such as using eye-hand coordination and collaborating with other players (Hsieh, Lin, Chiu, Meng, and Liu, 2015; Sandlund, Domellöf, Grip, Rönnqvist, & Häger, 2014). However, gaming controllers can be difficult for individuals with physical disabilities to use.

In 2019, Microsoft® Xbox launched the Xbox Adaptive Controller, a user-friendly controller that allows inclusion in the gaming world for children with physical disabilities. Since this is a new system, there is limited research regarding the overall use of the adaptive controller and no research on its use in the classroom. Therefore, this project aims to implement the Microsoft® Xbox adaptive controller into classrooms to enhance students' participation in gaming and social interactions. Moreover, with the support of our community partner on this project will provide video trainings, informative game sheets for teachers on a website dedicated to our capstone, and a live showcase for teachers and OTs to preview and experience the adaptive controller.

Literature Review

Gaming as an Occupation

Occupations are meaningful activities that individuals engage in every day: school, work, leisure, play, activities of daily living, instrumental activities of daily living, and social participation (AOTA, 2014). Play is a child's main occupation; it allows them to understand the world and develop motor, emotional, cognitive, and social skills (AOTA, 2012). Technology has been incorporated into most aspects of our lives, from the cars we drive to our use of cellular devices; as our society modernizes, play must too. Smith (2017) argued that "technology has redefined occupation forever… technology has a role in occupation so fundamentally, it must be considered an essential building block of occupation" and that technology is now a requirement for "work, play, and self-care occupations" (pp. 1 & 5). Thus, technology is changing the way that children engage in the occupation of play.

Video games are becoming far more prevalent in our society. In the United States, over 90 percent of children and adolescents play video games for "substantial amounts" of time (Gentile et al., 2017, p. S81). Online games allow children to play in virtual worlds and provide opportunities for "fantasy play, socio-dramatic play, ritualized play, games with rules, and what might be called 'rough and tumble' play" (Marsh, 2010, p. 30). Virtual games provide children with play experiences similar to those experienced in real-world, physical, and toy based play. Video games create a variety of social environments, as they can be played by multiple gamers together in the same vicinity, and allow for online social connections. Gaming incorporates the ever-advancing world of technology into children's play, allowing them to explore their interests in modern society.

Current Use of Games

Game clubs provide a social experience for individuals to share in the occupation of gaming. They often take place after school or in a library with facilitation from a teacher or librarian (Copeland, Henderson, Mayer, & Nicholson, 2013; Brown & Kasper, 2013). Gaming clubs have centered around board games, educational video games, and role-playing games (Copeland et al., 2013; Brown & Kasper, 2013). Games included aim to increase skills such as eye-hand coordination; academic skills, such as math and understanding history or literature; and facilitating interactions and friendships within a community of students with similar interests (Copeland et al., 2013; Brown & Kasper, 2013; Pence & Dymond, 2016). For example, children with disabilities who engaged in after school activities were shown to have more friendships and social experiences (Pence & Dymond, 2016). However, Pence and Dymond's (2016) survey noted that students with disabilities have the least engagement in after school activities; therefore, gaming clubs can provide an opportunity for children with physical disabilities to participate in a more social environment rather than a motor-based activity.

Barriers of gaming club implementation include lack of awareness that gaming clubs exist, limited access to transportation to and from after-school gaming club, the need for teachers to complete other job demands during the time allotted for the game club, the funds needed to purchase games, and conflicting schedules with additional, after-school therapies (Copeland et al., 2013; Pence & Dymond, 2016). Therefore, the children who could benefit from gaming clubs may not have access to this occupation.

Video Game Ratings

In order for children to be able to play video games, it is important that parents understand the content and appropriateness of what the child is playing. Video games are

currently rated by the Entertainment Software Rating Board (ESRB) and Pan European Game Information (PEGI) for age appropriateness with brief descriptions, such as violence or sexual content. However, these organizations do not account for online social interactions, player modification of games, and the player's decision making, which leads to inaccurate ratings that often mislead consumers (Jiow et al., 2017).

Parents often give more critical ratings than the rating boards; additionally, they are interested in the average playtime, game content regarding violence and sexuality, expenses of the game, and social experiences the game provides (2017). Similarly, when facilitators choose games for the game clubs, they consider the gaming design, its relation to the school curricula, and the duration of gameplay (Copeland et. al, 2013). Additional information exists online to rate the accessibility of different video games for people with physical disabilities; however, these ratings do not take into account the use of adaptive gaming systems and are based on only four people’s experiences with the gameplay (Dagers, 2019). By understanding these aspects of a video game, parents are better able to deem if it is appropriate for their own child.

Benefits of Gaming

Motor

Playing video games allows a child to engage in motor functioning in a way that is amusing and motivating. While users are playing, they are intrinsically motivated to use their motor functioning, whether it be with the use of their eyes, hands, feet, head, or shoulders to achieve the goal in the game. Gaming makes motor skill acquisition and development more inviting and instantly rewarding for children. For example, children with motor impairments, such as cerebral palsy (CP), have been shown to gain more control of their motor speed, control, precision, and smoothness in movement, as well as decreased trunk rotation during extremity

movement while playing (Sandlund et al., 2014). Moreover, specific video games are shown to incorporate different motor movements and accommodate slower processing skills in order for the user to feel accomplished in the task (Hsieh et al., 2015). Games such as the EyeToy®: Play 3 and Scratch software utilize horizontal, vertical, and combinations of upper limb movements to interact with the games (Hsieh et al., 2015; Sandlund et al., 2014). These types of games accommodate the child's motor deficit, allowing them to use their abilities and strengths to accomplish the challenges in the game. Consequently, it can be inferred that the horizontal, vertical, and combinations of upper limb movements produced during play will not only achieve the goal in the game, but they may assist in functional activities. Thus, occupational therapists may be able to utilize video games as a preparatory modality to produce those movements necessary for everyday skills such as handwriting, eating, or handling objects. Playing video games provides an asset to practicing and improving the motor functioning of a child. Gaming affords opportunities to engage in motor skills which may generalize past the time of gameplay.

Social

Video games provide social interactions for children both in person, when players physically play together, as well as online social interactions with players throughout the world. Thus, gamers have numerous opportunities to learn and practice social skills that will benefit them not only during gameplay but also in their everyday occupations such as in school or during playground play. Granic, Lobel & Engles (2014) note that the social benefits of video games include learning group norms, forming groups, leading groups, encouraging cooperative behaviors, reducing hostility, and promoting civic engagement. These skills can then be transferred into real-world relationships (Granic et al., 2014). Therefore, gaming allows children

to collaborate towards a common goal, utilizing components of interdependence, peer training, and pro-social gaming.

Peer Training. Interdependence, collaborative learning, and scaffolding are efficient teaching styles in inclusive and active classrooms (Clinton & Wilson, 2019; Dukuzumuremyi & Siklanderp, 2018). These techniques result in group collaboration and peer-mentoring, which builds a trusting community and allows peers to work together towards a common goal, as well as overall improved performance in the course (Clinton & Wilson, 2019; Forslund Frykedal & Hammar Chiriac, 2018; as cited in Dukuzumuremyi & Siklanderp, 2018). These qualities are beneficial to one's learning, as meaningful social interactions through teamwork and feelings of belonging create a positive learning environment.

Peer training is defined as the assignment of peers to students who have disabilities, in order to provide academic support (Carter & Kennedy, 2006). Olson (2010) demonstrated the effectiveness of peer training with children through video gameplay as they taught one another how to overcome a challenge for the shared goal of winning, using common interests, support, and competition to motivate their learning. In gaming, peer-training can be seen when a player who is already experienced with the game coaches an inexperienced player through a challenging level. The inexperienced player could work through the challenge alone, though this may cause increased frustration; but, by having an experienced player help, the experience may be more positive. They switch between the roles of teacher and student based on who has more expertise in an area of the game (Olson, 2010). Video games provide natural opportunities for children to work together and teach one another how to overcome a challenge in an unscripted manner, being motivated simply by a desire to play rather than because an adult has told them to.

Therefore, children may be able to create stronger bonds and friendships based on their initiation of play, which could then translate to the acquisition of other academic and social skills.

Prosocial Gaming. Prosocial gaming is the use of games that increase cooperative play through the social interactions the games offer to players. Children are able to bond with others and develop friendships while gaming (Olson, 2010). Families and loved ones are often concerned about violent and competitive video games and the increase of aggressive behavior displayed by the child as a result (Greitemeyer & Osswald, 2010; Harrington & O'Connell, 2016). However, competition contributes to growth and development in the context of rough and tumble play and is similarly fostered through interactions within a multiplayer game (Olson, 2010). By playing against others towards a common goal, gaming serves as an alternative "arena for the developmentally appropriate battle for status" (Olson, 2010, p. 185).

Moreover, multiple studies show how prosocial content within games results in prosocial behavior scripts. Since the child is continuously practicing the prosocial and collaborative behavior in the game, they are able to reflect skills such as sharing, team building, and helping during acts away from the screen (Verheijen, Stoltz, Sabine, van den Berg, & Cillessen, 2019; Harrington & O'Connell, 2016). While playing a cooperative game, children's attention is driven to achieve a mutual goal in the game, which increases the child's motivation to do well, and creates a meaningful, collaborative relationship.

Cognitive

In addition to the motor and social benefits, video games also provide cognitive benefits for users. Different types of games require the utilization of different cognitive skills and processing. For example, gamers who play shooting games, such as Halo 4, "show faster and more accurate attention allocation, higher spatial resolution in visual processing, and enhanced

mental rotation abilities" (Granic, Lobel, & Engels, 2014, p. 68). In gaming, children are able to learn from their mistakes, problem-solve to affect new outcomes during gameplay, design their own worlds and characters, and understand the benefits of persevering through a challenge. Video games allow for higher visual processing and attention, practicing the incremental theory of intelligence, placing children into a zone of proximal development, responding to failure productively, and improving emotional regulation (Granic et al., 2014). Not only are these skills attainable through video gameplay, but they can also serve as a means to motivate children to continue to play and build their motor, social, and cognitive skills, as discussed below.

Occupational Therapy's Role

School

OT "help[s] people across the lifespan participate in the things they want and need to do through the therapeutic use of everyday activities (occupations)" (AOTA, 2019). The scope of OT in school settings consists of providing classroom consultations, addressing Individualized Education Plans (IEP) for children with documented disabilities, and collaborating with an interdisciplinary team to promote learning and social engagement for students. School-based OT utilizes a multi-layered model, Response to Intervention (RTI), to identify and support the needs of all students in a classroom (AOTA, n.d.). The RTI model initially provides interventions to whole classrooms, allowing the children who need more individualized and intensive interventions to be identified and served by the OT (AOTA, n.d.). Consequently, the OT uses a "push-in" method of collaboration with the teacher to address and provide general classroom consultation and intervention, rather than pulling students out. Collaborative programming in the classroom can support the incorporation of universal design principles to address the needs of many students as part of the daily classroom routine (Hargreaves, Nakhooda, Mottay, &

Subramoney, 2012). While OT continues to define its role in schools, there is an absence of literature on the exploration of adaptive gaming as an intervention in the classroom setting.

Assistive Technology

AOTA defines AT through the Assistive Technology Act of 2004 (Pub. L. 108–364) as "any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities" (29 U.S.C. § 2202(2); as cited in AOTA, 2016a, p. 2). According to the Individuals with Disabilities Education Act of 2004, AT must be considered on every IEP for children with disabilities (Schoonover, 2014). AT enhances a child's quality of life to help them engage in occupations such as play and social participation by expanding their physical abilities. The OT's lens is key when assessing, creating, customizing, and distributing AT because OTs consider the person's environments and client factors to adapt, modify and individualize tools for a person to perform occupations with modified independence (AOTA, 2016a; Schoonover, 2014). AT can be a means to improve participation and engagement in occupations, or can be an occupation in and of itself, such as "engaging in leisure pursuits using virtual gaming platforms" (AOTA, 2016a, p. 3). Thus, AT allows the child to engage more in the classroom, allowing them to possibly ascribe more positive meaning to learning.

Games

Rehabilitation and therapeutic intervention programs have included gaming to target motor impairments. Multiple studies report OTs' and other rehabilitative professionals' use of consoles, such as the Nintendo Wii™ and Microsoft® Kinect for Xbox One, along with computerized games and adaptive switches, in efforts to facilitate motor skills and rehabilitation across the following populations for therapeutic interventions: children with down syndrome

(Wuang, Chiang, Su, & Wang, 2011), developmental disabilities (Hsieh et al., 2015; Standen, Camm, Battersby, Brown, & Harrison, 2011), and CP (Li, Lam-Damji, Chau, & Fehlings, & 2009; Golomb et al., 2010). OT and rehabilitation interventions involving the use of video games in rehabilitation have shown improvements in motor abilities for the above populations; however, more research is needed to examine gaming as an occupation itself, as well as a means of enhancing one's meaningful social participation.

Accessibility of Gaming Consoles. Console gaming incorporates the utilization of an external technological source, such as a Microsoft® Xbox or Sony PlayStation™, that connects to a monitor or screen and requires the use of one or more external controllers to play. Due to the design of typical controllers, most of the consoles and controllers that are currently commercially available are not suitable for people with physical disabilities who have deficits in finger opposition and fine motor control. Controller characteristics limit their experience and satisfaction of gaming (Engliston, 2019). Despite these limitations in controller design, Beeston, Power, Cairns, and Barlet (2018) report that gaming has been utilized as a therapeutic tool for individuals with disabilities. Moreover, this population plays video games for the same purpose as able-bodied gamers, which is for "fun, relaxation, challenge, and community" (Beeston, Power, Cairns, & Barlet, 2018, p. 11). Therefore, it is imperative that all gamers have access to consoles that accommodate their abilities.

Adaptive Gaming. Gaming is a play and leisure occupation for many; however, people who cannot manipulate a traditional controller are excluded from full participation. Therefore, adaptive controllers are necessary to engage all people in gaming through AT. Switches, joysticks, and various other controllers are commercially available, but these lack accessibility for people with limited mobility or in-hand manipulation use. The Microsoft® Xbox Adaptive

Controller allows for the connection of 19 external devices that range from switches, buttons, mounts, and joysticks. Xbox collaborated with Erin Muston-Firsch, Erik Johnson, and Kaitlyn Jones, occupational therapists who utilize video games with clients who have sustained spinal cord and brain injuries and with veterans, for the creation of the adaptive controller (Yamkovenko, 2019). Given that this technology was only recently made commercially available, there is an absence of research on this controller, how it works, and its benefits.

Problem Statement

The literature has shown that video games have become an integral part of today's modern play. Gaming provides motor and social benefits for children which parallel those provided in traditional children's play (Carter & Kennedy, 2006; Carter et al., 2017; Friends & Cook, 2012; Granic et al., 2014; Greitemeyer & Osswald, 2010; Harrington & O'Connell, 2016; Hsieh et al., 2015; Laffan et al., 2016; Olson, 2010; Sandlund et al., 2014; Verheijen et al., 2019). The literature has also shown that OTs have a role in the school setting, providing direct intervention towards children with IEPs, providing consultations for classrooms, providing classroom-wide interventions as a form of generalized treatment and RTI, and providing AT as indicated through children's IEPs (AOTA, 2014, 2015, 2016a; Fairbairns & Davidson, 1993; Hargreaves et al., 2012; Orr & Schkade, 1997; Schoonover, 2014).

Gaps appear regarding the use of video games, particularly the Microsoft® Xbox Adaptive Controller, in classroom settings to promote the inclusion of students with physical disabilities. Moreover, discrepancies appear between what the video game rating agencies (ESRB and PEGI) and parents and teachers deem appropriate for children (Jiow et al., 2017). Gaps also appear regarding information about which games are accessible for different disabilities, and information regarding the use and set up of the Microsoft® Xbox Adaptive Controller. Though gaming clubs have been used to promote after school engagement for all students, including those with disabilities, it has been noted that teachers and students alike have difficulties in implementing and attending them due to funding, work constraints, and transportation and scheduling conflicts (Pence & Dymond, 2016). Therefore, it is necessary to create a program that allows for the implementation of adaptive gaming within the school day to benefit students who may otherwise be unable to engage in play with peers at school.

Statement of Purpose

Since adaptive gaming, and gaming in general, has not been implemented in the classroom, limited research exists that shows its benefits for children with disabilities within the classroom. The purpose of this project is to develop a best practices guide for teachers to successfully implement adaptive gaming in the classroom. The overarching goals of this program are as follows: 1) the Microsoft® Xbox Adaptive controller will be used as an inclusive form of classroom play for all students, and 2) teachers will implement and maintain the use of the Microsoft® Xbox Adaptive controller into their classroom activities and free play. Therefore, the interventions chosen for this project are developing a website with video game information sheets regarding how to play, visual overlays to provide set-up cues, and video trainings that instruct the facilitator on how to set up the Microsoft® Xbox Adaptive controller and gaming system, implementing gaming into the classroom, encouraging peer training, and providing examples of how to set up switches for various games or players. The expected outcome of the project is to have an easily accessible and information-rich set of guidelines that will assist in implementing adaptive gaming into the classroom to promote its use as a curricular activity (e.g. during class time or recess). With the content provided, we hope to make the gaming set up process easier for a facilitator to implement. Moreover, we want teachers to understand the benefits of gaming as the modern form of play for children.

Theoretical Framework

In order to guide this project development, a multifaceted framework was developed to align with the "classroom kit" design. Concepts pertaining to the Actor Network Theory (ANT), the Ecology of Human Performance framework (EHP), the Dynamic Systems Theory (DST), the Model of Human Occupation (MOHO), and the Zone of Proximal Development (ZPD) were welded together to produce a sociotechnical informed OT theoretical framework. The combined framework addresses the theory behind technological innovation, specifically of adaptive video gameplay, and its potential use in the classroom setting. In understanding the theories and models and their defined intertwining components, we present a theoretically anchored project capturing the intersections between occupational therapy, education, and technology.

Actor Network Theory

In relation to this project development, ANT acts as the foundational element that introduces the successful integration of a piece of technology into a novel setting, such as the classroom, while avoiding "technological rejection" or failure when implemented in the given setting. ANT is a multidisciplinary-informed theory that best describes the relationship of science and technological innovation (Cressman, 2009, p. 3). It is used to understand how technology can either fail or succeed when placed into a "network," such as a specific environment like the classroom.

Two basic concepts of the ANT theory are *actors* and *networks.* An actor represents human and non-human entities that interconnect to create a network (Law, 1992). Internal wiring, plastic hardware parts, external wiring, buttons, and joysticks all act as actors of the network known as a gaming controller. A network is the assemblage or web of the actors (Law, 1992). While networks constitute actors, actors themselves are composed of networks. The physical components of the Microsoft® Xbox Adaptive Controller gaming system is a network

composed of actors including a gaming console, controllers, add-on accessories, and compatible games. The gaming console itself can also be dissected further as a network composed of internal wiring, hardware parts, external plug, etc. A notable attribute of ANT is that actors, whether human or non-human, are given equal value and agency, employing the same "analytical and descriptive framework when faced with either a human, a text, or a machine" (Cressman, 2009, p. 3), meaning no actor is favored or more carefully observed over another. The complex Actor-Network (AN) of a classroom is composed of students, the teacher(s), a structured time schedule, and various environmental factors that equally contribute to the analysis that supplies our project development.

The process of *punctualization* links the intertwining concepts of actors and networks or a completed complex AN. A completed complex AN is "black-boxed" or "assumed to be common knowledge" (Law, 1992, p. 385). For example, the actors including internal wiring and hardware components are webbed into a complex AN and are punctualized or black-boxed as a gaming controller. The process is similar to mental *schemas,* a term coined by Piaget to define units of knowledge that act as "flashcards" of mental images to represent concepts or objects, such as computers or video game controllers (Case-Smith & O'Brien, 2015). The next step of the punctualization process links the black-boxed AN to another complex AN and is re-labeled as an actor of this network. For example, the black-boxed complex AN of the Xbox gaming system is implemented into the complex AN of the classroom. This process continues in a fluid, interactive motion dependent on contextual changes and simplifies the complexity of the countless interactions within a complex AN and the interactions with others (Law, 1992, p. 385).

The gaming console and Microsoft® Xbox Adaptive Controller, referred to as a gaming system, acts as a complex AN and will undergo the process of punctualization, be relabeled as an

actor, and then placed into the complex AN of the classroom. Although it is described to be a "messy" theory due to its many moving parts, ANT's foundational concepts act as the sociotechnical-informed theoretical basis for the project development aiming to address the successful implementation of technology through the lens of occupational therapy.

Ecology of Human Performance

With ANT acting as the socio-technological element, the EHP framework dissects the contextual features of the classroom in relation to the individuals involved in the project. EHP "serves as a framework for considering the effect of context," and is defined by four intertwined concepts: the *person*, the *context*, *tasks*, and the resulting *occupational performance* (Dunn, Brown, & McGuigan, 1994, p. 598).

Person

The *person* is described to include one's experiences and overall skills and abilities, such as those pertaining to sensorimotor, cognitive, and psychosocial skills. This facet of the framework is better understood through the influence of the *Dynamic Systems Theory* and the concept of an *open system* from the *Model of Human Occupation* (Kielhofner & Burke, 1980; Thelen, 1989).

Dynamics Systems Theory and Model of Human Occupation. The DST refers to "performance or action patterns that emerge from the interaction and cooperation of many systems" (Case-Smith & O'Brien, 2015, p. 68). Humans are composed of internal systems that are in constant flux alongside environmental conditions. Due to the complexity of the person component of EHP, it cannot be simply reduced and dissected into the ANT scope as merely actors and networks. Instead, the person is addressed as an open system. The Model of Human Occupation (MOHO) introduces the concept of an open system as "an organizing complex of subsystems that are in dynamic interaction" (Kielhofner & Burke, 1980, p. 573). In addition to

the introduction of complex human systems from the DST, MOHO defines their interaction with the environment through four phases: Input, throughout, output, and feedback. The input describes the entry of information from the environment into the system, while the output is the behavior or external action produced after the interaction between the input and throughput. The throughput is the complex internalized process of converting and organizing the interaction of the input and feedback, the phase that informs the whole system of the result of the output. Within the throughput phase is another layer of subsystems including volition of one's motivations, values, and interests; habituation or roles and habits; and performance or one's internalized skills (Kielhofner & Burke, 1980, p. 574).

By understanding the person as an open system, this project will take personal conditions of the student population into consideration, such as existing disabilities that may affect the harmonious interaction with the environment. With the concepts supplied by the DST and the MOHO models, the person in the EHP framework is not only defined as one's experience and overall skills and abilities but also as a complex composition of subsystems in constant interaction with current environmental circumstances. The person, as a whole, acts as a single actor in the complex AN of the *context*, or environmental conditions, involved.

Contexts

The *context* in EHP is the current physical and social features of an environment the person faces in order to achieve successful occupational performance (Dunn et al, 1994, p. 598). In relation to this project, the contextual facet of the framework encourages thorough activity analyses of the console, controller, and associated games to prepare for the implementation of the gaming system and overall dissection of contextual factors, specifically deciphering the complex AN of a classroom setting into all of the actors involved. As a target of intervention, these

contextual modifications and conducted activity analyses for the adaptive gaming system promote engagement in the occupation of gaming.

Tasks

The *tasks* in EHP are defined as the "objective sets of behaviors necessary to accomplish a goal" (Dunn et al, 1994, p. 599). The constellation of tasks differs depending on the identified roles of the person, such as being a teacher or a student. The *performance range,* or allowance to pursue and fulfill tasks, depend on the harmony between the open system and present contextual factors.

Tasks are analyzed through a multilayered lens for this project. Games are analyzed to note the associated motor and/or cognitive skills needed to accomplish tasks. The roles involved, including teachers/professionals and student gamers, are taken into consideration for task analysis. The role of a teacher or associated professional constitutes corresponding tasks such as facilitating a gaming club and setting up the gaming system in the classroom. Tasks that correspond to student gamers include understanding game goals and manipulating switch controls.

Occupational Performance

The analysis of a person's existing abilities or skills as well as the open system's interaction with contextual features of the classroom and the implementation of the gaming system results in *occupational performance* (Dunn et al., 1994, p.599). This project aims to increase the performance range of student gamers with disabilities through a thorough analysis of the persons involved (students and teachers), contextual factors through an ANT-informed lens, and the interaction of both. A scaffolding method as informed by the *zone of proximal*

development (ZPD) (Vygotsky, 1978) will then be implemented to enhance occupational engagement.

Zone of Proximal Development (ZPD)

The concept of ZPD acts as the educating piece that influences the structure and delivery of EHP. ZPD is a concept developed by developmental theorist Vygotsky (1978) describing the distance between "actual development level," determined by mastery or independent problem solving, and the "level of potential development," determined through potential problem solving under "adult guidance or collaboration with capable peers" (p. 86).

In order to structure the "classroom kit," careful analysis of the individual and their roles, contextual factors of the classroom as well as the gaming system and adaptive controller itself are supplemental to the development of how persons are to inform and "domino" ZPD. The domino begins with OT consultation alongside teachers and other associated professionals on the proper use and implementation of the adaptive gaming system. The domino effect then speaks to the ongoing scaffolding between teachers and students, followed by scaffolding between the students and other peers.

The combination of these existing theories, frameworks, and concepts emphasize careful analysis of all systems involved including the gaming system, the populations' conditions (teacher, student), and the featured environment of a classroom to ensure a successful integration of adaptive gaming as a therapeutic modality (Appendix A).

Methods

Needs Assessment

The needs assessment was conducted via informal interviews with our community partner, who collaborates with children and families on how to successfully implement AT into their daily lives, encouraging social and school participation (Appendix B). Our community partner purchased the Microsoft® Xbox Adaptive Controller for the center and offered opportunities for children to try the system over the summer of 2018; however, parents and caregivers had difficulties implementing the gaming system into regular play, due to not knowing the needs for the games, not having enough players, and not having appropriate user and parent training. Our community partner has observed many students with disabilities engaged in gaming and has anecdotally noted the motor and social benefits. Our community partner believes that the adaptive controller encompasses various accessible properties tailored to individuals with physical disabilities. Our community partner recognizes the following needs to advance the systematic knowledge for implementation of adaptive gaming for professionals and caregivers, in regard to better training for the use of the system, providing information regarding the consoles and games, and customizing adapted controllers: 1) implement a games club; 2) provide training links; 3) provide instructional videos; and 4) provide information regarding the necessary cognitive, motor, and social components to engage in various video games. Based on the literature review findings and consultation with our community partner, our project aims to address the needs of educators and parents to successfully implement the Microsoft® Xbox Adaptive Controller in an inclusive classroom setting.

Following the initial needs assessment, our first task was to understand and experience the gaming process with the Microsoft® Xbox Adaptive Controller. After three informal sessions with the controller, we created a formalized documentation sheet (see Appendix C) to

assess the following components of the gaming process: setup of the console, and activity analysis of the games in relation to controllers and switch use. Our group members audio record and document using the documentation sheet in order to ensure a thorough activity analysis of the gaming console. All of the information collected from the sessions will be analyzed and put together to finalize the project design.

Project Design

Our project will be done in collaboration with the center. Our community partner will review our videos and content of game sheets, providing feedback on the work done and suggestions for usability and understandability prior to publication. The project will address the use of the multifaceted theoretical framework through careful analysis of technological components, conditions of the population(s) and their associated roles, and the environmental factors involved.

Program Goal 1: Game Sheets

After playing multiple video games and reviewing Jiow et al.'s (2017) results regarding the needs for video game ratings, the team developed game sheets for nine video games: Bomber Crew, Clustertruck, Disneyland Adventures, Hydro Thunder, Lego Batman, Rocket League, Snake Pass, Untitled Goose Game, and Zoo Tycoon (see Appendix D for example game sheet). The team recognized the need to include a general description of the game; rating information (i.e. game console type, the ability for online interactions, category of game, perceived content flags, and the average time needed to complete a level); the steps to set up and navigate the game; the needed controls for the game; and the motor, social, and cognitive demands of the game when played on a universal controller.

To make the information applicable and relevant to the educational system and occupational therapy practitioners, based on preliminary feedback from our community partner, we compiled relevant educational standards and concepts from the California Common Core State Standards (California Department of Education, 2013) into an interactive PDF file (see Appendix E). The games played were analyzed for their relationship to applicable standards. These standards are listed in a broad form on the game sheets with a link to the PDF for more detailed information. The PDF is categorized by category of game and by standard category. Finally, the game sheets included our recommendations for how OTs can facilitate play for each game using the adaptive controller. These recommendations include switch set up, cognitive strategies, and ways to incorporate multiple players and peer training.

Overall, the game sheets will be able to be downloaded and used by teachers, occupational therapists, and parents to understand the steps needed to set up a video game with the adaptive controller, the key features of the game, the relevance to the player's education, and how to ensure that players can achieve success in gameplay. The game sheets are designed to be used in conjunction with the visual overlays.

Program Goal 2: Visual Placemat and Overlay Icons

To complement the game sheets we created game specific visual placemats & overlays icons for each of the nine video games (see Appendix F for example of visual placemat and overlay icons). The visual placemats are a tool to ease the process of setup and game-play. Included in the placemats are detailed explanations of the inputs used along with the corresponding action for each game. The placemat is to be placed under the Microsoft ® Xbox adaptive controller. The user would then connect switches into the inputs that are highlighted in yellow. Notably, near the inputs where the switches were inserted are the action (e.g. jump,

select, move). The image and written text serve as a reminder of the action being performed and role assignment. Additionally, the enlarged game actions on the second page are visual overlay icons that serve as an extra tool when facilitating game-play. Some suggestions include cutting out the actions and velcroing to the corresponding switch or using larger images for individuals with vision challenges. Further information and suggestions on how to set-up and use the visual overlays are supported by our videos.

Program Goal 3: Videos Training

We will design training videos for setting up the gaming system console; switch use suggestions including types of switches; examples of gameplay with various setups of switches; and how to facilitate peer training, to be included via a link to the center on a website. We will allow for comments, through a new Gmail account for our team, to be posted on our videos, and respond to any concerns or questions regarding the content of the videos. The videos are animated through a website called Renderforest. Through this medium, we are able to customize and create three-minute animated videos and depict scenarios of how to interact with the Xbox Microsoft ® adaptive controller successfully, how to promote social interactions, and how gaming can benefit children.

Program Goal 4: Website Design

We will utilize Google Sites as a web page creation tool to display all project materials. Website content will include (1) training videos; (2) rating information about game descriptions, content, educational relevance to the California Common Core State Standards, and occupational therapy play recommendations; and (3) printable visual overlays for appropriate switch use and communication support between gamers using content-specific icons. Our webpage link will be posted onto the center's website for their users to access as a source for supplemental

information. The website will also contain a “Contact Us” page for any questions that users have regarding our project or implementation that can continue to be answered by future capstone groups. The website design and usability will be measured through a Google Forms survey described in Appendix G.

Evaluative Measures

Our project was measured for efficacy in two ways. Throughout our design process, our game sheets, overlays, videos, and website have been reviewed by our community partner, and suggested edits have been made. Our materials were critiqued by those who completed our Google Forms survey (Appendix G). This survey asked about the usability and understandability of all of our resources, in a short, numeric, and short answer format.

Ethical and Legal Considerations

In the process of designing our gaming toolkit for students to play and teachers to implement, it is necessary to adhere to occupational therapist’s ethical guidelines, which are noted in *The Occupational Therapy Code of Ethics* (AOTA, 2015). Included are a set of principles to follow beneficence, nonmaleficence, autonomy, justice, veracity, and fidelity (AOTA, 2015). This project design process applies beneficence, autonomy, and veracity. Beneficence addresses the need to maintain the safety and well-being of the clients (AOTA, 2015). Therefore, this project will include the characteristics of beneficence when creating gaming toolkits for students and teachers, such as website design, video training, and showcase. It will be designed to promote the inclusion of all persons who wish to play video games in the classroom, thus, supporting their wellbeing. Moreover, the website and videos will be user friendly for convenience to these populations. Autonomy takes into consideration the person and their right to self-determination, privacy, confidentiality, and consent (AOTA, 2015). Our participants will be asked to participate in an anonymous online survey only for feedback to

improve the project design; in order to keep their information confidential, any information provided will be kept within the team. Anonymous Google Forms will be used for the online survey and will be secured by a password that only the project team can access. Any records of the anonymous responses will be deleted following the completion of the project. Answers to the surveys will not be published. Moreover, participants will have the right to decline to complete the survey, exercising their right to autonomy. Lastly, veracity addresses the need for occupational therapists to provide a comprehensive and accurate guide that is professional and supports the practice (AOTA, 2015). Therefore, the gaming toolkit will provide an occupational therapy lens that is not only rich in information based on clinical reasoning and evidence-based research but also easy for other professions to understand and implement. Moreover, if the information is challenging to understand, participants will have the opportunity to communicate with the team through email which is accessed through the website. The permission to implement these tasks are disclosed in an agency letter to our community partner and the center (Appendix C). The letter provides a brief overview of our graduate capstone research project, provides consent to interact with participants at the center, and informs that this project will not interfere with our community partner work. Encompassing *The Occupational Therapy Code of Ethics* principles into the project development will allow for a safe and fair implementation (AOTA, 2015).

Conclusion

Video games can benefit children physically, cognitively, and socially. However, video game controllers historically have been made for people with adequate fine motor dexterity. To account for this, Microsoft® created the Microsoft® Xbox Adaptive Controller to promote inclusivity in gaming; yet, to date, there have not been supportive resources for school service providers to implement adaptive gaming into school settings. Our community development project addressed this need by designing a website intended for interprofessional use to demystify the challenges of adaptive gaming and provide background, setup, customization, and links to educational standards for implementation of adaptive gaming in school settings. For future directions, a pilot study is necessary to address the effectiveness of our toolkit in the classroom setting to determine the usability for teachers, professionals, and peers, as well as analysis on the step-up process and benefits of adaptive gaming in the classroom for children with disabilities. Adaptive gaming supports the inclusion and engagement of all students by encompassing each child's abilities and strengths in the ever-modernizing world of play, so, now, we can all play together.

Section II

Adaptive Video Gaming: A Toolkit for Using the Microsoft® Xbox Adaptive Controller in Schools

Submission to the *Assistive Technology Journal*

Abstract

Background: Limited resources exist to support adaptive gaming in school programming using Microsoft® Xbox Adaptive Controller for children. On the other hand, there is abundant evidence supporting motor, cognitive, and social benefits to gaming in rehabilitation.

Objectives: The goal of this program development project was to create a *virtual gaming toolkit* to support the interdisciplinary team's use of adaptive gaming during school programming.

Methods: Through our needs assessment and collaboration with our community partner, we discussed the parent and caregiver need for guidance in order to use the Microsoft® Xbox Adaptive Controller and facilitate gameplay with peers. Through an extensive review of the literature and in-depth activity analysis of the gaming console and games, we developed a resource website containing: informative game sheets, visual overlays, links to relevant California Common Core State Standards, and instructional videos.

Results: An in-depth survey was developed as part of the website. Ten surveyors analyzed the gaming toolkit had positive attitudes towards the content and the relation to the school criteria.

Conclusion: Literature identifies video games as a way to improve a child's motor, cognitive, and social skills. However, no research demonstrates the Microsoft® Xbox Adaptive Controller's role in-school programming. We designed a *virtual gaming toolkit* to promote the use of the controller so it can be used by the interprofessional team.

Background

Occupational therapy (OT) incorporates assistive technology (AT) into children's meaningful daily activities to support full engagement and inclusion in academia. OT prioritizes *occupations* or daily activities that people want and need to do, that promote physical and psychosocial well being. Occupations are used as both means and ends in OT to promote functional improvements in all aspects of a client's life. Play, a child's main occupation, affords developmental growth in multiple domains, including motor, emotional, cognitive, and social skills (AOTA, 2012; AOTA, 2014). As technology becomes more integrated into daily activities (Smith, 2017), video gaming (herein referred to as gaming) is considered a modern form of play.

The benefits of gaming have been examined in the literature. Beeston et al. (2018) reported that gaming has been utilized as a therapeutic tool and as a source of "fun, relaxation, challenge, and community" for individuals with disabilities (p. 11). Gaming can contribute to the development and improvement of motor and social skills in users, such as using eye-hand coordination and collaborating with other players (Hsieh, Lin, Chiu, Meng, and Liu, 2015; Sandlund, Domellöf, Grip, Rönnqvist, & Häger, 2014). However, commercially available controllers are often not accessible for individuals with physical disabilities, specifically those with upper extremity and fine motor impairments. In 2019, Microsoft® launched the Xbox Adaptive Controller. The design of the controller was conceptualized to promote usability and accessibility for gamers with physical disabilities (Yamkovenko, 2019). The adaptive console includes connection ports for 19 external devices for a variety of switch, button, mount, and joystick use options. Since this is a fairly new system, there is limited research regarding overall use and current means to implement the device. Further, there is a lack of programming to

support gaming, specifically adaptive gaming, in-school programming. Therefore, the purpose of this project was to develop a guide to implement adaptive gaming in schools and classrooms.

Significance of Gaming

Video games are becoming far more prevalent in our society. In the United States, over 90% of children and adolescents play video games for “substantial amounts" of time (Gentile et al., 2017, p. S81). Online games allow children to play, albeit in virtual worlds. Play comes in many forms and for many purposes. The copious varieties of video games available allow gaming as an occupation to encompass a broader variety of interests and skill sets than ever before. Therefore, gaming can provide opportunities for “fantasy play, socio-dramatic play, ritualized play, games with rules, and what might be called ‘rough and tumble’ play” (Marsh, 2010, p. 30). Further, video games create an array of social environments, as they can be played by multiple gamers virtually or in person. Therefore, we assert that gaming incorporates the world of technology into children’s play, including socialization, allowing them to explore their interests in modern society.

Current use of games

Rehabilitation and therapeutic intervention programs have included gaming to target remediation of motor impairments. Multiple studies report the use of video game consoles and adaptive switches improving motor skills for rehabilitation for children with physical and developmental disabilities (Wuang, Chiang, Su, & Wang, 2011; Hsieh et al., 2015; Li, Lam-Damji, Chau, & Fehlings, 2009; Golomb et al., 2010). However, more research is needed to examine gaming beyond a rehabilitation medium and rather as a play, motor, cognitive, social, and learning occupation in and of itself.

Gaming has also been used in after school game clubs to provide an environment for socialization. Game clubs include board games, educational video games, and role-playing games that aim to increase eye-hand coordination, academic skills, and facilitate social interactions between all students, with or without disabilities (Copeland, Henderson, Mayer, & Nicholson, 2013; Brown & Kasper, 2013; Pence & Dymond, 2016). However, game clubs, when separate for the daily school day schedule, fail to consider students' awareness of clubs, transportation needs, funds, and students' and teachers' schedules (Copeland et al., 2013; Pence & Dymond, 2016).

Benefits of Gaming

Motor

Gaming interventions for children have benefited control of motor speed, precision, and smoothness in movement, as well as decreased trunk rotation using games such as EyeToy ®: Play 3 and with software like Scratch (Hsieh et al., 2015; Sandlund et al., 2014). The use of video games has elicited functional movements for children with hemiplegia or cerebral palsy (Golomb et al., 2010; Li et al., 2009). Through gaming, children with down syndrome have shown improvements in motor proficiency, visual integration, and sensory-motor functioning (Wuang et al., 2011). Overall, gaming has provided children with physical disabilities a therapeutic and meaningful way to improve motor functioning.

Cognitive

Games require the use of cognitive and processing skills. Participation in video games increases visual processing and attention, utilizes the incremental theory of intelligence, creates a zone of proximal development, teaches productive responses to failure, and improves emotional regulation (Granic et al., 2014). Additionally, children are motivated to achieve tasks within the game and build their motor, cognitive, and social skills for daily tasks (Granic et al., 2014).

Social

Gaming offers in-person and virtual social interactions with players locally and globally. Social skills can be facilitated during gameplay that can be generalized to everyday occupations, such as in school settings. Granic et al. (2014) noted the social benefits of video games including learning group norms, forming and leading groups, encouraging cooperative behaviors, reducing hostility, and promoting civic engagement. Therefore, gaming can teach children to collaborate towards a common goal, utilizing prosocial gaming and peer training.

Prosocial gaming. Prosocial gaming increases cooperative play through social interactions as gamers are able to bond and develop gaming skills together (Olson, 2010). In contrast to negative perceptions regarding violent and competitive video games (Greitemeyer & Osswald, 2010; Harrington & O'Connell, 2016), multiple studies have proven prosocial content within games results in prosocial behavior scripts. Learning prosocial collaborative behavior within the game allows players to reflect on skills such as sharing, team building, and helping during acts away from the screen (Verheijen, Stoltz, Sabine, van den Berg, & Cillessen, 2019; Harrington & O'Connell, 2016). Moreover, in multiplayer game interactions, competition has been shown to contribute to child development in the context of rough and tumble play, with gaming serving as an alternative "arena for the developmentally appropriate battle for status" (Olson, 2010, p. 185). Therefore the literature provides an alternative view to the traditional negative lens of violence in video games: violent video games present children with an opportunity to build their sense of control over negative experiences, through providing an outlet for their anger that could result in bullying or aggression in the real world. Gaming also provides a safer, more inclusive format for the developmental rough-and-tumble play, such as wrestling. However, for the purposes of this project, as described below, we made the executive choice to

avoid including video games with violent content and imagery, such as shooting or fighting games.

An example of prosocial gaming in social development is peer training. Peer training is defined as the assignment of peers to students who have disabilities, in order to provide social and academic support (Carter & Kennedy, 2006). Olson (2010) demonstrated the effectiveness of peer training with children through video gameplay. For example, an experienced player can teach an inexperienced player how to overcome a challenge by using common interests, support, and competition to motivate their learning, with a dynamic shifting back-and-forth between roles (Olson, 2010). Video games provide natural opportunities to cooperatively work together and teach one another to overcome challenges, which is a common pedagogical goal in schools.

Interdisciplinary Collaboration

Occupational therapists (OTs) collaborate with an interdisciplinary team to promote learning and social engagement for students. School-based OTs support students through the evaluation and implementation of assistive technology (AT) (AOTA, 2016a; Schoonover, 2014), utilize the response to intervention (RtI) to provide collaborative programming to incorporate universal design principles (Hargreaves et al., 2012). Response to Intervention (RtI) is a multi-tiered model, designed to identify and support the needs of all students in a classroom (AOTA, n.d.). The RTI model initially provides interventions to whole classrooms, allowing the children who need more individualized and intensive interventions to be identified and served by the OT (AOTA, n.d.). The therapeutic service delivery model of "push-in" affords more collaboration with the teacher to address general classroom programming strategies, rather than pulling students out of their daily school routine. Through the use of interdisciplinary collaboration, teachers, OTs, as well as other school-based professionals, can reach a wide breadth of students. As part of a collaborative and RtI approach, AT can be a means to improve accessibility and

inclusion, harnessed by all members of the interdisciplinary team to support a student's success in the classroom (AOTA, 2016a, p. 3).

Problem Statement

Gaps appear in the use of video games, particularly related to the use of the Microsoft® Xbox Adaptive Controller in classroom settings to promote the inclusion of students with physical disabilities. Discrepancies appear between what the video game rating agencies (ESRB and PEGI) and parents and teachers deem appropriate for children (Jiow et al., 2017); information is lacking regarding the accessibility of games for different abilities, and information in reference to the use and set up of the Microsoft® Xbox Adaptive Controller. The goal of this program is to create a *virtual gaming toolkit*. The project is twofold: 1) provide custom-made materials to teach the setup and utilization of the adaptive controller and video games in classroom settings (game sheets, visual overlays, and instructional videos); and 2) create a custom website to house all materials.

Theoretical Framework

This interdisciplinary project is theoretically anchored, capturing the intersections between occupational therapy, education, and technology. Concepts pertaining to the Actor Network Theory (ANT), the Ecology of Human Performance framework (EHP), the Dynamic Systems Theory (DST), the Model of Human Occupation (MOHO), and the Zone of Proximal Development (ZPD) were welded together to produce a sociotechnical-informed OT theoretical framework. The combined framework addresses the theory behind technological innovation, specifically of adaptive gaming, and its potential use in the classroom setting. In understanding the theories and models and their defined intertwining components, we present a theoretically anchored, interdisciplinary project capturing the intersections between occupational therapy, education, and technology.

Actor Network Theory (ANT)

ANT introduces successful integration of a piece of technology into a novel setting, such as the classroom, while avoiding "technological rejection" or failure to integrate into that given setting (Cressman, 2009; Law, 1992). In order to successfully integrate new technology, a thorough analysis of all singular factors, or *actors,* involved is significant to understanding how the larger systems, or *networks*, have the potential to coexist and successfully work as a unit, or *actor-network.* We conducted thorough analyses of the gaming console, the selected games, and factors within the school environment. Specific setup directions, associated gameplay controls, and the California Common Core State Standards (CCSS) were then incorporated to support the gaming process and its educational relevance when designing the website resources.

Ecology of Human Performance (EHP)

The EHP model stresses the impact of the contexts in which a person completes daily tasks and activities that align with their meaningful and necessary roles (Dunn, Brown, & McGuigan, 1994). Performance of important activities depends on the supports or constraints of a given environment and their abilities (Dunn et al., 1994). EHP dissects contexts of gameplay with the existing features of classrooms, such as structural boundaries (class time routine and learning standards) and compares these to the associated factors of the individuals involved in the project, such as roles and physical, cognitive, and social skills. To support this specific framework, we also included concepts within the DST and MOHO to hone into personal conditions, such as existing disabilities, that may affect an individual's task performance. DST refers to "performance or action patterns that emerge from the interaction and cooperation of many systems" (Case-Smith & O'Brien, 2015, p. 68). The MOHO introduces the concept of an open system as "an organizing complex of subsystems that are in dynamic interaction"

(Kielhofner & Burke, 1980, p. 573). With the concepts supplied by the DST and the MOHO models, the person in the EHP framework is not only defined as one's experience and overall skills and abilities, but also as a complex composition of subsystems in constant interaction with current environmental circumstances.

Zone of Proximal Development (ZPD)

The ZPD (Vygotsky, 1978) is the educational framework guiding the development of this project, denoting the use of a just-right level of challenge to promote a learner's best ability, with scaffolding and support as needed. In order to structure the gaming toolkit, careful analysis of the individual and their roles, contextual factors of the classroom, as well as the gaming system and adaptive controller itself, are supplemental to the development of how persons are to inform and "domino" gaming. The collaborative domino process begins with OT consultation alongside teachers and other associated professionals on the proper use and implementation of the adaptive gaming system. The domino effect then speaks to the ongoing scaffolding between teachers and students, followed by scaffolding between the students and other peers. This domino effect facilitates the utilization of the virtual gaming toolkit for game-play.

The combination of these existing theories, frameworks, and concepts emphasize careful analysis of all systems involved, including the gaming system, conditions of the populations involved (teacher, student), and the classroom environment to ensure the successful integration of adaptive gaming as a therapeutic modality and educational activity (Appendix A). Through understanding each discipline's role in the context of the virtual gaming toolkit, various professionals can utilize our resources to facilitate inclusive gaming in the classroom.

Methods

Needs Assessment

The needs assessment was conducted via informal interviews with our community partner, a local speech-language pathologist, and an assistive technology specialist who runs a school-based technology center in Northern California (Appendix B). Daniel Phillips, MA, CCC-SLP, is the director of the Technology Resource Center (TRC) of Marin, which is part of the Marin County Office of Education (www.trcmarin.org). Phillips is a speech-language pathologist and an AT specialist, who collaborates with professionals, children, and families on how to successfully implement AT into their daily lives. He purchased the Xbox Adaptive Controller to include as part of the TRC in the summer of 2019 as there was high interest in gaming and anecdotally, Philips observed the motor and social benefits of gaming for students with physical disabilities. However, parents and caregivers had difficulties in implementing the gaming system. They reported needing guidance with the process of setup and use of the console, appropriate switch selections, and how to incorporate peers and friends into gameplay. Further, school professionals including teachers and related service providers would need resources for how gaming can be used during school programming. Based on the needs assessment and the review of the literature, we developed a gaming toolkit focused on the utilization of the Microsoft® Adaptive Controller used in school.

Virtual Gaming Toolkit

Program Goal 1: Game Sheets

The team completed thorough activity analyses of various video games, compiling notes into a formal documentation sheet (Appendix C). After playing multiple video games (Appendix D), game sheets were developed for nine video games: Bomber Crew, Clustertruck, Disneyland Adventures, Hydro Thunder, Lego Batman, Rocket League, Snake Pass, Untitled Goose Game,

and Zoo Tycoon (see Appendix D for example game sheet). The Game Sheets have the following main components (1) game description, (2) California Common Core Learning Standards, and (3) occupational therapy recommendations.

(1) Game description. General descriptions of the game were made regarding the following: rating information (i.e. game console type, the ability for online interactions, category of game, perceived content flags, and the average time needed to complete a level); the steps to set up and navigate the game; the required controls for the game; and the motor, cognitive, and social demands of the game when played on a universal controller.

Video game ratings. Video games are currently rated by the Entertainment Software Rating Board (ESRB) and Pan European Game Information (PEGI) for age appropriateness. However, these organizations do not account for online social interactions, player modification of games, and the player's decision-making, which leads to inaccurate ratings that often mislead consumers (Jiow et al., 2017). Parents want information on average playtime, negative content flags, and social experiences of games (Jiow et al., 2017). To help parents and professionals better understand these components of games and to better form their own perceptions of what is appropriate for their specific children, we present all of these parent-identified areas of concern objectively in the top box of the game sheet.

(2) California Common Core State Standards. For interdisciplinary use, we analyzed and related the skills needed to play each game to the California CCSS (California Department of Education, 2013) and created an interactive portable document format (PDF) file (see Appendix E). These standards are listed in broad form on the game sheets with a link to the extended PDF on the website for more detailed information.

(3) Occupational Therapy Play Recommendations. The final section of the game sheets, the OT recommendations, guides facilitators on how to implement gameplay using the adaptive controller, such as switch set up, cognitive strategies, and ways to incorporate multiple players and peer training. The game sheets are available on the website for the interdisciplinary team to understand video game set-up, key features of the game, the correlation between the game and the CCSS, and outline the success of gameplay.

Program Goal 2: Visual Overlays and Action Icons

To complement the game sheets, we created game-specific visual overlays & action icons for legal paper size (8.5x14) for the nine video games (see Appendix F). The visual overlays are a tool to ease the process of setup and game-play by offering detailed explanations of the inputs used along with the corresponding action for each game. The user places the Microsoft® Xbox Adaptive Controller on the overlay and connects the switches into the inputs highlighted in yellow. Notably, above the inputs where the switches are inserted are the visual action icons (e.g., jump, select, move). Visual supports serve as a visual reminder of the action being performed, encourage role assignments, and improve communication and vocabulary (Meadan et al., 2011). Enlarged versions of the action icons are included on the second page to serve as additional visual support when facilitating game-play, as they can be cut out and velcroed or taped to corresponding switches.

Program Goal 3: Training videos

Training videos were made to explain the setup process of the gaming console, the types of switches, the benefits of gaming, and the facilitation of peer training. The animated videos, created with the Renderforest website (https://www.renderforest.com/), depict scenarios of how

to use the Microsoft® Xbox Adaptive Controller successfully, promote social interactions, and how gaming can benefit children.

Program Goal 4: Website design

We utilized Google Sites as a web page creation tool to display all project materials. Website content includes (1) training videos; (2) game sheets; and (3) printable visual overlays to support gamers by using content-specific icons. The website is designed to be utilized by all disciplines, highlighting the overall importance of gaming, the links to the California CCSS, and our interdisciplinary game sheets and visual overlays. The website has a general navigation menu and links embedded in each webpage that leads to other resources for ease of use. Our webpage link will be posted on our community partner's website for their users to access. The website will also contain a "Contact Us" page for any questions that users have regarding our project or implementation. The website can be accessed at https://sites.google.com/view/adaptive-gaming/home.

Evaluative Measures

Our project was measured for efficacy in two ways. Throughout our design process, our game sheets, overlays, videos, and website have been reviewed and edited by our community partner and a university faculty advisor who has expertise in AT. Our materials are continually critiqued by those who complete our Google Forms survey (Appendix G). The survey asks about the usability and clarity of all of our resources, in a short, numeric, and short answer format.

Results

Our results stemmed from two avenues, (1) our collaboration and feedback with our community partner and a university faculty advisor who has expertise in AT, and (2) the survey posted on the website. Our community partner offered feedback throughout the website design process and reviewed the website design, game sheets, visual overlays, and the specific gaming features linked to CCSS. He said the following: “I am overly impressed with this project. I want to have a link to this site. The visuals are beyond what I thought they could be. The Common Core State Standards were a great idea, and I didn’t think of that.” Our survey was circulated to interprofessional colleagues of our advisor, including school-based direct service providers (e.g., OTs, speech-language pathologists (SLPs), special education teachers, school administrators, and higher education professors in the aforementioned fields). Additionally, this work was presented in virtual sessions at various conferences: Closing the Gap (session viewed 57 times), the Occupational Therapy Association of California Annual Conference (attended by approximately 50 viewers), and the Dominican University of California’s virtual poster session (attended by approximately 30 viewers). The survey was mentioned during each session, and the presenters asked session participants for feedback. Finally, the survey remains available to anyone who visits the website.

In total, we received ten responses through our survey (N=10). Those who completed the survey identified themselves as related service providers (N=4), administrators (N=3), paraeducators (N= 2), and, a recently retired special education teacher (N=1). Below are tables summarizing both qualitative and quantitative results from our survey. The qualitative summary is based on comments per category of feedback. The quantitative summary provides response means to survey questions (See Tables 1 and 2).

Table 1

Summary of Qualitative Survey Results

Category	Comments
Website	"The website looks beautiful- clean and easy to navigate".
Instructional videos	"Short, concise, and informative videos with very appealing pictures that compliment the dialogue"
Game Sheets	"I really liked the format of the game sheets as they provided the necessary details of each game in a summary form that was easy to read." "The game sheets are very helpful. I like that it clearly displays how control functions change to correspond to the adapted controller. I'm not familiar with the games so I appreciate that you've outlined the types of games they are i.e. racing vs role-playing".
California Common Core State Standards	"Very helpful for writing goals for special education teachers needing to meet common core standards". "Excellent resource for educators." "Great idea to provide this information for educators!"
Visual Overlays	"Having these overlays readily available is an invaluable resource!". "Love that everything needed is ready to go. You thought of everything!"
Additional comment/ feedback	"Families are always looking for appropriate activities for their children." "Any time a skill can be mastered by a student while having fun makes everyone's job a whole lot easier." "I do not work in a school-based setting but I can absolutely see how even outpatient orthopedic practitioners can benefit from this resource." "Overall this is a great capstone project and I can see the utility for students who are virtual learning as well."

Table 2

Summary of Quantitative Survey Results: Response means

Question	Mean Score
The **website** was clear and easy to navigate	***9.2***
The **instructional videos** were clear, well paced, and provided information that you can now readily use and implement.	***9.8***
The **game sheets** were clear, provided pertinent information, and were easy to navigate,	***9.6***
The **California Common Core State Standards (CCSS)** application to gaming and links were clear and easy to navigate.	***9.8***
The **CCSS** application to gaming provided pertinent information regarding how gaming can fit into the instructional educational day.	***9.9***
The **visual overlays** were clear and understandable for use while gaming.	***9.8***
How **likely are you to implement the classroom kit** if the device was available to you with students or clients?	***8.5***
How **likely are you to share this website** with colleagues, families, and other interested parties to expand adaptive gaming?	***9.8***

Note. Table 2 displays the average mean score per question from a Likert scale.

Discussion

This project was designed to support the use of adaptive video gaming in the classroom. The resources provided in our gaming toolkit website bridges the gap between service providers, families, and the realm of gaming. Gaming is considered to be a meaningful occupation with social, motor, and cognitive, and educational benefits. Our specific theoretical anchoring of ANT, EHP, and ZPD provided guidance for the overall website design, training video content, game sheets, visual overlays, and specific connection of gaming features to the CCSS (see Figure 1). ANT (Cressman, 2009; Law, 1992) informed how we could successfully implement new technology (adaptive gaming device) into a novel environment (school programming), by employing detailed activity analyses (the setup process for the gaming console, the required controls and actions of each game, and the games' relevance to the CCSS). As guided by EHP, we examined the occupational engagement of play (Dunn et al., 1994) and presented adaptations for customization and promotion of inclusive gameplay under the OT recommendations section of our game sheets. Finally, ZPD (Vygotsky, 1978) and the construct of scaffolding, informed the visual overlays and action icons, as well as strategies for facilitators, experienced peers, and new gamers to engage in the occupation of gaming.

Figure 1.

Collaborative Interdisciplinary Conceptual Model.

The game sheets were guided by the underlying principles of the ANT and the EHP (Law 1992; Dunn et al., 1994). The game sheets were designed to address game rating issues; provide console, switch, and game set-up; and facilitate the benefits of gaming as noted in the literature. The addition of OT play recommendations suggested ways to facilitate collaborative play and adapt traditional gameplay to promote all abilities. Feedback received about the virtual gaming toolkit confirmed the usability of the game sheets. The use of the CCSS added specific educational relevance to the value of gameplay. Feedback received regarding the correlation to the learning standards suggested that this component of the game sheets provides educators a resource to support goal writing with additional implications for use during current times of virtual learning. Finally, implementing gameplay within a classroom setting aligns with RtI and the use of the push-in model of OT service delivery and classroom consultation (AOTA, n.d.).

Pence and Dymond (2016) noted that professionals implementing game clubs needed resources to better understand how to set up and assist with gameplay. We met this need through the remaining components of the gaming toolkit. Guided by ZPD concepts, the visual overlays and training videos housed in our Adaptive Gaming website served to promote scaffolding during gameplay between facilitators, students, and peers. The nine overlays served as a tool to support setup and the facilitation of gameplay, by providing a visual guide to insert switches and icons for role assignment. Moreover, the short training videos instructed facilitators on the setup process of the gaming console, the types of switches, the benefits of gaming, and to promote peer training. All project materials, including the game sheets, are housed on our website to increase accessibility to the interprofessional team. Feedback on the videos and overlays demonstrated the short but complex informational components were "appealing and complimented the dialogue." Moreover, the design of the website allowed for usability and clear navigation of each of the components. Overall the project served as a sustainable resource to advocate for the motor, cognitive, and social benefits correlated with gameplay, and promote the use of adaptive gaming in an educational setting.

Limitations and Future Directions

Future directions include a pilot study to address the effectiveness of the gaming toolkit in the classroom. Examination of how the gaming toolkit website can be used as an interprofessional, collaborative resource would provide further valuable insights into how gaming can be meaningfully incorporated into inclusive school programming. The process of obtaining more extensive feedback on our project development from various professionals has been delayed due to the COVID-19 pandemic. Future work should include interdisciplinary workshops for direct service providers. Further, we were also only able to produce a limited

number of resources. Games were chosen from a limited game library provided to us by our community partner.

Conclusion

Video games can benefit children physically, cognitively, and socially. However, video game controllers historically have not been made for people with inadequate upper extremity motor control and fine motor dexterity. Therefore, the Microsoft® Xbox Adaptive Controller was created to promote inclusivity in gaming. However, to date, there have not been supportive resources for school service providers to implement adaptive gaming in schools. In collaboration with our community partner, we designed a virtual gaming toolkit intended for interprofessional use. The goal of the virtual gaming toolkit was to demystify the challenges of adaptive gaming, provide background information, setup, customization, and links to educational standards for implementation of adaptive gaming in school settings. Adaptive gaming supports the inclusion and engagement of all students by encompassing each child's interests, abilities, and strengths in the ever-modernizing world of play, so we can all play together.

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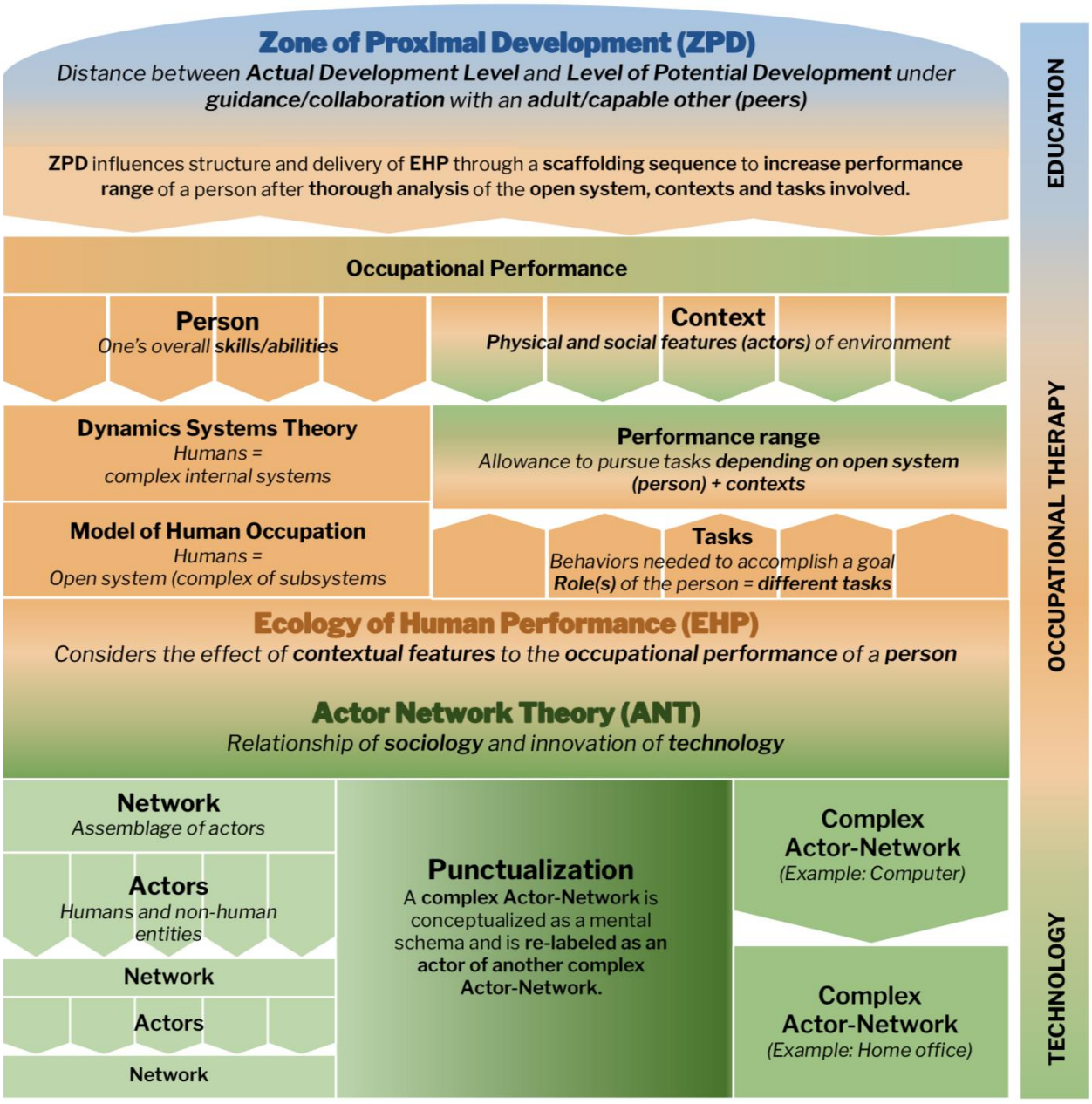
Appendix A- Theory


Zone of Proximal Development (ZPD)
Distance between Actual Development Level and Level of Potential Development under guidance/collaboration with an adult/capable other (peers)
ZPD influences structure and delivery of EHP through a scaffolding sequence to increase performance range of a person after thorough analysis of the open system, contexts and tasks involved.
Occupational Performance
Person
One's overall skills/abilities
Context
Physical and social features (actors) of environment
Dynamics Systems Theory
Humans = complex internal systems
Performance range
Allowance to pursue tasks depending on open system (person) + contexts
Model of Human Occupation
Humans = Open system (complex of subsystems
Tasks
Behaviors needed to accomplish a goal
Role(s) of the person = different tasks
Ecology of Human Performance (EHP)
Considers the effect of contextual features to the occupational performance of a person
Actor Network Theory (ANT)
Relationship of sociology and innovation of technology
Network
Assemblage of actors
Actors
Humans and non-human entities
Network
Actors
Network
Punctualization
A complex Actor-Network is conceptualized as a mental schema and is re-labeled as an actor of another complex Actor-Network.
Complex Actor-Network
(Example: Computer)
Complex Actor-Network
(Example: Home office)
EDUCATION
OCCUPATIONAL THERAPY
TECHNOLOGY

Appendix B: Agency Agreement Letter

APPENDIX ___
LETTER OF PERMISSION TO AGENCY DIRECTORS

DOMINICAN UNIVERSITY of CALIFORNIA
LETTER OF PERMISSION TO AGENCY DIRECTORS

Mr. Dan Phillips
TRC Director, AAC/AT Specialist, Speech-Language Pathologist; Technology Resource Center of Marin
1055 Las Ovejas, Room 5
San Rafael, CA 94903

Dear Mr. Phillips:

This letter confirms that you have been provided with a brief description of our graduate capstone research projects, which concerns factors related to adaptive gaming via a "Games Club" and exploration of adaptive gaming in the classroom, and that you give your consent for us to visit your facility to interview and interact with a random sample of your clients. These projects are important parts of our undergraduate and graduate requirements as occupational therapy majors, and is being supervised by Dr. Laura Greiss Hess, Assistant Professor of Occupational Therapy at Dominican University of California.

As we discussed in our meetings at the Technology Resource Center of Marin, we will make every effort to ensure that our data collection does not interfere with your regularly scheduled workshops or therapy sessions, and that your clients and co-workers are treated with the utmost discretion and sensitivity. If you have questions about the research you may contact us, hOTspOT and Gamer Gurlz, at the phone number or email address below. If you have further concerns you may contact our research supervisor, Dr. Hess, at (415) 482-1906 or the Institutional Review Board for the Protection of Human Participants at Dominican University of California by calling (415) 482-3547.

After our research projects have been completed in December 2020, we will be glad to send you a summary of our research results.

If our request to visit your establishment, collect data, facilitate the "Games Club", provide trainings to your co-workers and have videos or a link to our website from yours meets with your approval, please sign and date this letter below and return it to us in the enclosed self-addressed, stamped envelope as soon as possible. Please feel free to contact us if you have any questions about this project.

Thank you very much for your time and cooperation.

Sincerely,

Gamer Gurlz: Lauren J. L. Ferrell, Desarae A. Finck-Fugazi, Christine A. Manalang, Daniela M. Recinto, Noémie A. von Kaenel
hOTspOT: Lauren Andaya, Melanie Blaisdel, Christina Floyd, Madeline Pope, Audrey Metzger, Donna Chen Tubig, Christine Vincent
50 Acacia Ave., Department of Occupational Therapy
San Rafael, CA 94901
Email address: gamergurlzduot@gmail.com
(831) 333-6344

I agree with the above request

Signature

11/19/19
Date

Appendix C - Formal Documentation Sheet

Adaptive Gaming Field Note Chart

Name(s):	**Dates:**

Set Up	**Levels of Difficulty** ***(Date-score)*** **1** = least **5** = most	**5**	**4**	**3**	**2**	**1**	**Comments** ***(Date- Initial)*** What did you do? What helped? How would you teach this step to someone else?
Plug into (circle one): **Computer / Monitor / TV**							
Turning on console							
Signing in *(Xbox account)*							
Navigating to find a game							
Turning off console							
Additional setup steps:							

Additional Observations:

Activity Analysis of:

Game Category:	Objective of game:	Rating & Recommended ages:

# of Ps	Controller Information	Motor Demand	Social Demands	Cognitive Demands	Facilitator Considerations
	Switch Used / Control Button / Action				
	Switch Used / Control Button / Action				
	Switch Used / Control Button / Action				

Appendix D - Game Sheet

Untitled Goose Game

Costs: **$19.99** (listed on Microsoft ®)
*Included in the Xbox Game Pass Ultimate Pack

In-Game purchases:
- ☐ Yes
- ☐ No

Description of Game

The player is a goose in an English village completing challenges to explore the surroundings. The **goal of the game** is to:

1. Distract characters such as the groundskeeper to complete a "to-do list."
2. Completion of the "to-do" list unlocks a new area of the village for a new set of objectives to accomplish.

Gaming Console Type	Online Interactions	Type of Game and Design	Content Flags	Average Time Needed for Completion of a Level

☐ Xbox
☐ PC
	☐ Yes
	☐ No
		☐ Action
		☐ Adventure
		☐ Role-Playing Games
		☐ Racing
			☐ Sexuality
			☐ Violence
			  ☐ Animal kicking
			  ☐ Injury of game characters (e.g., tripping, falling, hitting the head, etc.)
			  ☐ Comic mischief
			☐ Graphic Imagery
			☐ Inappropriate Language
			☐ Other
			  ☐ Microsoft states a seizure warning due to photosensitivity
			For more information refer to: https://support.xbox.com/help/family-online-safety/online-safety/photosensitive-seizure-warning
				It takes approximately 45 mins to finish a "To-Do List."

<table>
<tr><th>Setting Up the Game</th><th>Steps</th></tr>
<tr><td>Turning on/Sign in on the Xbox</td><td>Turn on the controller, console, and the TV monitor.</td></tr>
<tr><td>Navigating Menu</td><td>1. Find and select the game using the left joystick or D-Pad, and A.
2. Locate Untitled Goose Game.
3. Select the game using A and allow it to load to the main page.</td></tr>
<tr><td>Controls/Buttons</td><td>
<table>
<tr><th>X</th><th>(L) Joystick</th><th>B</th><th>A (hold)</th><th>RT</th><th>LT</th><th>RB</th><th>LB</th><th>Two square</th></tr>
<tr><td>Goose honks</td><td>Steering goose's movement</td><td>Grabs items & drags them</td><td>Move faster</td><td>Goose flaps wings</td><td>Duck down</td><td>Zoom out</td><td>Zoom in</td><td>Check the "To-Do" list</td></tr>
</table>
</td></tr>
<tr><td>Start Game Play</td><td>Use controls/buttons above to navigate areas of the village and interact.</td></tr>
<tr><td>Save</td><td>The game autosaves after levels.</td></tr>
<tr><td>Turn off</td><td>Log out of your account. Shut down the controller, console, and TV monitor.</td></tr>
</table>

California Common Core Learning Standards

When engaging in adaptive gaming, these **California Common Core Learning Standards are met:**

Common Core Standard	Grade(s)	Relevance to Untitled Goose Game
Algorithms and Programming	3 - 8	Players will engage in problem-solving and strategy sequencing to accomplish the to-do list actions. The collaboration of ideas to solve how to complete the item is beneficial to social play. As the levels increase in challenge, there may be more steps to completing a level.
Arts, Media, & Entertainment & Computing Systems	6-12	The players will learn simple video game setups for entertainment from the perspective of human culture as a goose. By engaging in this game, the players will learn how to navigate

		video game settings by evaluating, assessing, and reviewing options and commands available.
English Language Arts & Reading Standards	K-12	As language sequence and comprehension become more dynamic during grade progress., describing the game context and objective while explaining the game to other peers, teachers, and parents. Due to the collaboration and social play available for this game, players will be learning new terminology regarding the setting of their game level and video game language. Additionally, each To-Do List is written and requires the player to read cursive handwriting.
Impacts of Computing	K-12	Through the use electronic tools this video game allows for collaboration and respectful use of computer uses when communicating with others. In order to play this game, players must first understand internet safety and privacy while using a video game. Some players may further learn how use computers to their benefit, for example coding and programming.
Information and Communication Technology	7-12	Players will be using and integrating computer skills for gaming. Players will first learn internet safety and privacy for video game use. Communication online can have shortcut phases and thus the player may learn to use new terminology.
Injury, Prevention, and Safety	9-12	Through this video game, players will evaluate the risks and responsibilities of maneuvering a goose and encourage safe animal handling. Some common knowledge is learned from where the goose is allowed and the groundskeeper or other characters are not allowed like swimming up a river is not a universal human skill thus human characters do not follow the goose into bodies of water. Some challenges involve injuring the groundskeeper or pulling the plug of a TV which should be followed up by an explanation of how these actions may be unsafe.
Reading Standards for Literacy in Science & Technical Subjects	K-5	This game promotes players' understanding language, reading skills, and following directions through pop up notifications, To Do List and setting cues.
Speaking and Listening	K-12	Players can participate in social collaboration and follow rules of discussion (turn-taking, following directions, critical thinking, reflection) throughout the challenges of completing the To-Do List. When collaborating, listening to your playmates is an important soft skill to gain.

To view, the expanded California Common Standards click here.

Components of Play

The Untitled Goose Game is a single-player game, with the option to create multiplayer use if one character if multiple switches are utilized during gameplay.

Cognitive Needs	Motor Needs	Social Needs
• The to-do list does not give instructions on how to achieve each step which incorporates a cognitive task of problem-solving on how to achieve the goal. • These goals usually involve sequencing actions together.	• Pressing down on the buttons or controls • Coordinate multiple buttons to press down on simultaneously	• Communication and collaboration if working in a team is needed • Teamwork to coordinate use of multiple switches by multiple people

General Occupational Therapy Play Recommendations (Vary as Needed)

Facilitate collaborative play • Utilize visual overlay with printable icons to distribute switches to multiple players. • More experienced players are encouraged to verbally communicate game objectives to other players consistently.	**Cognitive needs** • Game is not straight forward and objectives change based on the main player's completion of game objectives. • Players can create a plan of action on how to sequence actions to solve how to achieve the task on the To-Do list	**Fine motor coordination** • See the "Switches" video for more information. • If switches are difficult to place for best playing strategy, refer to our "Overlays" for a suggestion.

Appendix E - Common Core PDF

By Game

Action/Adventure

Bomber Crew

Algorithms & Programming	See list
Arts, Media, & Entertainment	CTE.AME.D.1.4
Computing Systems	See list
English Language Arts	L.2-10.3 ELD.PI.4-12.6a.B R-E L.11-12.3
Impacts of Computing	See list
Information and Communication Technology	See list
Injury, Prevention, and Safety	9-12.1.6.S 9-12.8.3.S
Library	LIB.1-8.4.1 LIB.9-12.4.1
Reading Standards for Literacy in Science and Technical Subjects	RI.K.10
Speaking and Listening	See list

Lego Batman

Algorithms & Programming	See list
Arts, Media, & Entertainment	See list
Computing Systems	See list
Impacts of Computing	See list
Information and Communication Technology	See list
Speaking and Listening	See list

Snake Pass

Algorithms & Programming	See list
Arts, Media, & Entertainment	See list
Computing Systems	See list
English Language Arts	L.2-10.3 L.11-12.3
Health Sciences and Medical Technology	CTE.ICT.C.3.2
Impacts of Computing	See list
Information and Communication Technology	See list
Library	LIB.1-8.4.1 LIB.9-12.4.1
Reading Standards for Literacy in Science and Technical Subjects	RI.K.10
Speaking and Listening	See list

Role Play

Disneyland

Algorithms & Programming	See list
Arts, Media, & Entertainment	CTE.AME.D.2.6
Computing Systems	See list
English Language Arts	L.2-10.3 ELD.PI.4-12.6a.B R-E L.11-12.3
Impacts of Computing	See list
Information and Communication Technology	See list
Reading Standards for Literacy in Science and Technical Subjects	RI.K.10
Speaking and Listening	See list

Untitled Goose Game

Algorithms & Programming	See list
Arts, Media, & Entertainment	CTE.AME.D.2.6
Computing Systems	See list
English Language Arts	L.2-10.3 ELD.PI.4-12.6a.B R-E L.11-12.3
Health Sciences and Medical Technology	CTE.ICT.C.3.2
Impacts of Computing	See list
Information and Communication Technology	See list
Reading Standards for Literacy in Science and Technical Subjects	RI.K.10
Speaking and Listening	See list

Zoo Tycoon

Algorithms & Programming	See list
Arts, Media, & Entertainment	CTE.AME.D.2.6, 7.8, 7.9, 8.5
Computing Systems	See list
English Language Arts	L.2-10.3 ELD.PI.4-12.6a.B R-E L.11-12.3
Health Sciences and Medical Technology	CTE.ICT.C.3.2
Impacts of Computing	See list
Information and Communication Technology	See list
Library	LIB.1-8.4.1 LIB.9-12.4.1
Reading Standards for Literacy in Science and Technical Subjects	RI.K.10
Speaking and Listening	See list

Racing

Clustertruck

Algorithms & Programming	See list
Arts, Media, & Entertainment	See list
Computing Systems	See list
Impacts of Computing	See list
Information and Communication Technology	See list
Injury, Prevention, and Safety	9-12.1.6.S 9-12.8.3.S
Reading Standards for Literacy in Science and Technical Subjects	See list
Speaking and Listening	See list

Hydro Thunder

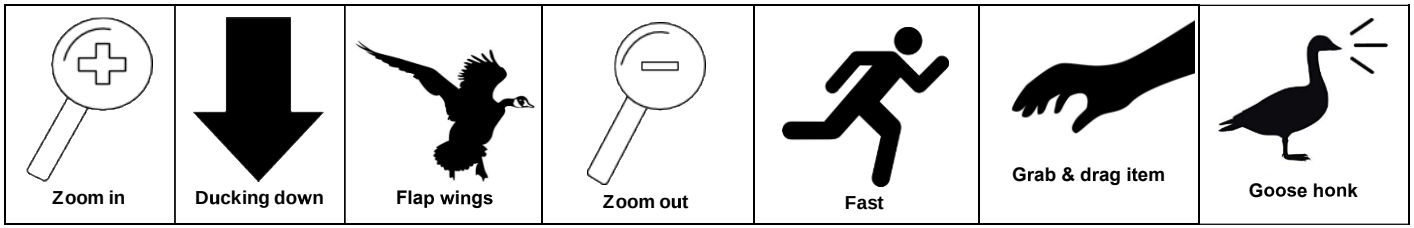
Algorithms & Programming	See list
Arts, Media, & Entertainment	See list
Computing Systems	See list
Impacts of Computing	See list
Information and Communication Technology	See list
Injury, Prevention, and Safety	9-12.1.6.S 9-12.8.3.S
Reading Standards for Literacy in Science and Technical Subjects	See list
Speaking and Listening	See list

Rocket League

Algorithms & Programming	See list
Arts, Media, & Entertainment	See list
Computing Systems	See list
Impacts of Computing	See list
Information and Communication Technology	See list
Injury, Prevention, and Safety	9-12.1.6.S 9-12.8.3.S
Reading Standards for Literacy in Science and Technical Subjects	See list
Speaking and Listening	See list

Appendix F Overlays

Untitled Goose Game



move goose

LB = zoom in

LT = duck down

RT = goose flaps wings

RB = zoom out

A = held = move faster

B = grabs & drag item

X = goose honks

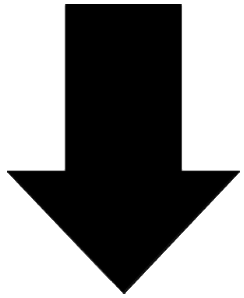
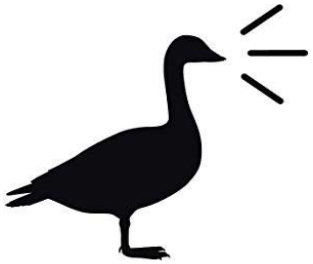
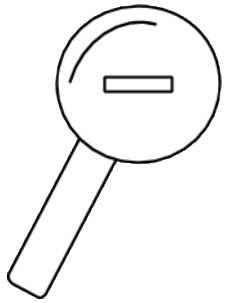
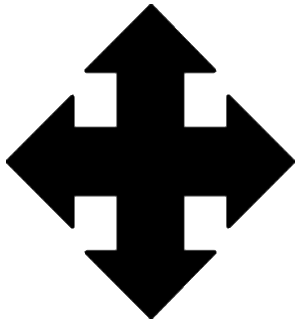
(L) = move goose

1.7 x 0.6

(R)

Printable Icons

**attach these icons to the corresponding switch while playing Untitled Goose Game.*

A  **Fast**	**B**  **Grab & drag items**	**LB**  **Zoom in**	**LT**  **Ducking down**
RT  **Flap wings**	**X**  **Goose honk**	**RB**  **Zoom out**	**(L)**  **Move goose**

Appendix G: Survey Questions

- Are you a ... (check all that apply)
    - Parent or family member
    - Related Service Professional (OT, SLP, AT specialist, PT, Other)
    - General Education Teacher
    - Special Education Teacher
    - Other… (write in)
- THE ADAPTIVE GAMING WEBSITE was clear and easy to navigate
    - Scale 1-10
        - 1: Unclear/confusing
        - 10: Clear/easy to understand
- The INSTRUCTIONAL VIDEOS were clear, well paced, and provided information that you can now readily use and implement?
    - Scale 1-10
        - 1: Videos not useful
        - 10: videos helpful and usable
- Please provide us with any comments about the WEBSITE content, navigation and INSTRUCTIONAL VIDEOS
- The GAME SHEETS were clear, provided pertinent information and were easy to navigate
    - Scale 1-10
        - 1: Unclear/confusing
        - 10: Clear/easy to understand

- Please provide us with any comments about the GAME SHEETS
- The COMMON CORE STANDARDS application to gaming and links were clear and easy to navigate
    - Scale 1-10
        - 1: Unclear/confusing
        - 10: Clear/easy to understand
- The COMMON CORE STANDARDS application to gaming provided pertinent information informing how gaming can fit into the instructional educational day
    - Scale 1-10
        - 1: Information is not useful
        - 10: Important standards information that can be used in classrooms
- Please provide us with any comments about the COMMON CORE STANDARDS & Links
- The VISUAL OVERLAYS were clear and understandable for use while gaming.
    - Scale 1-10
        - 1: Unclear/confusing
        - 10: Clear/easy to understand
- Please provide us with any comments about the VISUAL OVERLAYS
- How likely are you to implement the classroom kit if the device was available to you with students or clients?
    - Scale 1-10
        - 1: Very unlikely
        - 10: Very likely

- How likely are you to share this website with colleagues, families and other interested parties to expand adaptive gaming?
    - Scale 1-10
        - 1: Very unlikely
        - 10: Very likely
- Please share why or why not.
- Any other feedback you would like to share?
- THANK YOU for your time and thoughtful feedback. Your comments will greatly inform how we can improve the site for use by teachers, related service providers, families, gamers & more!