AUGMENTED REALITY FOR TEACHING PERSONAL FINANCE SKILLS IN THE COMMUNITY

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ABSTRACT

The ability to manage one's personal finances is an indicator for success and autonomy among adolescents preparing for adulthood. Accessing and spending money allows an individual to participate in preferred social and recreational activities within the community. For individuals with intellectual disabilities (ID), however, personal finance skills that afford opportunities for community participation are hindered by the limited adaptive skills associated with having ID and increased reliance on family and staff. These limiting factors can diminish an individual's self-determination and overall quality of life. The United States Department of Health and Human Services and The World Health Organization both identify the need for technologies that can improve accessibility in communities for individuals with ID. Therefore, this study used a multiple-probe design to examine the effectiveness of a video-modeling intervention, delivered through an augmented reality application, for teaching youth with ID to perform personal finance skills in their community. Results of the study show the intervention was effective for teaching the participants to withdraw money from an ATM and to pay for items using a debit card. Additionally, three of the four participants found the intervention to be a socially acceptable method for accessing instruction while in the community.

DEDICATION

This dissertation and this journey are dedicated to my Papa. There is nothing I wouldn't give to celebrate the closing of this chapter with you. My desire to work with youth began many years ago listening to stories of your tenure in education. I didn't know the man they call Mr. Bridges. To me, you were only ever *Papa*. I certainly wasn't familiar with Bullet, but I cherish the memories shared by family members and your former students. Although I didn't know you as an educator, I was so fortunate to receive the same mentorship and selflessness described in these stories. You changed so many lives, Papa. Thank you for your dedication to the field, but mostly, thank you for your encouragement and guidance.

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CHAPTER I:

INTRODUCTION

Preparation for the transition to adulthood among adolescents is preempted by acquisition of life skills that allow them to function independently in their chosen post-school pathways. For many, this includes participation in a postsecondary education program or entering the workforce after graduation. Furthermore, most adolescents desire to live independently and participate in community activities without the supervision or support of others. Many of the skills necessary to do so are learned incidentally through observational learning and guidance from their families. Examples of these skills include daily living skills, cooking, personal finance skills, and accessing transportation.

For students with intellectual and developmental disabilities, acquisition of these skills often does not occur incidentally. Specialized, explicit instruction is needed to ensure these individuals can learn the skills necessary to achieve independence to the highest degree possible. Thus, discrepancies exist among young adults with disabilities and those without in regard to employment, independent living, and community participation. To assist in alleviating this issue, this study examined the effectiveness of an intervention for teaching personal finance skills in the community for adults with ID. The overarching goal of the study was to increase personal finance skills so participants could access their money and participate more frequently and independently in community activities typical of same age peers. Examples of these activities include eating at a local restaurant and paying for the tab without assistance, purchasing movie

tickets, paying to use public transportation, or paying for new clothes at a department store.

This first chapter presents background information on the lower rates of community participation among individuals with ID. The sections below also describe the professional significance of the study and present an overview of the theories undergirding the study. The chapter concludes with definitions of terms relative to the study and an overview of the forthcoming chapters.

Background of the Problem

Deinstitutionalization led to increasing numbers of individuals with intellectual disabilities (ID) moving out of isolated institutions and into less restrictive community settings (Stock, Davies, Wehmeyer, & Lachapelle, 2011). This movement was guided by the notion that people with ID have the right to make choices about their daily lives, and less restrictive living environments provide more opportunities for participation in social and communal activities of choice (Verdonschot, de Witte, Reichrath, Buntinx, & Curfs, 2008). More recently, efforts to support individuals with ID have shifted toward enhancing quality of life by providing services and accommodations that aim to increase community participation (Carr, 2007; Thorn, Pittman, Myers, & Slaughter, 2009)

The International Classification of Human Functioning, Disability and Health defines community participation as the performance of people in activities through interactions with others in the context in which they live (WHO, 2001). Research on community participation has previously examined the extent to which individuals participate in the following domains: domestic life, interpersonal life, leisure, education, work, and civic life (Bigby, Anderson, & Cameron, 2017; Verdonschot, de Witte,

reichrath Buntix, & Curfs, 2009). A number of positive outcomes have been associated with community participation including increased autonomy and sense of self-efficacy (Heller, Miller, & Factor, 1998), improved social functioning (Bigby, Anderson, & Cameron, 2017; Chang, Coster, & Helfrich, 2013), and more opportunities to make choices (Zakrajsek, Hammel, & Scazzero, 2014). These outcomes allow for the fulfillment of personal goals, which strongly contribute to an individual's overall quality of life. Furthermore, increased autonomy and opportunities to make choices regarding one's life foster self-determination and intrinsic motivation. Research on community participation, however, has found that individuals with intellectual and developmental disabilities face numerous barriers that prevent them from fully participating in their communities at the same rate as those without disabilities (Chan, Gelman, Ditchman, Kim, & Chiu, 2009; Stancliffe, 2001).

Empirical studies report lower rates of participation among people with ID across many community domains including employment (Kampert & Goreczny, 2007), domestic activities (Wilhite & Keller, 1996), social relationships (Bigby & Wiesel, 2015; Hall & Hewson, 2006), and recreation and leisure activities (Amado, Stancliffe, McCarron, & McCallion, 2013; Dusseljee, Rijken, Cardol, Curfs, & Groenewegen, 2011). For instance, Hall et al. (2005) found that individuals with mild ID were less likely to be involved in community groups such as church, school, sports, and local government. In regard to employment, adults with ID are more likely to work in sheltered and segregated environments and less likely to be employed competitively (Olney & Kennedy, 2001; Taanila, Rantakallio, Koiranen, von Wendt, & Jarvelin, 2005). Lack of competitive employment means fewer hours and less wages for people with ID, which

further limits community involvement (Olney & Kennedy, 2001; Wilhite & Keller, 1996).

Domestic life includes everyday tasks related to home maintenance, food preparation, household chores and repairs, and tending to personal needs. Minimal research focuses on domestic life as it relates to community participation, but one study by Wilhite and Keller (1996) examined the domestic and recreation activities of people with ID. Their results found common domestic activities include shopping for groceries and performing household chores. Individuals in the study reported performing household tasks for 4.7 hours on average weekly and assisting neighbors and friends 2.6 hours per week.

A longitudinal study by Gray et al. (2014) investigated the living circumstances of a sample of 536 participants with ID from childhood to adolescents. Ages during the first wave of data collection were 4.0-18.9 and 20.5-37.6 at wave 5. Wave 1 of the data collection reported 84% (n = 357) of the sample were living at home, with family, or in foster care and 16.2% (n = 69) were living in group homes or residential facilities. Wave 5 of the data collection showed 61.3% (n = 217) were living at home with family, 29.7% (n = 105) were living in supported-care settings, and only 9% were living independently. The results of the study show a high percentage of adults with ID continue to live at home with family.

Leisure and recreational involvement of people with ID has also been studied empirically. Common recreational activities among people with ID include solitary and passive activities such as watching television and movies, eating out at restaurants, and attending church (Buttimer & Tierney, 2005; Luftig & Muthert, 2005; Zijlstra &

Vlaskamp, 2005). A study by Ager, Myers, Myles, and Green (2001) of the community and civic participation of adults with ID reported that 80% of the sample participated in at least one community activity, but 75% of the sample were accompanied by trained staff. A similar study by Hall and Hewson (2006) found that 48% of their participants with ID left their home for less than an hour a day.

Subsequent inquiries (Dusseljee et al., 2011; Hall et al., 2005; Hall & Hewson, 2006; Umb-Carlsson & Sonnander, 2006) have explored the social outcomes of community participation among people with ID, and the results of these studies show lack of community participation hinders the development of interpersonal relationships. The social networks of people with ID are mostly comprised of family members, staff, and other individuals with disabilities. Hall et al. (2005) found that people with ID were less likely than typical peers to have six or more friends or relatives with whom they had regular contact. These findings were corroborated by Dusseljee et al. (2011) in a large-scale of study of 653 people living in the Netherlands with ID. Their results found that 69% of the participants in the study had social contact with family, 35% had contact with friends, but only 12% reported contact with friends without intellectual disabilities.

Studies by Hall et al. (2005) and Umb-Carlsson and Sonnander (2006) focused on the intimate relationships of people with ID. Both studies found lower rates of marriage among people with ID. According to the study by Umb-Carlsson and Sonnander, severity of intellectual disability was predictive of marital status for people with ID. Additionally, Hall et al. (2005) reported that 73% of participants with mild ID were married. Umb-Carlsson and Sonnander's (2006) results found that 38.4% of women versus 28.2% of participants with mild ID were married.

Adults with ID face barriers that prevent them from gaining access to and participating in their communities. These barriers can be attributed to the characteristics associated with ID, which include delayed development of adaptive skills and difficulty retaining and generalizing new skills (Woolf, Woolf, & Oakland, 2010). Limitations in adaptive functioning contributes to the need for ongoing support across vocational, residential, and recreational settings (Lerman, Apgar, & Jordon, 2005). Findings of a study by Bigby, Anderson, and Cameron (2017) support the notion that community participation is limited for people with ID. Their results found that community participation is further hindered by poor staff practices such as group-based outings, use of anonymous public spaces, and inadequate use of staff for supporting the building of social networks. Similarly, an obstacle for accessing communities is dependence on staff for planning and carrying out trips to the community (Thorn et al., 2009; Verdonschot et al., 2008).

The extent to which individuals depend on staff and family members can be attributed to age and the severity of the individual's disability. Verdonschot et al. (2009), in a comprehensive review of literature pertaining to community participation, found the attention of most community participation research pertained to individuals with mild ID. A study by Dusseljee et al. (2011) corroborates the influence of age and severity of ID on community participation. Their results show older adults (50 years or older) with ID have fewer opportunities to participate in employment and daytime activities. Results of their study found that people with moderate ID had lower rates of paid work, participation in daytime activities, and fewer social contacts with people without ID when compared to individuals with mild ID. Few studies focus on the level of participation of people with

moderate, severe, or profound intellectual disabilities (Gray et al., 2014; Verdonschot et al., 2009).

Although research on community participation does not directly identify the inability to manage money as a barrier for community participation, limited participation in community activities and social engagements can be ascribed to an individual's inability to make, manage, and access money. Many individuals with ID lack the skills necessary to control their personal finances and are not afforded opportunities to do so (Browder & Grasso, 1999). This severely impacts a person's ability to engage in day-to-day leisure and domestic activities and further exacerbates reliance on family and staff.

Statement of the Problem

The Americans with Disabilities Act (ADA), enacted in 1990, emphasized and protected the rights of individuals with disabilities in the community. This law prohibits discrimination of people with disabilities in community domains by ensuring public accommodations and access to employment, transportation, and state and local government programs and services (Americans with Disabilities Act, 1990).

More recently, the need for inclusive communities that foster participation has been recognized by the United States Department of Health and Human Services (HHS). The HHS identifies access to social and community contexts as factors that can influence an individual's health and quality of life. The U.S. Department of Health and Human Services' *Healthy People 2020* initiative recognizes the important role of communities for ensuring the health, growth, development, and contribution of all people, regardless of ability. According to the initiative, healthy individuals must have opportunities to participate in meaningful daily activities. Goals outlined in *Healthy People 2020* address

the need for improving conditions of daily life by improving accessibility in communities, encouraging community living of people with disabilities, and increasing access to assistive technologies that can promote community participation.

Limitations in adaptive functioning lead to increased reliance on staff and family members. These barriers point to the need for interventions that would accommodate limitations in the area of adaptive functioning. Many individuals with ID must rely upon family and staff for managing and accessing money, yet, minimal research exists for teaching young adults with ID the skills necessary to perform these skills independently. Although personal finance skills are only one area of adaptive functioning, the opportunity to access money greatly contributes to a sense of autonomy and control over making decisions regarding day-to-day activities in the community.

Significance of the Study

Despite the enactment of ADA and the optimistic tone of the HHS initiative, there remains concern about community accessibility and participation, resulting in disproportionate participation of people with disabilities in their communities. Empirical studies have documented lower rates of community participation by persons with disabilities (Bigby, Anderson, & Cameron, 2017; Chang, Coster, & Helfrich, 2013; Verdonschot et al., 2009). Clearly, there is great need for increased community-based support services through community agencies and assistive technologies (Duseljee et al., 2011; Verdonschot et al., 2008). Experts have also noted the need for instructional emphasis on the development of functional skills to promote community participation and community living (Gray et al., 2014; Woolf, Woolf, & Oakland, 2010; Zakrajsek, Hammel, & Scazzero, 2014).

The use of assistive technology has been cited throughout literature on community participation as a method for increasing accessibility and fostering independence within communities (Duseljee et al., 2011; Verdonschot et al., 2008). Therefore, this study aimed to improve personal finance skills among individuals with ID through the use of an assistive technology application that is inexpensive and accessible to any user with a smart device.

The study applied an augmented reality (AR) intervention to a context and group of participants where minimal research on the use of AR previously existed. Majority of research on the efficacy of AR interventions are implemented in K-12 academic settings (Akcyir & Akcyir, 2017). More research was needed to determine the success of AR for improving financial independence and to determine whether AR is helpful for making communities more accessible to individuals with ID. Therefore, this study investigated the effects of the intervention among transition-age participants with ID learning to access their money in the community.

Research on the use of AR with individuals with ID has covered a variety of skills including academic skills, cooking, navigation, and hygiene skills (Cihak et al., 2016; McMahon, Cihak, & Wright, 2015; McMahon, Cihak, Wright, & Bell, 2016; Smith, Cihak, Kim, McMahon, & Wright, 2017). This study extended upon this body of research by using AR in teaching skills for withdrawing money from an ATM and paying for items at a local grocery store using a debit card.

Scope of the Study

This study aimed to determine whether AR increases the acquisition of personal finance skills in the community among transition-aged students with ID. The skills

selected for the study are critical for young adults preparing for transition. Through this study, participants learned to use an AR intervention to improve their ability to access money in two different community settings.

Purpose of the Study

The study examined the effectiveness of an AR intervention for increasing personal finance skills in the community. Augmented reality is an emerging intervention that combines visual strategies for teaching students with ID using modern technology and allowing users to perceive the world through a virtual overlay (Bower, Howe, McCredie, Robinson, & Grover, 2014).

Augmented reality, as used in this study, entailed students learning to use HP Reveal (2018), an AR application, on mobile devices that provided a video model for completing the steps necessary to perform personal finance skills within the community. The target skills included using AR to access video models demonstrating withdrawing money from an ATM and using a debit card machine at a local department store to purchase items. For this study, I proposed the following research question: How effective is augmented reality as a tool for improving the acquisition of personal finance skills within the community for adults with intellectual and developmental disabilities?

Theoretical Framework

Research on community participation by people with ID has framed community participation as both social and physical processes (Chang, Coster, & Helfrich, 2013; Hall, 2017). Dusseljee et al. (2011) define community participation as, "performing daytime activities while interacting with others (p. 4)." Bigby, Anderson, & Cameron (2017) recognize that definitions of community participation differ but state most

definitions encompass multiple domains related to domestic life, leisure, work, and social, political, and economic arenas. Similarly, community participation is defined by Chang, Coster, & Helfrich (2013) as involvement in activities that are socially motivated and are part of everyday household, occupational, or recreational activities.

The lower rates of social participation for people with ID warrants further examination. In this study, however, the focus was on physical participation. Specifically, the study evaluated the efficacy of an intervention designed to increase independence in performing personal finance skills in the community. Verdonschot et al. (2009) pointed out that few studies on this topic are based in theory. Therefore, the theoretical frameworks that guided this study were the International Classification of Functioning, Disability and Health (ICF), which provided a definitional perspective on community participation, self-determination theory, and social learning theory.

The ICF stated that community participation is, "the performance of people in actual activities in social life domains through interaction with others in the context which they live." Community is further categorized into four social life domains: (1) domestic life; (2) interpersonal life; (3) major life activities; and (4) community, civic, and social life (WHO, 2001). The ICF recognizes disability and functioning as multifaceted concepts that are influenced by health conditions, bodily structures, and environmental factors.

According to this framework, an individual's level of functioning is strengthened or hindered by the environmental factors that influence the degree to which the person interacts with his or her surroundings. Environmental factors identified by ICF are organized into the following five categories: (1) products and technology; (2) natural

environments and human-made changes; (3) support and relationships; and (4) attitudes; and (5) services, systems, and policies. This framework provided a basis for this study as it recognizes the importance of environmental factors as limiting or enhancing in community participation for people with ID.

Cummins and Lau (2003) contend that community integration and participation have improved for people with ID, however, participation may not reflect individual choice. Limited opportunities to make personal decisions can negatively affect an individual's intrinsic motivation. Effective transition planning provides opportunities for young adults to make choices about their goals for employment, education, living arrangements, and how they wish to participate in the community. Development of choice-making skills, problem-solving skills, and self-advocacy skills are critical for ensuring people with ID are participating in community activities that are meaningful to them and align with their personal goals.

The power to exude self-determination stems from an individual's intrinsic motivation. Self-determination theory examines the underlying intrinsic motivation that influences an individual's actions and interactions. Self-determination theory explores the role of a person's basic psychological needs in fostering personal growth and overall well-being (Legault, 2017). These needs include the need for autonomy, competence, and relatedness. Furthermore, self-determination theory acknowledges the role of the environment in facilitating or hindering a person's psychological needs (Ryan & Deci, 2000).

Social learning theory postulates that human learning is a function of environmental and mental process, and people learn by observing and imitating others.

Four key elements of this theory, according to Ormrod (1999), underscore the notion that people learn through observation of others: (1) people learn by observing others and by observing the consequences of those behaviors; and (2) learning and performing are not the same. Learning can take place when the behavior is observed but not be performed until a later time or not at all; (3) reinforcement plays a role in observational learning but is not necessary for learning to take place; and (4) cognitive processes play a role in learning. In accordance with this theory, Bandura (1977) identifies four components of observational learning:

1. Attention: An individual must be able to attend in order to learn;
2. Retention: Information must be retained. This is accomplished through two symbolic systems: representation of behavior in visual form or representation of behavior in verbal form;
3. Replication: An individual must possess the motor skills necessary to replicate the learned behavior; and
4. Motivation and reinforcement: Imitation occurs as the result of motivation and reinforcement.

The premise of the AR intervention was based on imitation of behavior after viewing a video model. Research has demonstrated the efficacy of video-based instruction for teaching functional skills to individuals with varying disabilities across all ages (Gardner & Wolfe, 2013). Therefore, the principles of social learning theory provided a theoretical foundation for the intervention in the study.

Research Questions

The study was guided by the following research question: How effective is augmented reality as a tool for improving the acquisition of personal finance skills within the community for adults with intellectual and developmental disabilities?

Definition of Terms

Adaptive skills- The American Association on Intellectual and Developmental Disabilities (2018) define adaptive behaviors as skills necessary for individuals to learn in order to function in their everyday lives. Examples of adaptive skills include expressive and receptive communication, reading and writing, financial management, eating, dressing, taking medication, toileting, following rules, obeying laws, and occupational skills. Delays in the development of adaptive behaviors are an identifying characteristic among individuals with intellectual disabilities.

Personal finance skills- The Jump $tart Coalition for Personal Finance Literacy (2007) define finance skills as an understanding of money concepts including money identification, cash flow (e.g., deposits and withdrawals), basic economic concepts (e.g., supply and demand), and debt/risk management. For the purpose of this study, personal finance skills are defined as withdrawing money from an ATM and purchasing items using a personal debit card.

Community- In the context of this study, community refers to the nonacademic settings in which the participants are using the AR intervention. The locations of data collection took place at the participants' local bank branches located and at a local department store.

Video modeling- Bellini and Aukullian (2007) define a video model as an instructional technique that provides a demonstration of a behavior or skill through video representation. Video modeling interventions have been employed across many disciplines and used for teaching students with intellectual disabilities a variety of skills (Bellini & Akullian, 2007).

HP Reveal- HP Reveal (2018) is a free AR application that can be downloaded to a mobile device. HP Reveal allows users to view video model overlays in real time that can be customized to any skill or activity. The app will serve as the tool for viewing the AR video model for participants to view prior to completing the task.

Target- This term is specific to the HP Reveal application. In order to trigger the application to present the video model, the participant must point his or her mobile device at the designated target. Targets are customizable and can be tailored to the activity or skill presented. They can be preloaded photos or pictures of actual objects. For the purpose of this study, the targets that will trigger the video model overlay will be an ATM and a debit card machine.

Summary

Community participation is a marker of an individual's independence. Myers, Ager, Kerr, and Myles (1998) described community participation as not only a goal but, "a process by which other goals are achieved." Participation in communities allows for opportunities to develop social relationships, find employment, and participate in recreational activities. Hence, instruction for increasing financial independence must be a central component in transition planning and in the development of individualized education programs (IEP).

As mentioned previously, community participation has been defined through research as both social and physical processes. Empirical studies have examined the social networks and frequency of social interactions as well as the degree to which people with ID perform adaptive skills independently in community settings. The need for increased participation of people with ID has been identified, yet, research reports that people with ID participate less across all community domains when compared to individuals without disabilities.

Limited adaptive skills and dependence on support staff for participating in communities further exacerbate this issue. Research points to the need for effective interventions that work to improve financial independence in communities. Additionally, the use of assistive technology has been cited throughout literature as a means for improving independent functioning. According to Scherer and Glueckauf (2005), assistive technology has the potential to enhance participation by promoting self-care, mobility, and communication. Assistive technologies are also identified in the ICF as an environmental factor that can facilitate a person's ability to participate in the community. Therefore, this study examined the effectiveness of a video modeling intervention delivered through AR to promote acquisition of personal finance skills. The following chapter includes a thorough review of the literature on community participation for individuals with ID, video modeling, and augmented reality. In addition, discussions of the theories and conceptual framework undergirding the study are detailed.

CHAPTER II:

REVIEW OF RELEVANT LITERATURE

This chapter provides an extensive review of literature on community participation, the barriers that limit participation for individuals with ID, and a description of the theories underpinning this study. As stated in the previous chapter, community participation is described in literature as both social and physical processes. The purpose of this study was to examine the effectiveness of an intervention that aimed to improve personal finance skills. This review, therefore, is limited to literature pertaining to community participation as a physical process. The social aspects of community participation are briefly discussed. A thorough review of literature on video modeling (VM), a commonly used instructional strategy for teaching new skills and appropriate behaviors to individuals with ID is also included in this chapter. The chapter concludes with a review of literature on augmented reality, as it is the tool through which the video modeling intervention was delivered in this study.

Relevant literature was compiled by searching SCOUT and ERIC databases. Additionally, academic journals covering research on working with individuals with ID were reviewed to identify literature related to the study. Key words used for the search included the following terms and combinations of terms to conduct Boolean searches: *community participation, adaptive skills, money management skills, personal finance skills, intellectual disabilities, developmental disabilities, transition, community presence, environmental factors, video-based instruction, video modeling, computer-based video*

instruction, and *augmented reality*. Other additional articles were located by reviewing reference lists on relevant articles.

Theoretical Framework

Theoretical and conceptual models of human functioning recognize the role of the environment as determinant of disability and emphasize community participation as an essential part of human functioning (Fougeyrollas, Noreau, & Bergeron, 1998; Luckasson et al., 2002; WHO, 2001). Common theoretical frameworks and models such as the International Classification of Human Functioning, Disability and Health (WHO, 2001), The Quebec Disability Creation Process Model (Fougeyrollas, Noreau, & Boschen, 2002), and the American Association on Intellectual Disabilities (Schalock & Luckasson, 2005) focus on defining disability in terms of functioning within an ecological perspective. A common theme among these frameworks is that human functioning and performance cannot be fully understood without assessing the interaction between the person and the environmental factors that can enable or hinder participation.

International Classification of Human Functioning, Disability, and Health

The World Health Organization's International Classification of Human Functioning, Disability and Health (ICF) is internationally recognized as a theoretical model for defining disability (McNaughton, McPherson, Falkner, & Taylor, 2011). According to Chan, Gelman, Ditchman, Kim, and Chiu (2010), the ICF theorizes that the experience of disability is connected to a person's body functions and structures, activities and participation, and personal and environmental factors. The ICF states that an individual's level of functioning is strengthened or hindered by environmental factors which influence the degree to which the person interacts with his or her surroundings.

Application of the ICF framework requires an understanding of the terminology used to describe it. Body functions are physical and psychological functions of bodily systems and include eight components: (1) mental functions; (2) sensory functions and pain; (3) voice and speech functions; (4) functions of the cardiovascular, hematological, immunological, and respiratory systems (5) functions of the digestive, metabolic, and endocrine systems; (6) genitourinary and reproductive functions; (7) neuromusculoskeletal and movement-related functions; and (8) functions of the skin and related structures. Body structure components consist of the organs, limbs, and other components that are associated with each of the body functions.

Community, as defined by the ICF, is categorized into four social life domains:

1. Domestic life- includes everyday tasks and actions;
2. Interpersonal life- friendships, intimate relationships, and family relationships;
3. Major life activities- consists of work and education opportunities; and
4. Community, civic, and social life- examples include activities involving religion, politics, leisure, and recreation.

An individual's functioning in the community can be hindered or supported by environmental and personal factors.

Environmental factors are external features that can affect an individual's performance in each domain. Environmental factors are organized into the following five categories: (1) products and technology; (2) natural and human-made changes to the environment; (3) support and relationships; (4) attitudes; and (5) services, systems, and policies. Personal factors also influence an individual's performance in each of the social

life domains of the ICF, and these can include an individual's gender, race, age, other health conditions, education, and socioeconomic status. Personal factors are included in the theoretical framework of ICF as contributing to a person's functioning, but these factors are excluded from the conceptual model because many of these components vary according to the individual's cultural and social circumstances (Chan et al., 2009).

Activities and participation are synonymous with capacity and performance in the ICF. Activity is defined as a person's ability to perform a task, and participation refers to engaging in life activities in the community (WHO, 2001). Activities and participation are characterized by functioning regarding limitations and ability in one or more of the following domains: (1) learning and applying knowledge; (2) general tasks and demands; (3) communication; (4) movement; (5) self-care; (6) domestic life areas; (7) interpersonal interactions; (8) life areas including education and work; and (9) community, social, and civic life (WHO, 2001).

Research has focused on the frequency of participation in each social life domain as well as the environmental factors that make community participation more or less attainable by people with disabilities (Verdonschot, de Witte, Reichrath, Buntinx, & Curfs, 2008, 2009). Full participation in the community, both socially and physically, is recognized as an ideal outcome for people with disabilities (Chen et al., 2010). When evaluating an individual's degree of independence in carrying out tasks and engaging in life activities, context must be considered to determine whether changes to the environment are necessary to increase functioning and to ensure accessibility and determine appropriate supports.

Self-Determination Theory

Self-determination is a desired outcome of most education programs for students with intellectual disabilities. Self-determination is defined by Wehmeyer (2005, p.117) as, "acting as the primary causal agent in one's own life and making choices and decisions regarding one's own quality of life free from undue external influence or interference." A self-determined person exhibits behaviors that are autonomous, self-regulated, psychologically empowered, and self-realizing (Wehmeyer & Schwartz, 1998). Skills taught as part of self-determination instruction include decision and choice making, goal setting, problem solving, and self-advocacy skills (Wehmeyer & Schwartz, 1998).

Self-determination has been found to be predictive of perceived quality of life (QOL) with respect to personal development and fulfillment (McDougall, Evans, & Baldwin, 2010), involvement in transition planning (Test et al., 2009), employment, and financial independence (Wehmeyer & Schwartz, 1998). Additionally, self-determination status upon exiting high school impacts adult outcomes with respect to employment, financial management, community access, and independent living (Shogren, Wehmeyer, Palmer, Rifenbark, & Little, 2015).

The power to act in a self-determined manner stems from intrinsic motivation. The self-determination theory emphasizes the need for individuals to develop self-determination skills to promote optimal functioning, social development, and personal well-being. Self-determination theory focuses on the conditions that foster human potential and behavior as well as the innate needs of all humans for competence, relatedness, and autonomy (Deci, Vallerand, Pelletier, & Ryan, 1991; Ryan & Deci, 2000). An individual that is intrinsically motivated seeks out challenges, desires

opportunities to explore and learn new skills, and exercise personal capacities (Ryan & Deci, 2000). Self-determination theory posits that social and environmental conditions can either foster or thwart a person's intrinsic motivation, and intrinsic motivation flourishes when a person's need for autonomy, relatedness, and competence are fulfilled.

As part of transition planning, many students with ID express the desire to work, attend postsecondary education, participate in social and recreational activities in the community, and live independently. Intrinsic motivation and self-determination are critical components for students to develop in order to make choices about their day-to-day activities and attain personal goals.

Social Learning Theory

Research supports the influence of external stimuli and consequences (e.g., reinforcement and punishment) on behavior (Goldenberg & Lowe, 2018). Bandura suggested, however, that learning does not always occur through direct experience or reinforcement but can also occur through observation of others. The notion that individuals learn vicariously through observation of behavior, modeling, and imitation is known as the social learning theory (SLT). In addition, SLT acknowledges to reciprocal relationship between the individual, behavior, and the environment. SLT serves as a theoretical basis for the influence of video modeling for teaching new behaviors to the participants of the study.

Modeling process. Modeling and imitation of behavior are key elements of SLT. According to SLT, new behavior is not only learned through direct experience, but it is also learned through observation of others and the consequences resulting from their behaviors. In order for the observer to internalize the representations of the new behavior,

Bandura (1971) stated that four subprocesses of modeling must occur: (a) Attention- it is essential for the observer to attend to the behavior and outcomes displayed by the model. The behaviors being modeled can be portrayed live or symbolically (i.e., via pictorial representations, video-modeled behaviors). To increase the likelihood that the observer will attend to the model, the model used should be someone who is perceived as important and competent to the observer; (b) Retention- behavior must be retained if it is expected to be performed at a later time; (c) Reproduction- the learner must be able to put together the modeled set of responses. This is determined by the degree to which the individual has learned the components of the skill and whether the individual possesses the motor skills necessary to perform the behavior; and (d) Motivation- observational learning is translated into action when reinforcement is received or directly or vicariously.

Reinforcement in SLT. Reinforcement incentivizes and informs behavior. When learning new skills through experience, consequences advise learners of what must be done to achieve beneficial outcomes or to avoid punishment. SLT suggests that reinforcement is not necessary for learning new behaviors, but rather, functions to strengthen the behaviors of the observer (Bandura, 1971). The anticipation of positive or negative outcomes serve as a motivational function for exhibiting desired behaviors, and the likelihood of reproduction is greater when the observer perceives the behavior to be socially acceptable and rewarding. Bandura notes that reinforcement can be received vicariously by observing the outcomes of modeled behavior and reinforcement does not have to be received immediately following the occurrence of the behavior in order for

learning to occur. Vicarious observation of consequences prevents the individual from making mistakes through trial and error (Goldenberg & Lowe, 2018).

Self-Regulation and Self-Efficacy

Behavior cannot always be attributed to external stimuli. Cognitive processes contribute to the internalization of observed behavior and influence future occurrences of the behavior. According to SLT, control over one's behavior shifts from external sources to internal sources through self-regulation (Grusec, 1992). Mental representations generated by the individual are retained through observation and experience. These mental representations serve to formulate internal standards which the individual judges his or her actions against (Grusec, 1992). These internal standards play a vital role in determining the value of the observed behaviors (i.e., self-evaluation) and whether the individual believes he or she has the ability to perform the behaviors (i.e., self-efficacy) (Goldenberg & Lowe, 2018). The development of self-efficacy is critical for young adults with disabilities, who serve as the participants for the proposed study. Individuals with a high degree of self-efficacy are more likely to set higher goals for themselves and exert greater commitment to achieve their personal goals (Bandura, 1993; Nangle, Erdley, Adrian, & Fales, 2010).

Reciprocal determinism. The interaction between the person, behavior, and the environment is known as reciprocal determinism and is an integral part of SLT (Nangle, Erdley, Adrian, & Fales, 2010). Environmental conditions are strongly influenced by an individual's behavior. Likewise, elements of the environment to which the individual is exposed can have a lasting impact on the individual's behavior. This reciprocal interaction can be seen in the ways society views individuals with intellectual disabilities.

Many people feel that persons with ID do not possess the abilities necessary to live independently or participate in the community without supervision. Therefore, persons with ID are less likely to have opportunities to perform functional skills in the community that would lead to a change in the perception of their abilities. Providing young adults with a tool that increases independence in the community can promote self-efficacy and potentially improve societal attitudes towards people with disabilities.

Community Participation and Presence

In the disability studies literature, community is understood as a shared experience within any context (Myers, Ager, Kerr & Myles, 2010). Community has further been defined as a political entity, a geographical location, and a social or psychological place or a sense of belonging (Willmott & Thomas, 1984; Abraham, 1989; Baron & Haldane, 1992). An all-encompassing definition marries the three components central to research on the topic of participation by defining community as "place," "people," and "sense of membership or belonging" (Bell & Newby, 1974; Walker, 1999; & Wellman & Leighton, 1979).

Previous research on community participation has examined the extent to which people with ID participate socially, through interactions with other people in the community, and as a measure of involvement and participation (Bigby, Anderson, & Cameron, 2017; Bigby & Wiesel, 2015; Dusseljee et al., 2011; Hall, 2013; Thorn, Pittman, Myers, & Slaughter, 2009). Similarly, research has studied the physical actions of people with ID in their communities by examining their degree of independence in performing functional, vocational, and leisure skills (Amado, Stancliffe, McCarron, & McCallion, 2013; Chang, Coster, & Helfrich, 2013). Despite the emphasis on measuring

and improving social and functional outcomes, studies show that people with disabilities continue to be excluded from their communities when compared to people without disabilities (Amado, Stancliffe, McCarron, & McCallion, 2013; Chang et al., 2013).

Failure to develop policies and interventions that effectively address poor outcomes for people with ID may result from ambiguity in definitions of community participation (Bigby et al., 2017). The terms community *presence* and community *participation* have been used interchangeably, making it difficult to determine whether community participation is a social or physical process. O'Brien and Lyle's (1987) framework for distinguishing between presence and participation refers to community participation as being part of a growing social network that includes people with and without intellectual disabilities. Lack of a clear definition of community affects intended outcomes for those aiming to improve community participation for people with ID (Bigby, Anderson, & Cameron, 2017).

Community participation can also be understood subjectively and objectively (Chang et al., 2013). Research following the deinstitutionalization movement focused on objective measures by examining the observed behaviors and actions of individuals participating in daily activities, leisure, and social engagements in the community (Amado et al., 2013; Hill, Lakin, Novak, & White, 1987; Hill, Lakin, Bruininks, Amado, & Anderson, 1989). These studies compared frequency, variety, and quantity of community resources and community activities among people living in institutions and in the community (Heal, Haney, Amado, & Novak, 1988). In spite of the increased physical presence of people with ID in communities, early research reported an overall absence of belonging and membership among people with ID and others in their communities.

The result of this shifting paradigm has led to studies of the social aspects of community participation. Hall (2013) considers community participation to entail subjective feelings, a sense of belonging, and societal attitudes. Subjective measures of community participation focus on the personal fulfillment gained by participating in community activities. Qualitative and quantitative research have assessed the extent to which people with disabilities engage in social interactions with peers without disabilities (Bigby & Wiesel, 2015; Hall & Hewson, 2006), the development of interpersonal relationships (Hall et al., 2005; Hall & Hewson, 2006; Umb-Carlsson & Sonnander, 2006), and experiences of convivial encounters with strangers (Bigby et al., 2017).

Benefits of Community Participation

Social Outcomes

Community participation is associated with positive health, social, and quality of life outcomes (Carr, 2007; Chang, Coster, & Helfrich, 2013). One of the most obvious benefits of being present and participating in the community is the opportunity to develop friendships and relationships with new people. People with ID are less likely than people without disabilities to have friends and relatives with whom they are in regular contact (Hall et al., 2005). Studies on the social networks of people with ID have found the majority of social networks are comprised of paid staff, family members, and other people with intellectual disabilities (Amado et al., 2013). Forrester-Jones et al. (2006) found the average social network size of their participants with learning disabilities was 22 people. Furthermore, the authors reported 43% of their participants' social networks consisted of paid staff, 14% included family members, and only 11% were friends and contacts working in local businesses. Support and relationships are identified by the ICF

as a factor that can influence access to communities for people with ID. Therefore, involvement in communities is critical for the development of interpersonal relationships that further community participation and contribute to improved life satisfaction and quality of life.

Self-Determination Outcomes

Freedom of choice and autonomy are outcomes associated with financial independence and community participation for people with ID. Limited autonomy and decision-making power has led to increased emphasis on developing self-determination skills for people with intellectual disabilities. People with ID have historically been restricted from making decisions regarding their own lives (Stancliffe, 2001). This includes limiting their choices in daily activities, social activities, and community access. Providing opportunities to make choices about when, where, and with whom one wishes to participate in the community promotes self-determination and authentic community experiences for people with ID.

A supportive environment is essential for fostering self-determination. Wehmeyer and Bolding (2001) studied adults with intellectual and developmental disabilities moving out of institutions and into community settings. They found that self-determination is influenced by opportunity afforded or inhibited by the environment, previous experiences, social support by peers and staff, friends, family, availability of accommodations and services, and individual ability. In their review of literature on community participation and integration, Cummins and Lau (2003) concluded that research examining community participation does not reflect the choice of people living and participating in these environments. Social inclusion, self-determination, and

interpersonal relationships are three critical elements of quality of life (Schalock, 1996). Therefore, providing people with ID opportunities to make choices promotes autonomy and enhances quality of life.

Barriers to Community Participation

Environmental Barriers

Social and physical participation in the community require that environments be accessible to individuals with ID. The ICF defines environmental factors as, "external features of the physical, social, and attitudinal world that can have an impact on an individual's participation (p.37)." The World Health Organization (2001) describes environmental factors as contributing to or hindering community participation for all people. Combined with an individual's health conditions, environmental factors can promote or hinder disability outcomes. Environmental factors include products or technology that make environments more accessible, supports and relationships that facilitate involvement, attitudes of people in the community and people with ID, and services, systems, or policies that support community participation (WHO, 2001).

Adherence to environment is a critical part of understanding human functioning, but limited research exists on the impact of these factors on community participation (Verdonschot, de Witte, Reichrath, Buntinx, & Curfs, 2008). Results of a review of literature related to environmental factors by Verdonschot et al. (2009) found that most of the existing research relates to availability of systems and services. This domain encompasses community systems and organized programs available to people with ID that would make community participation more or less accessible. Services and systems include transportation, residential facilities, day programs, vocational services, and

recreation and leisure programs. Lack of access to products and systems that would foster independence and promote participation in the community serve as barriers for individuals with ID. More research is needed to study the effects of interventions that address the environmental barriers that would lead to greater community participation.

Adaptive Behaviors

An intellectual disability affects both intellectual functioning and adaptive behavior. These delays make it difficult for people with ID to acquire and retain new information and skills (Woolf, Woolf, & Oakland, 2010). Deficits in these areas affect a person's ability to live independently, maintain employment, develop and sustain relationships, and tend to personal needs (Kampert & Goreczny, 2007). Thus, a reciprocal relationship between adaptive skills and community participation exists. The higher functioning the individual, the more likely he or she is to live and work independently. Limited adaptive skills make a person more likely to require supervision in vocational settings, residential, and community settings (Woolf, Woolf, & Oakland, 2010).

The relationship between severity of ID and degree of community participation has been empirically validated. Myers, Ager, Kerr, and Myles (1998) found that severity of ID influences the number of opportunities a person has to participate in community activities. A study by Dusseljee et al. (2011) examined the relationship between severity of ID and participation in work, daytime activities, social contacts, and participation in leisure activities. Their sample (n = 653) included participants with mild to moderate intellectual disabilities. Results of their study found that fewer people with moderate ID were gainfully employed when compared to participants with mild ID. Additionally, participants with moderate ID participated less frequently in daytime activities that were

not specifically for people with ID and had less contact with friends than people with mild ID. Similar findings were reported by Tint, Maughan, and Weiss (2017) in a study of caregivers of youth and young adults with a diagnosis of autism spectrum disorders (ASD), ID, or both. Results of their study found that individuals with ASD and ID were less involved in neighborhood outings, community events, organizations, or volunteer activities. In addition, 40% of caregivers of individuals with both ASD and ID reported the cognitive demands for participating in the community were significant barriers for their children, compared to 27% of caregivers for individuals with only ID.

Two studies have examined the relationship between adaptive behaviors and independent functioning. Perry and Felce (2005) used a multivariate analysis to measure associations between adaptive behavior and staff perception of choice, involvement in domestic activities, resident perception of choice, autonomy, and range and frequency of social and community activities. The researchers reported more than half the variance (53%) in the staff perception of choice questionnaire scores was associated with adaptive behaviors. Similarly, adaptive behavior scores accounted for 47% of the variance in autonomy scores. Adaptive behavior also accounted for more than half the variance in participation in domestic activities (54%) and engagement in social activities (51%). Conversely, adaptive behavior explained only 21% of the variance in scores on total frequency of community and social activities, indicating factors other than adaptive behavior influence the frequency in which participants were able to participate in the community. The authors concluded that level of staff attention strongly predicts community outcomes for individuals with intellectual disabilities. The need for increased

support allows fewer opportunities for individuals with ID to make choices about social and community activities.

Woolf, Woolf, and Oakland (2010) completed a correlational study among adults with moderate disabilities (n = 272) in residential and day treatment centers to determine the influence of adaptive behavior on vocational and residential independence. The participants were assessed using the Adaptive Behavior Assessment System II (ABAS-II) to measure adaptive behaviors, independence at work, and residential independence. The results indicated all Pearson correlations among the variables were significant. Results of the ANOVA showed adaptive behavior accounted for nearly half the variance in vocational independence (42%) and residential independence (46%). Interestingly, the authors found that adaptive behavior scores of those working independently and those working in supportive settings did not differ significantly, nor did adaptive scores between those living independently and participants living in group homes. The results of this study underscore the relationship between adaptive behaviors and independence for people with ID. These findings indicate the need for direct instruction for adaptive skills is crucial during transition years as young adults with ID prepare to live and work independently.

Living Arrangements

Type of living arrangement is a factor which strongly influences community participation for people with ID (Hatton & Emerson, 1996; Heller, Miller, & Factor, 1998, 1999; Stancliffe & Keane, 2000). Heller, Miller, and Factor (1998) examined the size and type of residential facilities on the level of community integration among residents. Their findings show individuals living in smaller living arrangements have

greater access to the communities, and therefore, have greater participation. Dusseljee et al. (2011) also examined the influence of living arrangement on community participation and found that people living in non-campus settings had greater access to the community and increased social interactions with people without disabilities when compared to those living in residential facilities. Additionally, results of a Pearson-chi squared test found significant differences between people living in non-campus settings versus campus settings in regard to access to paid work and social contact with neighbors without ID.

These findings were further corroborated by Gray and colleagues (2014) in their longitudinal study of 536 Australians with ID. This large-scale study surveyed participants and/or family members of people with mild, moderate, severe, and profound ID at five points across an 18-year period. Data were collected on type of living arrangements, participation in daytime activities, living skills, and social involvement in the community. Results at Wave 5 of the data collection showed a significant number of participants were still living with family (61.3%), and a large proportion of participants with severe ID (73.3%) were living in residential facilities. At Wave 5, only 14.1% of participants attended daytime activities such as mainstream school, technical and vocational training, and employment. The majority of the sample (79.1%) were attending activities and programs specifically for people with ID. It is important to note this is one of few studies to include participants with severe and profound disabilities. Little research has examined the barriers for community participation among individuals with severe ID.

Hall and Hewson (2006) completed a qualitative study using diaries to log the amount of time residents in a group home spent with unpaid visitors. The participants

were comprised of 60 residents that were included in a similar study conducted in 1995. Their results found that duration and frequency outside the house decreased when compared to the results of the 1995 study. The authors found that 88% of residents went outside less than one time per day, and 48% spent less than one hour outside of their home per day. Most residents reported few visits with people who were not paid staff. The results showed 55% of the residents had not received personal visitors at all during the four-week period of data collection. A severe limitation of this study was lack of member-checks or triangulation of data. Despite these limitations, an important conclusion can be drawn from the results of this study. Community access and social interactions are likely to decrease as individuals with ID in supported living age. Access to and involvement in community activities are less accessible to individuals who live in housing that is managed by paid staff. Conversely, people living in community housing have larger social networks and greater frequency and choice of activities they can access both at home and in their communities (Kennedy et al., 1990).

Staff Practices

Deinstitutionalization brought about the need for increased agency support for individuals in communities and supported living arrangements (Kugel & Wolfensberger, 1969). The focus of agency support shifted from providing learning opportunities in isolated environments to providing support and learning opportunities within communities (Carr, 2007). For individuals with ID, degree of functioning strongly influences the intensity of support necessary to live, work, and participate in activities outside of the home. It is believed those living in supported living environments inherently require more intensive support, which are most often provided by paid staff

members. Staff members play a pivotal role in determining the individual's access to and participation in the community. Furthermore, support staff also facilitate or hinder the development of social relationships among individuals with ID and patrons in the community. Limited access to communities often result from poor staffing practices. According to Bigby et al. (2017), poor practices can include group based outings, use of anonymous public spaces, inadequate training for staff members, lack of supervision, and limited opportunities to allow residents to engage in social activities. Consequences of such practices profoundly impact an individual's sense of self-determination and quality of life.

In the attempt to address the aforementioned issues, Zakrajsek, Hammel, and Scazzero (2014) conducted a mixed methods study to evaluate the effects of a workshop designed to increase capacity among staff members for supporting choice and community participation. Forty-one participants working with people with intellectual and developmental disabilities (IDD) participated in the pilot study. The researchers used pre- and post-assessment measurements to determine the needs of staff and administration in order to support people with IDD. The two-hour workshop also offered a platform for staff members to share experiences and resources for supporting their residents. Upon completion of the workshop, quantitative findings showed significant differences between all but one outcome measures. Results showed the participants felt more confident in their understanding of the importance of community participation and how to use available resources for community outings (i.e. peer mentors, transportation, low/no cost activities). They also felt increased confidence in their ability to plan community activities and overcome obstacles and barriers that prevent community participation. On

the contrary, participants lacked confidence in supporting residents in making choices regarding community activities. Qualitative findings revealed the participants found the workshop to be very helpful in expanding current outings and scheduling more community activities for residents. The authors noted the generalizability of these findings may be limited, but future research should explore the current knowledge of staff members for facilitating choice-making skills when planning for community outings with residents.

Staff play an important role in facilitating social interactions in the community. Likewise, support workers have the power to prevent social interactions from occurring. Their presence can potentially interfere with the individual's desire to engage socially with others, thus, limiting the individual's autonomy and power of choice. In an ethnographic study of the role of support workers in facilitating social encounters, Bigby and Wiesel (2015) used unstructured observations and one-on-one interviews to better understand the role support staff play in fostering relationships among individuals with intellectual and developmental disabilities (IDD) and community members. Twenty-six adults and their support workers participated in the study. Two of the participants lived independently in clustered housing; the other 24 lived in group homes spread across Melbourne. Ages of the participants ranged from 20-65, and all participants had mild-moderate disabilities. The researchers completed 160 hours of observations in community locations frequented by workers and residents (i.e. parks, cafes, supermarkets, local pubs, and banks). Interviews were conducted with staff supervisors, and a focus group was conducted that included the support workers.

Results of the thematic analysis determined a general theme of "support" that included the sub themes initiation of encounters, facilitation of encounters, educational interventions, and prevention/obstruction of encounters. The authors described participants initiating encounters by directly introducing residents, including them in conversations, or using gestures to invite residents into social interactions. Support workers facilitated encounters by interpreting behaviors or miscommunications between residents and patrons. The authors noted that patrons appreciated the presence of support staff and found them to be reassuring. This allowed them to engage more comfortably with the individual with disabilities. Educational interventions were described as intervening in encounters in order to change behaviors of the person with IDD. Lastly, participants were observed preventing or obstructing encounters when they were not convenient to staff or when the person with IDD was observed to behaving inappropriately. Implications for the study addressed that staff should eliminate interference in social encounters as much as possible and allow encounters to occur naturally. Furthermore, the authors explained the need to adequately train staff to support social encounters but acknowledged issues of funding, training and management for providing such training.

Financial Independence

Knowledge of how to earn, access, save, and spend money are essential for living independently and a critical component to transition instruction. Instruction for personal finance skills is a required part of the curriculum in 45 states, and 17 states require high school students take a personal finance course as a requirement to graduation (Council for Economic Education, 2018). Research reports, however, a gap exists between the

number of young adults with and without disabilities who are financially independent (Newman et al., 2011). According to the NLTS-2, when compared to young adults without disabilities (73.9%), there was a significant difference in the percentage of young adults with ID (58.7%) who had been out of high school for eight years and reported having a checking account. Additionally, Newnan and colleagues (2011) found that only 41.4% of young adults with ID who were out of high school for eight years reported having a credit card. The inability to earn an income, access, and spend money severely limits community participation. Furthermore, lack of financial independence fosters reliance on families and caregivers for tending to the needs of individuals with ID.

Researchers have explored best practices for improving financial independence among individuals with ID. The skills assessed in the literature for personal finance skills, according to Rowe and Test (2012), are narrow. The most common skills assessed in these studies are purchasing (Ayers, Langone, Boon, & Norman, 2006; Cihak & Grim, 2008; Hansen & Morgan, 2008; Rowe & Test, 2012) and withdrawing money from an ATM (Cihak, Alberto, Kessler, & Taber, 2004; Cihak, Alberto, Taber-Doughty, & Gama, 2006). Rowe, Cease-Cook, and Test (2011) and Rowe and Test (2012) evaluated interventions for tracking expenses.

Cihak et al. (2004) evaluated the effectiveness of various scheduling arrangements of community-based and simulated instruction across functional skills for students with moderate ID. Two of the skills assessed addressed financial independence: withdrawing money from an ATM and purchasing with a debit card. Their results found that combining simulated and community-based instruction on the same day was most effective for improving and maintaining functional skills over time.

In a different study by Cihak, Alberto, Raber-Doughty, and Gama (2006), an adapted alternating treatments design was used to compare the effectiveness of using static picture prompting and video prompts for teaching students with moderate ID to withdraw money from the ATM and purchase two items using a debit card. Their findings indicate both prompting strategies are effective for acquiring and maintaining the target skills. Additionally, the authors reported that no functional differences between the two strategies were found for four out of the six participants. In a replication study for Ayers and Langone (2002) and Ayers, Langone, Boon, and Norman (2006) applied a computer and video modeling intervention to teach middle school students with ID purchasing skills using the dollar plus purchasing strategy. Results of their study found the intervention was effective for teaching the strategy to three out of the four participants. The study also found the participants were successful in generalizing the skill into the community.

An intervention using a computer-based program called *Project Shop* was used by Hansen and Morgan (2011) to evaluate independence based on a five-step task analysis purchasing items in a grocery store. Their participants included three high school students with ID who had IEP goals related to grocery shopping. The program used DVD videos and computer instruction to teach purchasing skills. Results of their study found the intervention to be successful for teaching the target skills to all three participants when using the computer-based program. The authors reported the skills practiced on the program also generalized with 100% accuracy in the community for all three participants.

Rowe, Cease-Cook, and Test (2011) examined the effectiveness of classroom simulation with static picture prompts on their participants' ability to follow a 15-step

task analysis for purchasing items with a debit card and tracking expenses by subtracting them on a check register. The authors found a functional relationship between the intervention and the participants' ability to perform the steps in the task analysis. Generalization probes were conducted in community settings upon the completion of the intervention, and all participants showed the ability to generalize purchasing and tracking expenses. Rowe and Test (2012) expanded upon their findings by studying the efficacy of an intervention using classroom simulation to teach high school students to purchase items with a debit card, and track expenses and deposits. All participants found the intervention effective for teaching purchasing and money tracking skills. The participants were also able to generalize and maintain the skills in the community.

Overall, the interventions for teaching personal finance skills were successful. Discussions included in the research relate to expanding interventions for personal finance skills to extend beyond purchasing and withdrawing money. The need for community-based instruction for teaching these skills is frequently noted, but the feasibility and financial burden of CBI interventions were identified as barriers for teaching personal finance skills in authentic environments (Ayers, Langone, Boon, & Norman, 2006; Rowe & Test, 2012; Barczak, 2019).

Interventions for Improving Participation

Video-Based Instruction

The Individuals with Disabilities Education Act (2004) requires schools use scientifically based practices for supporting students with disabilities in academic settings. Horner et al. (2005) identified indicators for an intervention to be determined evidence-based: (1) the intervention must have been documented in a minimum of five

single-case studies meeting acceptable methodological criteria, demonstrating experimental control, and be published in a peer-reviewed journal; (2) the studies in the intervention have been employed by at least three independent researchers across three different locations; and (3) the five or more studies must include at least twenty participants. Use of evidence-based instructional strategies during transition can increase the probability of positive post-school outcomes for young adults with ID (Alexander, Ayers, Smith, Shepley, & Matras (2013). Video modeling and video-based instruction meet the aforementioned criteria and are considered evidence-based strategies that are proven to be effective and practical for improving skills associated with transition (Bellini & Akullian, 2007; Clinton, 2015).

Video-based instruction (VBI) is a widely used intervention for teaching people with intellectual and developmental disabilities new skills. Video-based instruction is grounded in Bandura's social learning theory (Bandura, 1977). The premise of this theory is that people acquire new skills and develop a sense of self-efficacy through observation and imitation of behavior. According to Bandura, people learn best by observing behaviors performed by models who they perceive as competent and who are similar to them in some way (Bellini & Akullian, 2007). Videos can be individualized according to the learner's needs, and audio and visual features can be included to make the learning experience more accessible and effective (Mechling, 2005). The use of VBI has been applied to interventions targeting multiple skills including: social and communication, academic skills, functional skills, money management, and self-determination (Mechling, 2005).

Numerous advantages have been outlined in the literature for teaching people with ID through VBI (Bellini & Akullian, 2007; Mechling, 2005). This method allows users to view videos multiple times to ensure mastery of the skills and to maintain skills over time. The ease of use allows the intervention to be employed across personnel and settings, and it is a cost- and time-effective method for teaching new skills. Additionally, video programs can be run by the learner and accessed on various types of equipment such as computers, mobile devices, and tablets.

Research has examined the efficacy of multiple types of video-based instruction: video feedback, video modeling, video self-modeling, computer-based video instruction, and video prompting. Video feedback provides learning opportunities by viewing and evaluating one's own performance (Dowrick, 1999). Users are recorded performing skills and asses their personal performance against the video model.

Video self-modeling is a form of VBI in which the learner serves as the character of the video. Participants view themselves performing a task that is above their current skill-level (Buggey, Toombs, Gardener, & Cervetti, 1999). This strategy is effective for students who find viewing themselves to be reinforcing. Two subtypes of video self-modeling are positive self-review and feedforward (Mechling, 2005). Video self-review models are created demonstrating best case performance of skills by the learners, whereas feedforward is used to teach skills not yet in the learner's repertoire (Dowrick, 1999). Individual steps are recorded and edited to demonstrate compete performance of the task.

Video prompting involves breaking a multi-step task down into discrete steps. The viewer is shown one clip at a time and given the opportunity to complete that step before moving on to the next. This strategy is highly effective for individuals with severe

intellectual disabilities and for learners who struggle to retain the information provided in longer videos through video modeling (Wu, Cannella-Malone, Wheaton, & Tullis, 2016).

Video modeling (VM) is a form of VBI where users view a model, such as a same-age peer or adult without a disability, performing a task or demonstrating a skill. In video modeling interventions, the learner views the video and then imitates the behaviors seen in the video (Haring, Kennedy, Adams, & Pitts-Conway, 1987). Studies on the use of video modeling as an instructional strategy have evaluated its efficacy across different age groups, disability categories, settings and skills.

Participants

Video modeling has been used to teach new skills to people across multiple disability categories. Mechling (2005) conducted a review of literature focusing on the use of video modeling to teach individuals with disabilities. Results of her search identified 24 studies incorporating this procedure for teaching students with intellectual disabilities, autism, emotional and behavior disorders, attention deficit hyperactivity disorder (ADHD), learning disabilities, and physical disabilities. Majority of the studies included participants with autism (54.2%), followed by individuals with intellectual disabilities (45.8%).

Video modeling is particularly suitable for individuals with autism who often prefer visual learning strategies, attend to irrelevant details, and who are easily overstimulated by social interactions (Bellini, 2004; Sherer, Paredes, Kisacky, Ingersoll, & Schreibmen, 2001). Bellini and Akullian (2007) conducted a meta-analysis of video modeling and video self-modeling interventions for teaching children and adolescents with autism spectrum disorders. Twenty-three studies met their inclusion criteria and

were analyzed on the characteristics of the participants, research design, intervention efficacy, and demonstration of experimental control. Results of the meta-analysis show research on the use of video modeling has been studied across participants with autism ranging from 3-20 years, and interventions were conducted in school, home, clinical, and community settings. Their findings conclude that video modeling and video self-modeling are effective strategies for teaching social-communication skills, functional skills, and behavioral functioning, with the highest intervention effects seen in studies for teaching functional skills.

Students with emotional and behavioral disabilities (EBD) often exhibit maladaptive behaviors which interfere with their ability to participate in academic instruction (Blood, Johnson, Ridenour, Simmons, & Crouch, 2011; Carr, Taylor, & Robinson, 1991; Wehby, Symons, Canale, & Go, 1998) and form and maintain peer relationships (Chu & Baker, 2015; Cook et al., 2008). The need for effective evidence-based interventions for students who engage in highly disruptive behaviors has led researchers to explore video modeling for teaching prosocial and on-task behaviors to individuals with EBD (Clinton, 2015). A review of video modeling literature targeting individuals with EBD identified 16 studies for improving social interactions, decreasing off-task behavior, and increasing appropriate behaviors among students with EBD (Baker, Lang, & O'Reilly, 2009). The authors noted that video modeling interventions for individuals EBD are commonly part of intervention packages using additional components such as reinforcement, self-monitoring, and discussion. Further research is needed to evaluate the effectiveness of VM alone.

Research supports the effectiveness of video modeling interventions for individuals with autism, intellectual disabilities, and EBD. However, minimal research evaluates the effectiveness of video modeling for students with ADHD, learning disabilities, and physical disabilities. This method for instruction has been identified as an evidence-based strategy for improving numerous skills. Therefore, future research is needed to determine whether the effects of VM are applicable to other disability categories.

Implementation Factors for Video Modeling

Research has demonstrated video-based instruction to be an effective educational tool for improving a broad range of skills. The success of video-based instruction, however, is determined by moderating factors that can influence the magnitude of change in targeted outcomes. Models, viewer perspective, and other implementation components (i.e., including VM as part of an intervention package or providing reinforcement) should be carefully considered when designing VM instruction. Mason, Davis, Boles, and Goodwyn (2013) recommend researchers and practitioners consider the following factors when designing VM instruction: participants' responses, complexity of skill, number of steps in sequence, individual learning abilities, and cost efficiency. Consideration of these elements make VM a highly individualized intervention that can be effective across participants and skills.

Viewer Perspective

Perspective is a moderating factor that should be considered when designing VM instruction for students with disabilities. Two types of perspective are used in VM: first person perspective, also referred to as point-of-view (POV) perspective, and third person

perspective (Gardner & Wolfe, 2013). From third person perspective, behaviors and skills are viewed as they would be from the learner's standpoint. When designing VM instruction, it is critical to consider the learner's learning preferences and needs.

Most literature evaluating the efficacy of VM interventions presents video models from a third person perspective (Mason et al., 2013). Laarhoven, Zurita, Johnson, Grider, and Grider (2009) used a within-subject adapted alternating treatment design to compare the effectiveness and cost of video-based instruction using three different perspectives: self as model, other as model, and from a subjective point-of-view. Results of their study show that two participants increased their ability to perform functional skills independently using "other" as the model, whereas one participant found the subjective point-of-view to be most effective. The least effective model for increasing independence was "self." In addition to comparing perspectives, cost was compared within the same study to determine which method was most cost efficient. Scores were computed by considering the ratio of participants' growth to the measured cost of minutes required to create the instructional materials. Based on their analysis, VM employing other models was determined to be more cost effective and required less time to develop (Laarhoven et al., 2009).

Researchers have studied the types of models that lead to increased performance using third person perspective for VM. Models can be an adult or peer, either known or unknown to the learner, or the individual receiving the intervention. A meta-analysis conducted by Mason, Ganz, Burke, and Camargo (2012) examined the moderating factors of video modeling using only others as models (VMO). Variables derived from the studies included demographic information, implementation variables, and outcome

variables. Improvement rate differences (IRD) were calculated to determine effect sizes for the above variables in 42 single-case studies that employed video modeling with others as models. The overall effect size (IRD = .82) showed a large magnitude of change for improving independent living skills, communication skills, social skills, academic skills, maladaptive behaviors, and self-help skills. Results indicated age and diagnosis are moderating factors that influence the potency of VMO. The greatest magnitude of change was found among elementary students (IRD = .86). Additionally, large effect sizes were found for VMO interventions including participants with autism spectrum disorders (IRD = .83), and studies including individuals with developmental disabilities were found to have a moderate effect (IRD = .68).

Video Modeling with Other and Video Self-Modeling

Video self-modeling interventions have been studied for individuals with autism and developmental disabilities across an array of skills (Bellini & Akullian, 2007; Hitchcock, Dowrick, & Prater, 2003; Sherer et al., 2001). Hitchcock et al. (2003) focused on outcomes of VSM interventions for people with intellectual disabilities in academic settings in their review of literature. Their findings showed most participants included in VSM literature are students ages 13 years or younger attending elementary schools. The data showed moderate to strong outcomes for VSM for improving academic, communication, behavior, and adaptive performance. These findings were supported by Bellini and Akullian (2007) who conducted a meta-analysis of VMO and VSM interventions for children and adolescents with autism. Seven studies used VSM intervention and were found to have moderate effects for improving targeted outcomes. According to the authors, VSM interventions are highly effective for people with autism

spectrum disorders as they tend to exhibit selective attention and prefer visual learning strategies. Video self-modeling allows researchers and practitioners to remove irrelevant details that would otherwise occupy the viewer's attention. The authors note that VSM may also be especially reinforcing to people with autism as it can reduce the stress and anxiety related to social situations (Bellini, 2004).

Mason and colleagues (2013) conducted a similar meta-analysis examining the differential effects of VMO and VSM based on treatment protocol. Point-of-view modeling interventions were excluded from their analysis. Data were extracted from 56 single-case studies to compare the effect sizes of VMO to VSM, type of model (other, peer, or self), whether the model was known or unknown, and implementation variables specific to each intervention (i.e., delivery of VM alone, with reinforcement, or part of a package). Robust improvement rate differences were calculated to determine effect sizes for each moderating variable. Large effect sizes were reported for both VMO (IRD = .82) and VSM (IRD = .79) interventions. Their results found that VMO interventions were most effective when adults were used as models when compared to peers as models or video self-modeling interventions. Peer models were found to be the least effective (IRD = .70) when compared to adults (IRD = .87) and self (IRD = .79) as models. The authors noted this finding to be especially interesting as it contradicts early literature on modeling by Bandura (1969) and video modeling Bellini and Akullian (2007) who stated the model should closely resemble the observer.

Point-of-View Perspective

As previously stated, third person perspective is most frequently used in video modeling literature, but selection of perspective should be based on individual learning

abilities. Unlike third person perspective VM, point-of-view allows learners to focus only on the most critical elements of the task by removing unnecessary stimuli from the video (Gardner & Wolfe, 2013). Point-of-view perspective depicts what the learner would see and requires little preparation or editing (Rayner, Denholm, & Sigafoos, 2009).

A meta-analysis of POV interventions by Mason et al. (2013) assessed the implementation protocol of various studies to determine which components enhance the effectiveness of POV interventions. Outcome variables included in the studies fell into three categories: independent living, play, and social skills. Majority of the outcomes were related to independent living skills, and participants included in the studies were largely comprised of secondary and postsecondary-age individuals with developmental disabilities. Results of this meta-analysis show POV interventions to demonstrate a larger effect for individuals with autism (IRD = .81) than those with developmental disabilities (IRD = .73).

Additional Components

Interventions using VM often include additional components such as reinforcement, error correction procedures, and performance feedback. Researchers have examined these components to determine which elements contribute to greater effects, but inconsistencies exist regarding which components, if any, are most beneficial in conjunction with VM. In a review of literature for teaching daily living skills to individuals with autism and developmental disabilities, Gardner and Wolfe (2013) found video modeling alone required fewer trials to achieve mastery than video modeling interventions that included least-to-most prompting. Mason and colleagues (2013) meta-analysis results concluded VMO interventions implemented with reinforcement were

most effective when compared to VMO interventions implemented alone or as part of a package. For VSM, the largest effect size was found for interventions using VSM as part of a package.

In a meta-analysis of POV interventions, Mason et al. (2013) found an overall large magnitude of change for POV interventions (Mean IRD = .78). The largest effect sizes, however, were found for POV interventions using POV alone (IRD = .86). The authors suggest that completion of targeted outcomes of interventions employing this method could be intrinsically reinforcing, thus, leading to greater effect sizes (Mason et al., 2013).

Before implementing additional components, it is recommended to begin the intervention as a stand alone procedure (Mason et al., 2013). A common limitation described by researchers using VM with additional components is that it is difficult to decipher whether the change in behavior is attributable to the VM alone or the other components (i.e. reinforcement, error correction, prompting). Many researchers suggested more research is needed to determine which elements are most beneficial for increasing the efficacy of video-based instruction (Hammond, Whatley, Ayers, & Gast, 2010; Hart & Whalon, 2012; Mechling & Ortega-Hurndon, 2007; Mechling, Pridgen, & Cronin, 2005; Mousa AL-Salahat, 2016).

Video Modeling for Social and Communication Skills

Substantial evidence demonstrates the effectiveness of VM for teaching appropriate social and communication behaviors. Much of the literature for teaching social and communication skills include young participants with autism. A qualitative document analysis of video modeling literature for teaching social skills to individuals

with disabilities by Gul and Vuran (2010) found that video modeling interventions are primarily used with participants with autism (91%). Majority of the participants in their analysis of 21 studies using video modeling found that participants' disabilities primarily included autism and Asperger's. The authors also reported video modeling interventions addressing social skills are commonly tested using young children (53% were 3-6 years) and minimal research exists studying the efficacy of video modeling for teaching adults appropriate social and communication skills. Only 5% of the studies recruited participants 12-15 years in age, and no studies evaluated the intervention with adults. Lastly, the authors found that most video modeling interventions were conducted in controlled environments (76%). This included school settings, rehabilitation centers, and medical centers.

Similar findings were reported by Shukla-Mehta, Miller, and Callahan (2010). The authors completed a review of literature on VM interventions for teaching social and communication skills to children with autism. Their review consisted of 26 studies using VM for teaching appropriate play behaviors, scripted and unscripted verbal responses, social initiation reciprocal play, and engagement. Their findings provide evidence for VM as an effective intervention for participants with autism ranging from 2.5 years to 15 years of age.

Play behaviors are also commonly targeted outcomes in literature on video modeling for young children. A study by D'Ateno, Mangiapanello, and Taylor (2003) implemented a video modeling intervention for teaching two young children with autism, one three-year-old and the other eight months, imaginative play skills. A multiple baseline procedure was used across three play activities: tea party, shopping, and baking.

The video model included adults demonstrating scripted verbal responses with a doll and manipulation of various toys. Results showed the intervention was effective for increasing both scripted verbal responses and modeled motor responses. Paterson and Arco (2007) implemented a similar intervention for teaching verbal and motor play behaviors to two children using a multiple baseline intervention across behaviors. The participants were two children, ages six and nine, with autism. The study took place in the children's classroom. A video modeling intervention with instructional prompts, redirection, and reinforcers were used to increase appropriate play behaviors and decrease repetitive behaviors. The authors concluded the intervention was effective for increasing appropriate play and decreasing repetitive behaviors with both participants. Appropriate play behaviors generalized with other toys.

Despite the gap in existing literature addressing video modeling for social skills among adults with disabilities, one study was found using college students with Asperger's as participants. In a study by Mason, Rispoli, Ganz, Boles, and Orr (2012), video modeling was used to improve social interactions (i.e., eye contact, facial expressions, and turn taking) for two college students with Asperger's. The intervention was delivered in a college classroom where the participants were shown separate videos modeling each target skill followed by a five-minute data collection period where the student engaged in unscripted conversations with a facilitator. The participant was rated on all four skills using a nine-point Likert scale. The intervention resulted in improved ratings for one participant in eye contact (M = 4.6-5.2), facial expressions (M = 3.12-3.57), and turn taking (M = 3.96-7.5). The other student also demonstrated increases

across all behaviors: eye contact (*M* = 1-3.27), facial expressions (*M* = 2.2-4.2), and turn taking (*M* = 3.31-6).

Lack of evidence for the efficacy of video modeling for teaching social skills to adults points to the need for additional research. Majority of participants in studies of video modeling interventions for teaching social and communication skills include young children. Such skills are essential for adults as they increase the likelihood that one can obtain and maintain employment, engage with people in the community, and develop interpersonal relationships. Gul and Vuran (2010) addressed this gap in research and argued that adults with disabilities also require social skills instruction for establishing communication and interactions with peers to increase their quality of life.

Video Modeling for Academic Skills

Majority of interventions employing VM primarily target social, functional, and communication skills. Whereas these skills lend to increased academic performance, few studies have applied VM to academic skills for participants with disabilities (Cihak & Bowlin, 2009; Clinton, 2015; Prater, Carter, Hitchcock, & Dowrick, 2012). A review of literature by Hitchcock et al. (2003) analyzed the participants, settings, and behaviors included in studies of video self-modeling (VSM) interventions in academic settings. Eighteen studies were analyzed consisting of 129 participants. Studies showed VSM interventions were most commonly applied in elementary schools in both general and special education classrooms. Dependent variables in the targeted compliance in the classroom (Clare, Jenson, Kehle, & Bray, 2000; Davis, 1979; Lonnecker, Brady, & McPherson, 1994; Hartley, Bray, & Kehle, 1998), disruptive behavior (Kehle, Clark, Jenson, & Wampold, 1986; Possell, Kehle, Mcloughlin, & Bray, 1999; Woltersdorf,

1992) language responses (Bray & Kehle, 1996, 1998; Buggey, 1995; Dowrick & Hood, 1978; Pigott & Gonzales, 1987), peer relationships (Walker & Clement, 1992), adaptive behaviors (Dowrick & Raeburn, 1995), math skills (Schunk & Hanson, 1989), and reading fluency (Dowrick & Power, 1998). Behaviors measured in these studies support the notion more research is needed using VM for improving academic outcomes rather than behaviors associated with academic performance.

Hart and Whalon (2012) used an ABAB reversal design to evaluate the effectiveness of a video self-monitoring intervention for responding to questions during science instruction. A 16-year-old participant with autism and moderate ID was shown a video of himself, edited by the researcher, demonstrating correct responses to questions from the teacher. As part of the intervention, the student was prompted to view the video using an iPad at least three times prior to the beginning of the science class. Results showed variable but gradually increasing data after the introduction of the intervention. The student provided more correct responses but required prompting from the teacher to respond. Social validity data report the teacher felt the intervention was acceptable but was concerned about her own lack of technology knowledge. In addition, the researchers were unable to ascertain whether the student demonstrated variable data due to lack of understanding or failure to attend to academic tasks.

A study by Burton, Anderson, Prater, and Dyches (2013) used a multiple baseline across participants design with four middle school participants. A VSM intervention was designed to teach students with intellectual disabilities to solve money word problems. Students were video recorded reading a script of a seven-step task analysis. Five videos were created for each student to solve five math word problems. A functional relationship

was found between VSM and accuracy for completing math word problems for all four participants. Maintenance data showed accuracy did not maintain for one student after the intervention was faded, but the authors noted it may have been due to differences in aptitude and skill level.

Clinton (2015) completed a more recent review of literature for using VM for improving academic skills. The review compiled 11 studies: five related to reading, two for math and writing, and one study targeting language arts and science. Dependent variables included in the interventions were reading fluency (Ayala & Connor, 2013; Decker & Buggey, 2014; Dowrick, Kim-Rupnow, & Power, 2006; Hitchcock, Prater, & Dowrick, 2004), writing skills (Delano, 2007; Moore, Anderson, Treccase, Deppler, Furlonger, & Didden, 2013), geometry skills (Cihak & Bowlin, 2009), solving math word problems (Burton et al., 2013), and academic responses during science instruction (Hart & Whalon, 2012). Despite the paucity of research, Clinton's findings conclude video modeling is effective for improving a variety of academic skills. The author notes further research is needed to apply academic VM to unexplored skills and to participants with EBD and ADHD in academic contexts.

Video Modeling for Employment

Employment is a marker of adulthood and often a centerpiece in transition education for young adults with intellectual disabilities. Benefits of being employed include the opportunity to earn money, improved mental health (Darity & Goldsmith, 1996), development of routines and structure throughout the day, increased sense of purpose, and opportunities to develop social networks and engage in peer interactions (Allen, Wallace, Renes, Bowen, & Burke, 2010; Flatau, Galea, & Petridis, 2000). For

people with ID, additional supports may be necessary in employment settings. Video modeling is a promising intervention that can contribute to increased performance of vocational tasks.

In a study my Mechling and Ortega-Hurnson (2007), a multiple-probe design across behaviors was used to evaluate the effectiveness of teaching students multi-step tasks that are associated with the role of "office manager." The study took place in an office space in a university education building. Three young adults with moderate ID were taught to view video models prior to engaging in vocational tasks that included watering plants, delivering mail, and changing paper towels in the bathroom. All three participants increased their ability to perform the three multiple-step tasks. Maintenance data were collected four months after the completion of the intervention and showed all participants' levels of independence remained high (84.2%-100%) for all three tasks. The authors concluded the intervention was effective for teaching multi-step employment tasks. In their recommendations for future research, the authors stated the intervention should be studied using more complex and real-world employment tasks.

Allen, Wallace, Renes, Bowen, and Burke (2010) used video modeling to teach vocational skills to young adults with autism in a multiple baseline study across participants. Four participants, ages 16-25 with mild-moderate ID, participated in the intervention. The video model was used to teach participants to wear a mascot uniform to entertain customers in a retail store. Two videos were used in the intervention. Unlike other studies using VM interventions with models developed by the researchers conducting the study, the videos were developed by the company and were part of the standard employee training. The first video provided point-of-view modeling of how to

manipulate the costume to exhibit the target behaviors. The second video demonstrated a customer's view of the mascot waving, high-fiving, shaking its tail, eyes, and ears, moving its tongue, and jumping. Data were collected on the participants' use of multiple behaviors during 15-second intervals during 10 to 20-minute observations with 10-minute breaks between observations. Participants were instructed to view each video twice before beginning the observation. Three of the four participants required a third viewing of the videos after their first observation. The participants' demonstrations of multiple skills increased substantially after the additional viewings. One participant was able to achieve criterion level with no additional viewings. Two out of the four participants maintained these skills one-month after completing the intervention. A limitation noted by the authors was the duration of the observations were much shorter than in a real work environment. They recommend future studies consider longer periods of work over multiple days. Additionally, the authors stated that more research is needed to assess the effectiveness of video modeling for teaching complex vocational skills.

Burke, Allen, Howard, Downey, Matz, and Bowen (2013) used video modeling and prompting for teaching four young adults with autism to complete a complex, multi-step shipping task. A task analysis was developed based on interviews from employees and managers consisting of 104 possible task steps. A 13-minute 10-second video was produced demonstrating the execution of the task. The video was then uploaded into a computer program and delivered via tablet. The program was designed to provide modeling, prompting, and feedback to employees with autism working in a shipping warehouse. Participants were instructed to view the video at home and while performing the task at the shipping warehouse. Unlike other studies, the program allowed participants

to view the video in its entirety or view individual steps separately. The viewer also had the ability to stop and start the video as needed and search for specific components of the tasks. The program provided feedback by allowing users to access alternate videos when errors were made in the packaging process. After receiving access to the intervention, all four participants reached 100% task accuracy. Overall, the average tasks completion during baseline was 68%. During intervention, participants averaged 99% accuracy. The study expands upon existing employment literature by applying video modeling to complex job tasks, however, the authors state the development of the intervention was both time and labor intensive. Strategies that are more practical should be explored.

In addition to improving performance of vocational tasks, VM interventions can also be used to teach students with ID soft skills related to employment. Three transition-aged students with autism were taught to use a video modeling intervention to increase their performance in responding to employer questions during job interviews. In an experimental study, Hayes et al. (2015) developed prototype software that provided peer and self-modeling videos for improving performance during job interviews. Pre- and post-interviews were conducted and rated by potential employers. Interview questions were collected from prospective employers and used to develop scripts based on interviews for jobs in health care, hospitality, retail, and food service. A general script for other jobs was also developed, and scripts were individualized for participants with and without prior work experience. Through the software, students were taught to watch the model, practice interviewing while being recorded, and view their videos. Students were asked questions about the task or behavior and received colored feedback based on their responses. Post-intervention scores found that students in the treatment group (those that

received access to the prototype software) scored significantly higher by interviewers whereas the control groups' scores did not change. The treatment group fidgeted significantly less, presented ideas more clearly, and showed improvement in personal hygiene. Although the treatment group scored significantly higher in all areas compared to the control group, the researchers reported the results could have been inflated due to the small sample size.

Video Modeling for Functional Skills

Development of functional and adaptive skills is critical in order to achieve the highest degree of independence possible. Adaptive skills include the skills necessary for an individual to function in his or her environment. Performance of these skills determines the level of supports necessary to live independently or participate in the community. Functional skills, according to Carnahan, Hume, Clarke, and Borders (2009), can contribute to increased participation in society and to an individual's overall quality of life.

Substantial research focuses on VM for teaching functional skills to individuals with intellectual and developmental disabilities. A meta-analysis by Mason, Ganz, Parker, Burke, and Camargo (2012) of the moderating factors of video-models as other (VMO) reported that most target behaviors addressed in the 42 studies of VMO interventions related to independent living skills. The target skills included shopping, meal preparation, clothing care, laundry, and self-care. Similarly, in a meta-analysis of point-of-view video modeling interventions, Mason et al. (2013) found that 12 of the 14 studies that met the quality standards for their meta-analysis were related to independent living. These skills included using an ATM, making popcorn, purchasing items, using an

iPod, and putting out a fire. Large effect sizes were reported for video modeling interventions in both meta-analyses for the use of VM for improving performance of functional skills.

Mechling and colleagues have employed computer-based video instruction (CBVI) for teaching a number of functional skills to participants with intellectual disabilities in community settings. A study was conducted for teaching young adults with intellectual disabilities to use public transportation (Mechling & O'Brien, 2010). A multiple-probe design across participants was used with young adults in a postsecondary education program for individuals with intellectual disabilities. Computer-based video instruction was provided in the classroom for teaching students to identify landmark cues and press "stop" at appropriate times to reach their destination on the public city bus. Generalization probes took place on the city bus after students achieved mastery during the intervention condition. The intervention was successful for teaching all three students to independently locate landmarks and press "stop" at the correct time during the intervention phase. Two of the three participants were able to generalize the skill with 100% accuracy while riding the bus during generalization probes.

Functional skills associated with daily living have also been studied using VM. Skills in this domain include cooking, cleaning, self-care, home maintenance, and leisure and recreation. Interventions targeting daily living skills increase independence and the likelihood of people with disabilities will live successfully on their own.

Continuous video modeling, a method of VM that loops video models in their entirety while allowing participants to complete steps in sync with the video, was used with high school students with ID learning to complete multi-step cleaning tasks.

Mechling, Ayers, Bryant, and Foster (2014) used a multiple-probe design across behaviors to evaluate the efficacy of this form of VM, which has received little attention. The authors claim continuous video modeling eliminates the need for participants to press buttons and manipulate technology while completing the cleaning tasks. Behaviors included in the study were cleaning an exercise bike, shampooing and vacuuming a rug, and cleaning kitchen counters. Analysis of the data showed all three students increased the percentage of steps completed independently on all three tasks. Two students, however, required the addition of an error correction procedure after eight sessions to achieve mastery. In their discussion, the authors noted that participants struggled in their attempts to stay in line with the video and often skipped steps entirely when unable to perform them in sync with the model.

A study by Cannella-Malone et al. (2006) compared the effectiveness of video modeling to video prompting for performing daily living tasks. A multiple-probe across participants with an alternating treatment design was used to teach six adults with developmental disabilities to put away groceries and set a table. During the video prompting condition, ten separate clips were filmed from the performer's perspective demonstrating the sequence of steps. In the video modeling condition, participants viewed a single video of the ten steps being completed from the perspective of a spectator. Narration was included in both videos. Video prompting was found to be more effective for all participants. The authors stated the effectiveness of video prompting may be due to limited attention spans among the participants. The authors also noted that the differences in perspective between the two videos could have influenced the outcome of the study.

Studies have applied VM interventions to cooking skills (Mousa AL-Salahat, 2016; Taber-Doughty et al., 2011). An alternating treatment design was used to compare the effectiveness of video modeling and video prompting systems for teaching cooking skills to young adults with mild ID. The intervention alternated each system in conjunction with least-to most prompts to teach students to cook simple recipes. The authors concluded video modeling was more effective for two of the three participants whereas one participant found video prompting to be more effective. Results of Taber-Doughty et al.'s (2011) study were validated in a similar study by Mousa AL-Salahat (2016). Three young adults with Down syndrome were taught to prepare simple meals using video modeling and a system of least-to-most prompting. Results of the study show all three participants were successful in learning to prepare the meal demonstrated in the video. The author noted the possibility that the change in behaviors may have resulted from the addition of least-to-most prompts or verbal reinforcement for completion of the task.

Three students with moderate ID were taught to extinguish fires using three different methods: pouring flour over the fire, placing a lid on a pot or pan that is on fire, and using a fire extinguisher. Mechling, Gast, and Gustafson (2009) used video modeling as part of their intervention for teaching cooking safety skills. Probe and instructional sessions took place in an apartment rented by the transition program where the participants attended. Adult models were used to demonstrate the target skills with a voiceover instructing the students through the sequence of each skill. The participants were shown a DVD of how to appropriately respond to fires in different locations at the apartment. Results of their study show the intervention was successful for teaching fire

extinguishing skills to all three participants. Maintenance data were collected 22 and 52 days after the end of the study. No video models were used during these probes, but all three participants maintained high performance levels.

Video modeling interventions have been developed to increase access to recreation and leisure activities among young adults with ID. Using CBVI, Mechling, Pridgen, and Cronin (2005) taught three students in a university-based transition program to order fast food. The students participated in instructional sessions in their classroom. Video models were made depicting an adult model ordering food at local fast food chains. As part of the intervention, students viewed the videos and performed verbal and motor skills to simulate the steps necessary to order food. Data were collected on verbal and motor responses associated with ordering. Generalization probes were conducted in community restaurants after 100% criterion level was achieved in four out of five trials. Baseline averages for the performance of verbal skills necessary to order fast food were 25% for one student and 0% for the other two. Upon completion of the intervention, averages increased to 100%, 75%, and 75%, respectively. Data collected for motor skills also increased for all three students.

Hammond et al. (2010) used video modeling when teach three middle school participants with mild ID to listen to music, view photos, and watch movies on an iPod. All participants demonstrated 0% independence for using the iPod to access each activity during initial probe trials, but reached mastery for independently using the iPod for leisure activities after viewing the video modeling intervention. The authors noted that all three participants required a “video booster” session after 70 sessions due to decrease in

maintenance data. Results indicate a functional relationship but suggest that the intervention may not maintain over time.

Future Research

Despite the vast amount of studies employing video modeling interventions, authors have made recommendations for expanding research to further validate the efficacy of the intervention. Academic and social interventions that incorporate video modeling may be useful for promoting inclusion (Hitchcock, Dowrick, & Prater, 2003). Currently, limited research exists using students with EBD, ADHD, and learning disabilities as participants (Clinton, 2015; Hammond, Whatley, Ayers, & Gast, 2010; Mason et al., 2013; Mason et al., 2012). Given the large population of students who qualify for special education services under these categories, video modeling interventions may improve academic, social, and behavioral outcomes and increase participation in general education settings for students with LD, ADHD, and EBD.

Further research is also needed to examine the success of the intervention in new settings. Mason et al. (2012) recommend researchers examine whether video modeling interventions would be successful at the university level for students with disabilities. The authors state video modeling would require little time or financial investment from universities, and interventions can easily be delivered in Disability Support Offices. Hitchcock, Dowrick, and Prater (2003) recommended applying VM interventions to include academic settings outside of classrooms such as playgrounds, art, music, and physical education classes. In addition, more research is needed to explore the use of video modeling intervention in natural settings (Mechling, 2005). With advancements in technology, individuals with ID have increased opportunities to access interventions that

promote independent functioning in the community. Devices such as smartphones and other handheld technology are less intrusive and make VM more accessible in a variety of locations (Blood, Johnson, Ridenour, Simmons, & Crouch, 2011). Video modeling research implemented in natural environments will further demonstrate the social validity of the intervention (Clinton, 2015; Gul & Vuran, 2010).

Ample evidence demonstrates the effectiveness of VM interventions for teaching a variety of skills to individuals across multiple age ranges and disability categories. Video models can be individualized to align with learner's needs and preferences. Additionally, interventions using video modeling can be delivered in any setting and can be controlled by students. This level of flexibility and portability make video modeling interventions less stigmatizing and ideal for supporting individuals in community contexts.

Augmented Reality

Research has demonstrated the effectiveness of video modeling for improving a multitude of skills. Traditionally, these interventions are delivered in instructional environments or isolated settings away from the general population by an educator or researcher prior to performing target skills. Advancements in technology, such as the development of smart phones, tablets, and other handheld devices, have made video-based interventions a portable and discrete option for delivering instruction in authentic contexts where the target skills are expected to be performed. The development of portable devices and the increasing accessibility of such devices have led developers to further explore options for integrating technology into everyday life for people with disabilities.

First introduced in 1990 as a training tool for Air Force pilots, augmented reality (AR) allows viewers to perceive digital information in real time (Akcayir & Akcayir, 2017). Augmented reality differs from virtual reality in that pictures and video models delivered through AR can be used in tandem in authentic settings. Unlike virtual reality, AR does not fully immerse viewers in alternate realities but provides digital content alongside the real world (Bower, Howe, McCredie, Robinson, & Grover, 2014). Advances in technology and the development of wireless mobile devices have expanded applications of AR (Lee, 2012). Currently, AR technology is used in the fields of education, medicine, and manufacturing, robotics, entertainment, tourism, and social networking (Bower et al., 2014; Lin et al., 2016).

Augmented reality systems can enhance learning opportunities for people with disabilities by providing video modeling interventions through digital overlays on the physical world (Cihak et al., 2016; Craig, 2013). Virtual information is accessed when the user triggers the AR system. There are two types of AR systems: marker-based and markerless systems (Lee, 2012). Marker-based AR systems rely on a physical marker to cue or trigger the virtual overlay. Markers for cueing AR systems are often referred to as targets. Image recognition software "anchors" digital data to the environment (Johnson, Smith, Levine, & Haywood, 2010). Markerless AR systems rely on Global Positioning Systems (GPS) and have wider applicability than marker-based systems. Markerless systems do not require specialized labels or targets to cue the appearance of digital content (Lee, 2012). Through AR, video modeling interventions can be controlled by users and discreetly delivered in authentic settings, thus, reducing the stigma associated

with needing additional support and providing socially valid methods for accommodating individuals with disabilities in mainstream settings (Cullen & Alber-Morgan, 2015).

AR in Education

Scarce research exists on the use of AR systems in education, but studies evaluating its efficacy report promising results. Augmented reality has been used in many academic subjects including chemistry, mathematics, biology, physics, and astronomy. Similarly, AR systems have been used as an instructional tool in K-12 and higher education classrooms (Lee, 2012). In a review of literature on the use of AR technology in education, Akcyir and Akcyir (2017) sought to examine which AR technologies are most commonly used in education and with whom they have been researched. Their findings show mobile devices to be the most common tool for using AR technology in education (60%), followed by desktop computers (24%). The "other" category (16%) included sophisticated technologies developed by researchers conducting the studies. Results of their review concluded that most AR research (nearly 51%) studied AR use among K-12 students. The second highest population included in AR research were higher education students (29%). This category included students in college and postgraduate students. Adult learners (7%) were those working full-time or studying via AR from outside an education setting. Research on AR use among teachers consisted of 3% of the participants. The remaining 10% of participants were included in studies where the learner type was not directly identified. The authors noted minimal research focuses on the use of AR technology as an instructional tool for students with disabilities.

The benefits associated with augmented reality are extensive. When used as an instructional tool, technology allows students to learn at their own pace and develop a

sense of control over their learning (McMahon & Walker, 2014). Augmented reality reduces dependence on teachers for providing instructional support (Lin et al., 2016) and is shown to increase motivation and learning outcomes while improving students' attitudes toward learning (Bower, Howe, McCredie, Robinson, & Grover, 2014; Lee, 2012). Through AR, students engage in "authentic exploration" that simultaneously works to improve their technology skills (Dede, 2009; Wu, Lee, Chang, & Lang, 2013).

Limitations associated with AR prevent educators from exploring ways to incorporate this modern technology into their teaching methods (Lee, 2012). Overall, there is a lack of support for teachers on how to use AR technology in classrooms (Antonioli, Blake, & Sparks, 2014; McMahon & Walker, 2014). Resistance may also stem from lack of training for manipulating complex technologies and overcoming technical issues that can potentially arise. For students with disabilities, use of AR may lead to cognitive overload due to the introduction of large amounts of information (Wu, Lee, Chang, & Lang, 2013). Similarly, students may find AR systems complicated and struggle to fix technical problems associated with AR systems (Lin, Hsieh, Wang, Sie, & Chang, 2011). Cost is also a concern, although, advancements in technology continue to make these complex technologies more affordable. Despite these challenges, AR as an instructional tool is gaining attention among educators and researchers.

AR as an Assistive Technology

The implementation of AR interventions as a method for enhancing or accommodating instruction aligns with the Universal Design for Learning (UDL) framework. The principles of the UDL framework are applied by developing instruction and interventions that promote accessibility and engagement of all learners (McMahon &

Walker, 2014). Instruction or instructional supports delivered through AR provide flexibility in the delivery of new information and accommodations that can be easily implemented across skills and settings. In accordance with the UDL framework, learning experiences through AR interventions are appropriate for students with disabilities as they often require repeated instruction and reduced instructional pace. AR interventions foster independence in academic settings, and thus, increase access to the general education setting and allow students to expand content into real-world settings (Antonioli, Blake, & Sparks, 2014; Burton, Anderson, Prater, & Dyches, 2013; Cihak & Bowlin, 2009).

AR interventions have been applied using multiple modes of technology to increase independence among participants with disabilities. Researchers have developed AR interventions for teaching functional skills, navigation, educational concepts, vocational skills, and leisure activities to people with disabilities. A study by McMahon, Cihak, Wright, and Bell (2016) employed an AR intervention to teach science vocabulary words to students with ID attending a postsecondary education program. Word lists were created based on vocabulary terms used in the health and science courses in which the students were enrolled. Data were collected to measure the correct responses on vocabulary assessments with criterion mastery of 80% for matching definitions and correctly labeling items. The intervention included videos lasting 25-30 seconds of the definitions being read aloud and a 3D simulation for each vocabulary team. Participants used Aurasma, an AR application for mobile devices (Aurasma, 2014), and study guides that included markers for triggering the video overlays. Results of the intervention showed AR was effective for improving students' knowledge of science vocabulary

words. Effect size averages indicated the intervention was effective for teaching definitions and labeling of the vocabulary words (PND = 85%, 89.9%, 94.4%, and 100% for matching definitions; PND = 85, 89.9, 79.8%, and 91.9% for labeling).

Researchers in Spain developed a sophisticated AR instrument for teaching money concepts to students with mild disabilities (Cascales-Martinez, Martinez-Segura, Perez-Lopez, & Contero, 2017). Twenty-two students, ages six to twelve, participated in a quasi-experimental study to determine the effectiveness of a tabletop AR interventions that allowed manipulation of the European monetary system for teaching money skills. Skill measured included coin and bill identification, matching the correct amount of money, and associating money by number. Pre-test and post-tests were conducted to measure the students' progress after participating in a three-week intervention. Non-parametric statistics were used. Results showed a statistically significant difference in pre- and post-test scores for all measures. The intervention was found to be effective for teaching students with learning disabilities, mild ID, and ADHD money skills. Social validity data were collected using a Likert-type scale and showed the students found the AR system to be highly motivating and enjoyable. The authors acknowledge the small sample size may have inflated their results, and a severe limitation of their study was the absence of a control group.

Three elementary students were taught an AR intervention delivered through an iPod touch to increase their independence while performing personal care tasks. Cihak, Moore, Wright, McMahon, Gibbons, and Smith (2016) used a multiple-probe design to teach students with autism teeth brushing. Students were prompted to use Aurasma to view a video model that was activated by a photo before brushing their teeth. Participant

one correctly performed 17.5% of the 16-step task analysis during baseline, participant two performed 34.7% correctly, and participant three performed 22.1% correctly during the baseline probes. All three participants demonstrated immediate improvement upon introduction of the AR intervention. Based on the task analysis, independence increased to 94%, 100%, and 100%, respectively. Furthermore, all students maintained their ability to brush their teeth nine weeks after completing the intervention. Social validity data collected by the teachers showed the targets used to activate the video models were easy to develop. They also stated they would recommend the AR intervention to other teachers.

An augmented reality intervention was used to teach seven students with ID to scan barcodes to identify food allergens. McMahon, Cihak, Gibbons, Fussell, and Mathison (2013), employed an ABAB design to test the efficacy of an AR intervention for identifying food allergens among students attending a postsecondary education program. Baseline conditions involved students using a list of food allergens to respond to eight scenario-based questions. Questions were read aloud to the participants with no other assistance provided. The intervention conditions used an app compatible with iPhones and iPads to scan barcodes to detect whether packaged food items contained common food allergens. After scanning the barcode, students were taught to read the ingredients of the item. Food allergens were color-coded red, and the participants responded to eight scenario-based questions. The mean number of correct responses during the first baseline condition was three. After introducing the AR intervention, the mean increased to 7.7, requiring an average of 4.4 sessions to achieve criteria. Upon withdrawal of the app, the mean number of correct responses decreased to three, followed

by an increase of eight for all participants upon the reintroduction of the intervention. Maintenance data indicated the participants maintained their progress of 100% accuracy six weeks after ending the intervention. A functional relationship was demonstrated and the app was determined to be successful for teaching students to correctly identify food allergens.

Several studies have examined AR as a form of assistive technology for navigation. A study by McMahon, Cihak, and Wright (2015) compared the effects of a location-based AR program to Google Maps (Google, 2014) and paper maps as a navigation tool for students with ID. Using an adaptive alternating treatment design, the researchers compared the methods for teaching four students with ID and ASD attending a postsecondary education program on a university campus to search for employment. Three treatment conditions were implemented. During the paper map condition, participants were given a paper map with an X marking the destination. Students used iPhones to access Google Maps during the Google Maps treatment condition. The route to the target location was highlighted on the app with a blue dot displaying the destination. For the AR condition, Layar mobile app (Layar, 2013) was used to navigate to the designated location. This app uses the camera feature to display visual prompts for navigating to the participants' destination. The researchers used event recording procedures to record "navigation checks" from the starting location to the business. Responses were marked as either independent, incorrect, or assisted. Results of the study showed the AR intervention was profoundly more effective for increasing independence in navigation and decision making when compared to Google Maps and paper maps. The authors stated all four participants required support from an adult during the Google

Maps and paper maps conditions but did not require additional assistance when using AR.

A similar study by Smith et al. (2017) used AR through a mobile app to travel to unfamiliar places. The researchers employed an ABAB reversal design for teaching three young adults with ID "wayfinding" skills. The authors defined wayfinding as the process an individual uses to navigate to new and unfamiliar locations. During the first and third baseline conditions, the participants were assessed using a campus map to navigate to unfamiliar locations. Students were then taught to use an AR app to travel to unfamiliar locations. For the treatment conditions, predetermined locations were programmed into the participants' mobile apps. Students used the on-screen visual and auditory prompts to travel to the designated locations. A researcher asked for the next direction along the way to the destination. The dependent variable measured in the study was the number of independent waypoint decisions recorded when traveling. A waypoint decision was scored as correct or assisted when the researcher asked the student to provide verbal turn-by-turn directions (i.e., left, right, forward). During the initial baseline session, the average independent waypoint decisions for all participants was 28%. Upon introduction of the AR intervention, the average increased to 94%. For the return to baseline, the participants averaged 24% correct waypoint responses, and for the final treatment condition, the mean independent waypoint decisions for all students increased to 99%. All students improved immediately with the introduction of the intervention with 100% non-overlapping data. Results of the social validity assessment indicated using personal devices as a navigation tool increased autonomy and self-determinations among the

participants. Furthermore, the participants felt use of hand-held devices promoted a non-stigmatizing appearance on the college campus.

Use of technology for students with disabilities can contribute to positive vocational and employment outcomes (Wehmeyer, Palmer, Smith, Parent, Davies, & Stock, 2006). An augmented reality intervention developed by Chang, Kang, and Huang (2013) used a task-prompting system to teach food preparation skills as part of employment training for participants with disabilities. Specific information regarding the participants' ages and disabilities were not included in the study. The study took place in a university cafeteria and employed a multiple-probe design. The AR system used markers that represented food items to teach the participants to construct meals typically ordered in a job at the university's cafeteria. The system provided visual prompts and auditory cues when an order was incorrect, teaching the students to self-correct their errors. The mean success rate during baseline conditions was 40%. After introducing the participants to the AR intervention, the mean success rate for correctly fulfilling orders increased to 98%, which was maintained during follow-up sessions conducted four weeks after the completion of the intervention. The system was successful for teaching students to self-correct and correctly fill food orders, but the technology system was sophisticated and required several pieces of equipment. Regardless, the participants of the study reported low mental and physical demands for using the system.

Contrary to the positive outcomes of the study by Chang, Kang, and Huang, researchers in Prague found an AR intervention to be too complex and confusing for their participants. Benda, Ulman, and Smejkalova (2015) implemented an AR intervention at a horticulture worksite for people with intellectual disabilities. The intervention was

delivered using tablets and was designed to show locations where gardening activities were to take place. At each location, a video model was presented to demonstrate the task to be completed. No specific data were presented based on the participants' performance, but the authors stated the participants were unable to view the material through the tablet and found the AR technology to be confusing and demanding.

Augmented reality interventions have been successful for teaching people with intellectual disabilities to navigate to new locations and independently tend to their personal needs. Furthermore, AR has been effective in teaching employment and academic skills to young adults preparing for transition. The availability of hand-held mobile devices paired with advances in AR technology make information accessible to users in any situation. This technology has the potential to increase independence in new and challenging environments, such as community, daily living, or employment settings, where individuals with ID frequently require ongoing support (McMahon, Cihak, Gibbons, Fussell, & Mathison, 2013). Research demonstrates AR's ability to increase adaptive functioning and foster independence for individuals with ID. Recommendations for future research points to the need to expand this technology to new environments and skills. Augmented reality interventions should also be studied among participants with disabilities not previously studied. In addition, the majority of research on the use of AR technologies for people with ID use single-case research designs, limiting the sample sizes to a small number of participants. Studies on the efficacy of AR interventions should continue to be designed for large groups and apply AR interventions to new skills and settings (Cihak, Moore, Wright, McMahon, Gibbons, & Smith, 2016; Smith, Cihak, Kim, McMahon, & Wright, 2017).

Conceptual Framework

Technology has the power to increase independent functioning and provide access to environments previously inaccessible to individuals with disabilities. Commonly identified barriers to accessing assistive technologies include cost, lack of training, lack of knowledge for how AT can be beneficial in one's life, and difficulty using complex technologies (Wehmeyer, 1998, 1999). These challenges, however, are becoming less of an obstacle for acquiring affordable assistive technology devices. The development of handheld devices, such as tablets and smartphones, make AT a portable, inexpensive, and less stigmatizing option.

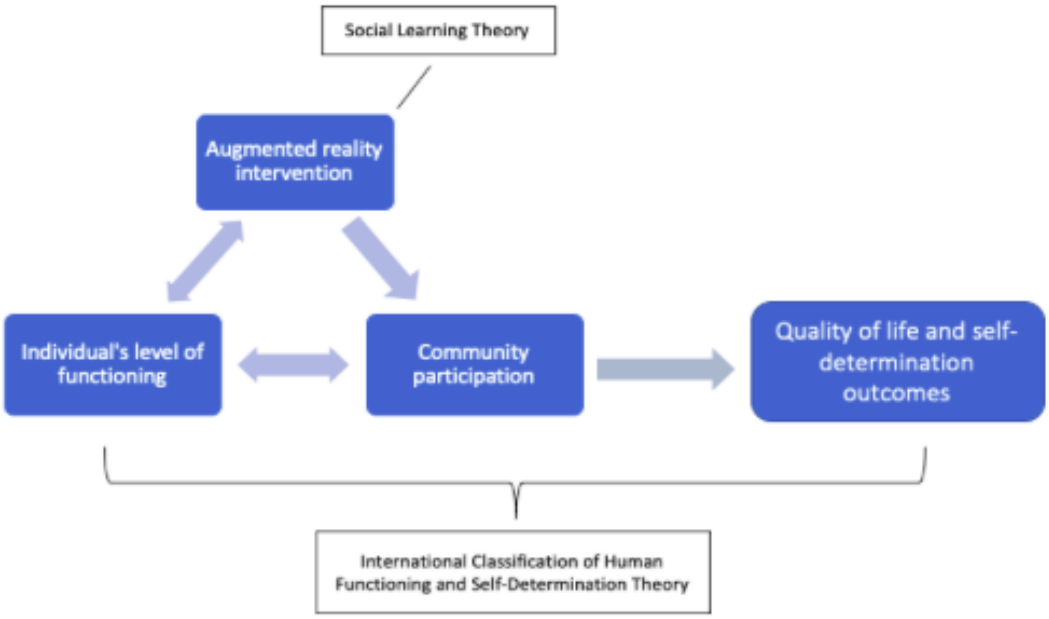

Figure 1. Conceptual framework

Figure 1 depicts the conceptual framework that supports the development of this study. Limited adaptive functioning leads individuals with ID to rely on support workers or families to meet their needs. This severely hinders self-determination by limiting opportunities to make choices regarding their daily lives. In addition, level of functioning determines the degree to which a person can access his or her money and participate in the community. The AR intervention serves as a mediating variable, which can improve independent functioning, thus, increasing the participants' ability to access money and participate in community activities of his or her choice.

In addition to increasing functioning, the use of AR and community participation facilitates the development of intrinsic motivation and self-determination. Providing the participants with the power to access support independently and to control the frequency and method through which support is administered meets the individual's psychological need for autonomy. Similarly, the confidence to perform skills more independently contributes to a sense of competence. The ability to access money leads to increased participation in the community, which affords more opportunities to engage in social interactions. This contributes to a sense of belongingness and relatedness to peers. These factors serve to empower individuals and improve overall quality of life.

CHAPTER III:

METHODS

Overview of the Study

Community participation and financial independence for individuals with intellectual disabilities (ID) are hindered by limited adaptive skills. Deficits in these areas lead to increased reliance on family members or paid staff. Interventions that foster independent functioning are critical to promote autonomy and self-determination among persons with ID. Thus, the proposed study sought to determine the efficacy of an augmented reality (AR) intervention for increasing independent functioning and was guided by the following research question: How effective is augmented reality for improving personal finance skills within the community for adults with intellectual disabilities? This chapter presents the methodology used in the study. A description of the research design, participants, setting, instrumentation, and procedures for collecting and analyzing data are provided.

Research Design

To explore the extent to which AR can influence personal finance skills, a single-case research design was used. Single-case research designs are commonly employed to evaluate the effectiveness of interventions (Baer, Wolf, & Risley, 1968). A hallmark of single-case research is exposure of the intervention to all participants, whereas most experimental designs only apply interventions to a treatment group. Single-case research designs use baseline logic to examine changes in behavior across differing conditions

(Sidman, 1960). Studies that use baseline logic control for threats to internal validity by alternating baseline and intervention conditions across time (e.g., A-B or withdrawal designs) or introducing the intervention in a time-lagged manner across multiple behaviors, conditions, or participants (e.g., multiple baseline and multiple-probe designs) (Gast & Ledford, 2014).

Data are graphed and visually analyzed by the researcher after each observation to make decisions for changes in conditions. These decisions are made by examining changes in levels, trends, and stability over time (Gast & Ledford, 2014). Interobserver agreement data are collected periodically for each dependent variable by an alternate observer to ensure the primary researcher is accurately measuring the behavior. The minimal standard for interobserver agreement is 80% (Gast & Ledford, 2014). Threats to internal validity are controlled by collecting procedural fidelity for each procedural variable of a condition. In addition, procedural fidelity data are collected to ensure the primary observer is implementing key procedural components accurately. Gast (2005) recommended procedural fidelity data be collected at least once per condition or during 20% of the sessions of a condition.

Multiple-Probe Designs

According to Morgan and Morgan (2009), the purpose of single-case research is to demonstrate a replication of the effects of an independent variable or intervention. This replication is demonstrated in withdrawal research designs by alternating baseline and treatment conditions across behaviors, participants, or settings. Multiple baseline and multiple-probe designs are more appropriate for measuring the effectiveness of an intervention when the participants are unlikely to return to baseline levels upon the

introduction of the independent variable. Multiple baseline designs typically include three separate baseline conditions. Independent variables are introduced in staggered intervals, which can lead to concerns regarding the length of baseline data collected. When the target behavior is not in the participants' repertoire, multiple-probe designs are more appropriate.

Multiple-probe designs are a variation of multiple-baseline designs used for examining the effectiveness of interventions developed for behaviors that are functionally irreversible (Gast, Lloyd, & Ledford, 2014). They are similar to multiple-baseline designs in that they are strategically staggered across behaviors, participants, materials, or settings, over time. Multiple-probe designs involve a few data points in baseline immediately before the intervention begins, rather than prolonged baseline conditions (Murphy & Bryan, 1980). A probe is defined by Morgan and Morgan (2009) as, "a single, discrete measurement of a target behavior, often conducted at random, or at least not according to any predetermined time, in order to rapidly establish the natural rate of the behavior before intervention (p. 26)." Rather than continuously measuring baseline data as the intervention is staggered across tiers, intermittent probe data of the target behaviors are collected prior to the introduction of the intervention to a new tier (Gast, Lloyd, & Ledford, 2014).

Gast, Lloyd, and Ledford (2014) outlined the following guidelines for using multiple-probe designs:

> (a) selection of three independent but functionally similar tiers (behaviors, conditions, or participants); (b) selection of criterion level for staggering the introduction of the intervention to the next tier; (c) planned intermittent

measurement of all tiers from the beginning of the study until the intervention is applied to all three tiers; (d) independent variable is withheld from a tier until acceptable level of stability and a contratherapeutic trend direction are observed; (e) data collection occurs continuously during the intervention condition; (f) independent variable introduced to the subsequent tiers when data are stable and predetermined criterion level for staggering has been met; (g) ongoing collection of reliability data on the dependent and independent variables in each condition. (p. 258)

A multiple-probe design was appropriate for the study since the target behaviors were irreversible and unlikely to occur without prior instruction (Gast, Lloyd, & Ledford, 2014; Murphy & Bryan, 1980). Prolonged baseline collection was unnecessary since the participants were unlikely to acquire the target skills without direct instruction, which was provided through video models using the AR application.

Participants

After approval for the study by the Institutional Review Board (IRB), four high school students were recruited to participate in the study. In order to participate in the study, students were nominated by their teachers based on the following inclusion criteria: (a) student's age was 16-21 years of age; (b) student had a formal diagnosis of a mild intellectual disability; (c) student's IEP included a goal related to financial management and/or community participation; (d) student demonstrated basic iPad proficiency (i.e., turning on the device, independently opening apps, and logging into programs).

To assist in selecting students who were most likely to benefit from the study, I first conducted interviews with teachers. The teachers were asked to nominate students with IEP goals related to financial management and/or community participation and met the inclusion criteria above to assist in narrowing the recruitment pool. A total for seven students met criteria for the study. Teachers were given a flyer to send home to the students' parent/guardian explaining the purpose of the study and asking for their consent to be contacted. Only four of the seven forms were returned. Based on the feedback received from the teacher and the return of signed consent forms, I contacted the students' parents/guardians to arrange interviews.

Parents were asked to provide background information about the extent of their child's participation in the community (i.e., Does the student have his or her own bank account? Does the student shop independently? What activities does the student enjoy doing in the community? How does the student pay for activities/items in the community?). After speaking with the parents, the students were interviewed. Student interviews were similar to the interviews conducted with parents. Students who expressed the desire to live and participate in the community independently were preferred. To further narrow the students, I observed the students using iPads to ensure they possessed the prerequisite skills necessary for participating in the intervention (i.e., turning on the device, independently opening apps, and logging into programs). Four students who did not already perform the target skills independently and who expressed goals for increasing their financial independence were asked to participate in the study.

The students and parents selected to participate in the study received assent and consent forms explaining the purpose of the study. Because all participants were between

the ages of 16 and 21, and individuals with ID are considered vulnerable under the IRB's regulations, consent forms were collected for all students. The assent forms asked students for their permission to participate and to use the results of the study for publications. Each participant and their family received a review of their performance on using the intervention for increasing personal finance skills upon the completion of the study. Information on the participants' ages and disability characteristics are provided in Table 1.

Table 1

Participant Characteristics

Participant	Age	IQ	Adaptive	Disability
Jaylen	16	WNV: 48	ABAS-II: Parent: 62 Teacher: 64	Soto Syndrome
Nessa	17	WISC-V: 60	ABAS-III Parent: 72 Teacher: 71	Intellectual Disability
Lola	16	WISC-V: 64	ABAS-III Parent: 80 Teacher: 86	Autism
Nick	21	WISC-IV: 41	BASC-II: 94	ADHD

Note. WNV = Wechsler Nonverbal Scale of Ability (Naglieri &Brunnert, 2009), WISC-IV = Wechsler Intelligence Scale for Children- 4th Edition (Wechsler, 2003), WISC-V = Wechsler Intelligence Scale for Children- 5th Edition (Wechsler, 2014), ABAS-II = The Adaptive Behavior Assessment System-2nd Edition (Harrison & Oakland, 2003), ABAS-III = Adaptive Behavior Assessment System-3rd Edition (Harrison & Oakland, 2015), BASC-II = Behavior Assessment System for Children- 2nd Edition (Reynolds & Kamphaus, 2004)

Jaylen

Jaylen is a 16-year-old white male student with a diagnosis of intellectual disability. Additionally, Jaylen had a diagnosis of Soto Syndrome. Jaylen was an avid

Alabama football fan. He enjoys watching and attending sporting events and discussing games with his teachers and peers. In his interview, Jaylen stated that he wants to live in a house with his friends after graduation. He desires to one day attend the University Alabama and shared that his favorite activity in the community is shopping for video games. Jaylen most frequently shops at the grocery store for food, but his mother pays for items and activities that he wants/needs. Jaylen has a personal bank account, but he did not have his own debit card until he was asked to participate in the study. In the parent interview, Jaylen's mother stated that his participation in the community was limited. He had experience in paying for items with cash but had never used a debit card to purchase items or withdraw cash.

Jaylen participated in the state's alternate assessment and spent the majority of his day in a self-contained class for students with multiple disabilities. He participated in community-based instruction and employment training programs as part of his special education services. At the time of the study, Jaylen worked in the school print shop. His job duties included making copies and collating and stapling papers for teachers at his school. He also worked weekly at a local hardware store. At this job site, Jaylen learned stocked shelves and assisted in dusting the store.

Results of Jaylen's most recent assessments indicated that his full-scale IQ score was 48, based on the Wechsler Nonverbal Scale of Ability. Jaylen lived at home with his family. On the Adaptive Behavior Assessment System- Second Edition (ABAS-II), Jaylen received a standard score of 62 on the home version and 64 on the school version. Jaylen's teacher reported that he could independently tend to his personal needs. He is able to recognize some high frequency words and is working on learning to read signs in

the community. In the area of math, Jaylen can add and subtract using a calculator. He can identify the value of all coins and bills but is unable to count money without assistance.

Nessa

Nessa is a 17-year-old white female who received special education services because of her intellectual disability. She was the only participant who qualified for free and reduced lunch. At school, Nessa was very social and enjoyed spending time with her peers. Nessa said that her favorite activities in the community included hanging out with friends and shopping at the mall for clothes. Her goal was to one day live independently or with a boyfriend. Her goal for herself in regards to employment was to teach or work at a preschool with young children. At the time of the study, Nessa did not have her own bank account or debit card. She used her father's debit card for both skills. Nessa had experience purchasing items using gift cards and cash. Her father expressed concerns about Nessa's inability to count money affecting her participation in the community.

At the time of the study, Nessa participated in an alternate pathway designed for students who are interested in living independently and entering the workforce after graduation. She received all academic and special education services in a small group setting. Nessa had a basic understanding of concepts of money. She could recognize bills and coins but was unable to count them. Results of Nessa's most recent assessments showed that her full-scale IQ was 60, based on the Wechsler Intelligence Scale for Children, Fifth Edition (WISC-V). Nessa's teachers and parents completed the Adaptive Behavior Assessment System, Third Edition (ABAS-3), upon which she received a standard score of 69.

Lola

Lola is a 16-year old white female who qualified for special education services because she had autism. Her hobbies included drawing, watching her favorite Disney Pixar movies, and chatting with friends on social media. Lola stated that she was interested in participating in a local university-based transition program for young adults with ID. Her goal was to one day live in a college dorm with roommates.

In Lola's interview, she said she enjoyed shopping at the mall, Target, and Sam's Club. Her favorite items to shop for were jewelry and make up. She liked to eat at Wendy's and Starbucks. Lola's dad shared that she was very active in the community. She competed in paddleboard competitions with the local Special Olympics team. Lola also enjoyed attending local activities such as football games and community events. According to her father, Lola had a bank account but had not used a debit card for purchasing or withdrawing money prior to participating in the study.

Lola received a full-scale IQ of 64, based on the Wechsler Intelligence Scale for Children- 5th Edition (WISC-V). Her adaptive scores on the Adaptive Behavior Assessment System-3rd Edition (ABAS-III) were 80 on the parent scale and 86 on the teacher scale. Lola also participated in the state's alternate assessment, and her special education services were provided in a self-contained classroom for students with mild intellectual disabilities. Lola participated in community-based instruction for employment at a local hotel. Her job duties included cleaning the lobby and assisting in the laundry department. Lola's teacher reported that she could count money and make correct change. She could read well but had difficulty with comprehension.

Nick

Nick was a white male and a recent graduate of the school where recruitment took place. Although Nick did not have a diagnosis of an intellectual disability, his former teacher felt he would highly benefit from participating in the study. He was 21 at the time of the study and had volunteered for a home health service for the last three years. Nick loved Alabama football. His hobbies included playing baseball with the local league for individuals with disabilities, listening to country music, and attending his former high school's football games. Nick also enjoyed impersonating Elvis for elderly people in the community. His goal is to one day live with a friend or family member.

After graduation, Nick participated in a university-based postsecondary transition program for young adults with disabilities. He attended the program for one year and was not asked to return. Nick's grandmother shared that she does not desire for him to live independently but to remain with family after she can no longer care for him. She did not believe Nick had the ability to take care of himself.

While in school, Nick participated in a self-contained classroom for students on the alternate achievement standards. Nick's most recent special education testing results show a full-scale IQ of 41 on the Wechsler Intelligence Scale for Children- 4th Edition (WISC-IV) and a standard score of 94 on the Behavior Assessment System for Children-2nd Edition (BASC-II). Nick's former teacher stated that he could read basic sight words and identify numbers. He was unable to count money or consistently recall amounts of money. He was able to perform simple math operations with the use of a calculator. Nick's grandmother stated in her interview that Nick's participation in the community was limited to neighborhood activities.

Setting

Participants were recruited from a high school located in northeast Alabama. The school system consisted of a diverse population of students. Among the 1,234 high school students, 61% of students are white, 28% African American, 8% Hispanic, 2% multiracial, and 1% are Asian. In addition, 58% of the students in the system qualified to receive free or reduced lunch.

Initial observations and parent interviews were conducted in a classroom. Pre-intervention training for using the AR application was conducted in the students' classroom in one-on-one sessions with the principal investigator after school hours. Data collection for the probe trials, intervention, and maintenance probes took place in the community where the skills would naturally occur. All four participants learned to use the ATM intervention at their families' bank branch. Intervention for learning to purchase took place at two different locations. Two of the three students learned to pay for items using a debit card while purchasing items from a local department store. The selection of the department store was based on the generalizability of the location. The department store is accessible nationwide. Most patrons of the city included in the study use it, and the participants were likely to purchase grocery, home, and personal items from this store for years to come. One of the participants, Lola, requested to purchase items from a local convenience store where she and her dad purchased after school snacks daily.

Materials

Materials for Video Models

All videos were recorded using a Canon Vixia HD Camcorder. An adult acted as the model in the videos. First person point-of-view videos were created to demonstrate the steps necessary to withdraw money from an ATM and pay for items using a debit card. The recorded video clips were edited using iMovie (2016, version 10.1.1) software. The videos were sequenced together to demonstrate the entire task with voice narration and captions added. The lengths of the videos were 35-50 seconds long. Once the video models were created, they were uploaded to the HP Reveal cloud where they can be accessed by pointing a mobile device at a pre-made target.

Materials for Using AR App

The researcher's personal iPad was used for the intervention. To activate the video models for the intervention, participants pointed their iPads at pre-made targets. When participants received the ATM intervention, opening HP Reveal and pointing their cameras at the ATM triggered their video models. For learning to use the debit card machine, students learned to point their camera at the debit card reader to trigger the video model.

Measures

Dependent Variable

The dependent variable was the percentage of steps completed independently based on a task analysis that I developed for performing each skill. Using percentage allowed me to assess the accuracy of the participants' responses (Gast & Ledford, 2014).

Independent Variable

The independent variable was the AR intervention, which provided video modeling instruction for teaching the participants to perform financial transactions in the community. Each participant received training for using the intervention separately, and I assessed the participants' application of the intervention in one-on-one sessions in the community. To control for threats to internal validity and to demonstrate replication of the effect, the intervention was staggered across the participants. Participants received training for the AR intervention once they were able to maintain three consecutive stable data points during the probe condition.

Reliability

Prior to beginning the study, a research assistant was recruited for collecting interobserver agreement and procedural fidelity data. In order to train the research assistant, I made videos of myself completing the steps for each task. Next, the research assistant and I viewed the videos together while I modeled analyzing the procedures and levels of prompt displayed in the video. When the study began, each session was video recorded, uploaded to UA Box, and reviewed by the assistant. The research assistant collected IOA data on a minimum of 25% of the observations within each condition (i.e., initial probes, intervention, maintenance probes).

To assess interobserver agreement, the kappa coefficient of agreement (k) was calculated for each session in which IOA data were collected. This method for determining interobserver agreement is considered more reliable than calculating the percentage of agreement as it considers the proportion of the total amount not explained by chance (Watkins & Pacheo, 2000). A kappa coefficient, according to Viera and

Garrett (2005), provides a numerical rating of the difference between how much agreement is actually present (observed agreement) compared to chance agreement (expected agreement). Viera and Garrett (2005) offered the following guidelines for interpreting kappa values: (a) any value < 0 indicates less than chance agreement; (b) values 0.01-0.20 indicate slight agreement; (c) 0.21-0.40 show fair agreement; (d) values 0.41-0.60 show moderate agreement; (e) 0.61-0.80 indicate substantial agreement; (f) 0.81-0.99 show almost perfect agreement.

Procedural fidelity was assessed by the assistant for a minimum of 25% of the sessions for each condition. This was done by the assistant who viewed the video of the observation and collected data on the implementation of the intervention procedures.

Social Validity

Social validity data were collected for each participant upon the completion of the study. A questionnaire was completed asking each participant to report whether the intervention was accessible, easy to use, and helpful for increasing independence in the community.

Procedures

A multiple-probe design across participants with a replication of two behaviors (Gast & Ledford, 2010) was used to evaluate the effectiveness of an AR intervention for improving personal-finance skills in the community, for young adults with ID. Participants were observed using the AR app to view video models for using an ATM and paying for items using a debit card machine. The intervention occurred in one-on-one sessions in the context in which the participants would regularly perform these skills. To

prevent interactive effects and to control for threats to internal validity, each participant began the study with a different behavior.

Experimental control was established by systematically introducing the intervention in a time-lagged manner across behaviors. The first participant, Jaylen, participated in probe trials for withdrawing money until he was able to reach a mastery level of three stable data points. Once Jaylen maintained stable data in his initial probe trials, he was then trained to use the AR intervention. Once he began intervention for withdrawing money, Nessa began initial probe trials for purchasing items using a debit card. Lola began her probe trials for using the ATM once Nessa was in the intervention phase. This pattern continued with Nick, who also began the study with using the ATM. Nick began with this skill because he entered the study after Lola had already mastered using the ATM and moved onto purchasing. All participants remained in intervention phases for each skill until achieving a mastery level of 80% or higher across three consecutive data points. Two weeks after the participants completed intervention for both skills, they participated in maintenance probes where they were not given access to the video models. Maintenance probe procedures were identical to initial probe trials.

Probe Trials

Three initial probe trials were conducted for each participant to determine their current level of independence in completing each target skill. Initial probe trials were conducted three times weekly for each participant until stable levels and no upward trend occurred in the data. During the probe trials, the participants were taken to the location where they were going to perform the skill and received a task direction to complete the task, “It’s time to _____.”

Data were collected on observations of each participant's ability to perform the steps using the task analyses in Tables 2-4. Each step of the task analysis was scored as *independent* or *not observed*. If the participant stated he or she did not know how to perform the skill, or if the participant performed a step in the sequence incorrectly, the session was terminated, and the rest of the steps were scored as *not observed.* The percentage of independent steps was calculated by counting the number of steps performed independently, dividing it by the total number of steps in the task analysis, and multiplying it by 100. No reinforcement was given for correct steps or upon the termination of the session during probe conditions.

Intervention Training

Training for using the AR intervention was staggered and given only once the participant demonstrated stable or decreasing data. I assisted students in setting up and using the app on the iPad. Pre-intervention training took place in one-on-one sessions in the classroom and in the community.

During pre-intervention training, I modeled opening the app, pointing the device at designated targets, watching the video model, and then completing a simple task (e.g., wiping the counter, putting away groceries, and loading the dishwasher). Least-to-most prompts with a five-second wait time were given to assist the participants in opening the application, pointing the iPad at the targets, watching the video model, and initiating the task. Data were collected on the participants' ability to use the app independently based on a task analysis for using HP Reveal (see Table 2). Accuracy for completing the tasks was not assessed.

After the participants demonstrated they could independently use the app on three targets in the classroom, they were taken to the first community location where they learned to use the community targets to gain access to the video models. I repeated these steps for teaching the participants to use the AR app for the intervention. During this portion of the training, the students did not complete the target skill but were only assessed on their ability to correctly activate the video model using the app. During training, data was collected on the participants' ability to use the app independently with a mastery criterion of 100% over three consecutive trials.

Table 2

Task Analysis for Using HP Reveal

Using HP Reveal
1. Locate iPad
2. Open iPad by pushing the home button and sliding your finger over the home screen
3. Find and click on the HP Reveal App
4. Locate HP Reveal target
5. Push the blue button on the bottom/center of the app home screen
6. Hold iPad up to the HP Reveal target with camera facing target
7. If needed, turn sound on using the button on the side of the iPad
8. Watch video
9. Put iPad down

Intervention

The participants remained in the intervention conditions until they reached mastery level of three stable or increasing data points at or above 80%. Data collection during the intervention conditions assessed the participants' percentage of independent steps performed after viewing the video model (see Tables 3, 4, and 5). Observations during this condition took place in the community in one-on-one sessions. To initiate the task, I provided the task direction, "I want you to _____." The participant was given a five-second wait period to pick up the iPad, point it at the designated target, view the

video, and complete the task. If the participant did not pick up the iPad to view the video model, I provided a prompt to use the target. The subsequent steps were scored as either *independent* or *prompted* for performing each step in the task analysis. Verbal praise was given upon completion of the task.

If the participant performed the first step in the task analysis incorrectly, the step was scored as *prompted* and the participant was directed to watch the video again. After the second viewing of the video, I provided the participant with the task direction, "Now you do it." If the participant performed the first step correctly, behavior specific praise was given for correcting the error. If the second viewing of the video model failed to elicit the correct response, a system of least-to most prompts was implemented with a five-second wait time between prompts to support the participant in completing the task. The system of prompts was as follows:

(a) Indirect verbal prompt ("What do you need to do?")

(b) Direct verbal prompt ("You need to___.")

(c) Model ("Watch me_____. Now you try.")

(d) Partial physical prompt

(e) Hand-over-hand assistance

Verbal praise was given if a prompt was used and the participant corrected his or her error.

Table 3

ATM Task Analyses

Nick	Lola, Jaylen, and Nessa
1. Locates ATM	1. Locate ATM
2. Inserts card correctly	2. Inserts card correctly
3. Selects "English"	3. Types correct PIN number
4. Enters 4-digit PIN	4. Makes selection to withdraw money
5. Presses "Enter"	5. Selects correct account
6. Makes selection to withdraw money	6. Selects to receive receipt
7. Selects the correct amount	7. Removes cash
8. Selects correct account from which to withdraw	8. Removes card
9. Selects to receive receipt	9. Removes receipt
10. Selects to return card	
11. Removes cash	
12. Removes card	
13. Removes receipt	

Table 4

Purchasing Task Analysis for All Participants

Jaylen and Nessa	Lola
1. Insert card with chip inserted in reader	1. Wait for cashier to give price
2. Selects "pay with debit"	2. Insert card chip first
3. Types correct PIN number	3. Selects correct payment method
4. Presses green enter key	4. Selects green "yes" button
5. Select "no" for cash back	5. Waits for transaction to process
6. Waits for payment to process	6. Removes card
7. Removes card when payment is authorized	7. Takes receipt
8. Takes receipt	

Maintenance Probes

Maintenance probe data were going to be collected for each participant on both target behaviors two weeks after the participants completed intervention. Procedures in this condition were going to be identical to the probe trials. Owing to the COVID-19 pandemic, maintenance probes were collected for only two participants.

Data Analysis

Decisions for condition and phase changes were made based on visual analysis of the data. Percentages of independent steps from each observation were plotted on line graphs, and data were analyzed within, between, and across conditions. Gast and Spriggs (2014) described strict guidelines for analyzing single case research data, which were used in the analysis of the data:

1. Repeated measurement of the dependent variable across time and conditions;
2. Controlling for threats to internal validity;
3. Systematic manipulation of only one variable at a time;
4. Demonstration of procedural fidelity within each condition;
5. Maintenance of stable baseline levels and trends until introduction of the intervention;
6. Retrieval of baseline levels in A-B-A-B withdrawal and reversal designs;
7. Replication of experimental effect across similar experimental conditions, behaviors, and participants; and
8. Inspection of level, trend, and percentage of non-overlapping data across conditions.

Within-Condition Analysis

Within conditions, the condition length was monitored to determine how long each participant remained in each condition. A minimum of three consecutive trials was required in each condition to determine level stability and data trend (Gast & Spriggs, 2014). The degree of variability determined how long the participants remained in each

condition. If a great deal of variability existed, the participant remained in his or her current condition until data were stable or increasing.

Between Adjacent Conditions

Trend direction was also monitored between adjacent conditions (Gast & Ledford, 2014), and percentage of non-overlapping data (PND) was calculated. According to Gast and Spriggs (2014), a higher percentage of non-overlapping data between conditions indicates greater impact of the intervention on the behavior. A gradual positive change in the percentage of steps completed independently between the probe and intervention phases showed a strong demonstration of experimental control and the effectiveness of the intervention.

Analysis Across Similar Conditions

When analyzing across conditions, I expected the initial probe levels to be maintained until the intervention was introduced. I also determined that the trend and level improved immediately following the introduction to the AR intervention. A functional relationship was demonstrated between the DV and IV since there was positive change in trend and level across behaviors after implementing the intervention and the subsequent participants who had not yet received the intervention maintained lower baseline data.

CHAPTER IV:

RESULTS

Data were analyzed visually within each condition, between adjacent conditions, and across similar conditions. Level, trend, and percentage of nonoverlapping data (PND) were also assessed across conditions to determine the effectiveness of the intervention (Gast & Spriggs, 2014). Four participants learned to withdraw $20 from the ATM using the AR intervention. Based on initial probe trial data, the participants were able to independently complete 13-50% of the steps in the task analysis for withdrawing money independently. Their level of independence immediately improved after beginning the AR intervention (see Figure 2). Results show all four participants independently increased their percentage of independent steps on the ATM task analysis to a level demonstrating competence (100% independent). Two participants completed maintenance probes for withdrawing money. Jaylen completed 75% of the steps independently, and Nessa maintained her performance at 100%. Overall, PND for the participants was 100% for withdrawing money from the ATM.

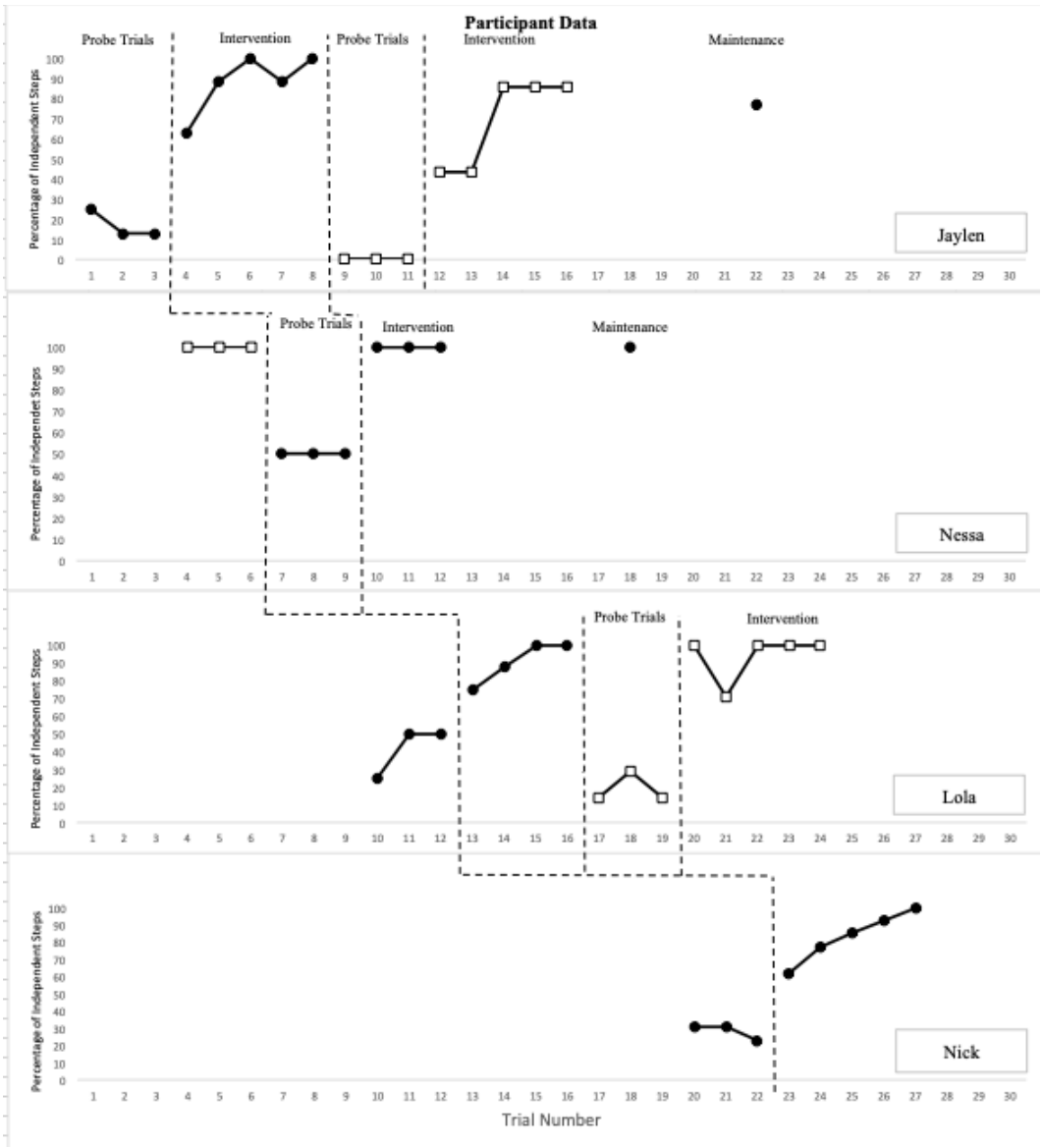

Figure 2. Participant data
Note. The closed circles represent data for withdrawing money from the ATM. The open squares represent data for purchasing using a debit card.

Jaylen, Lola, and Nessa participated in sessions for purchasing items using a debit card. Baseline results for two of the three participants revealed they were unable to purchase items by paying with a debit card. These participants independently completed a mean of 10% (range = 0-29%) of the steps in the task analysis during the initial probe trials for purchasing. One participant, Nessa, was able to complete the steps of the task analysis with 100% accuracy during all three probe trials for purchasing and did not

participate in intervention for this skill. Upon introduction of the AR intervention, both participants improved their ability to independently pay for items using a debit card. During intervention, the participants' data steadily increase (range = 43-100%). Both Lola and Jaylen were able to achieve 100% independence while using the AR intervention for purchasing, and PND of 100% for both participants demonstrate the intervention was highly effective. .

Reliability

To collect interobserver agreement (IOA) and procedural fidelity (PF) data, all sessions were video recorded. Point-by-point IOA data were collected by the research assistant using the same task analysis for each skill. IOA was calculated by dividing the number of steps in the task analysis that were agreed upon by the total number of steps in the task analysis and multiplying by 100. The research assistant also collected PF data using a separate task analysis of instructional procedures for each condition. Procedural fidelity data were used to ensure task directions were provided at the beginning of each session, error correction procedures were implemented correctly, and positive reinforcement was given upon the completion of the task.

IOA and PF data were collected for 58% of the initial probe trials for withdrawing money from the ATM, 47% of the intervention sessions, and 100% of maintenance sessions. For withdrawing money, IOA between the two observers was 100%, 97%, and 100% respectively. PF was 100% for each session. IOA and PF data were collected for 44% of the initial probe trials and 40% of intervention sessions for purchasing. No participants completed maintenance trials for this skill. IOA and PF were 100% for the

initial probe and intervention trials, and the kappa coefficient (k = 1) indicates perfect agreement between the two observers.

Individual Data

Jaylen

ATM. During baseline, Jaylen completed range = 14-29% of the steps for withdrawing money independently. Jaylen's performance immediately improved, as shown by the ascending trend between the probe and intervention data, with the introduction of the AR intervention. He achieved mastery by completing three consecutive sessions at or above 80% in four trials. In the intervention condition, Jaylen completed 63-100% of the steps independently. Visual analysis of the data between the initial probe trials and intervention shows no overlapping data (PND = 100%). A maintenance probe was completed two weeks after completing the intervention. During this session, Jaylen was prompted to withdraw $20 from the ATM without the video model. Jaylen performed 75% of the steps independently during this trial. Overall, Jaylen's data show an ascending trend with low variability, indicating the intervention was successful in increasing his level of independence.

Purchasing. Initial probe data show that Jaylen completed zero steps of the task analysis for purchasing. Upon introduction of the intervention, Jaylen immediately increased his independence in performing the task. It took five trials for Jaylen to achieve mastery criterion of three consecutive sessions at or above 80%. During the intervention condition, Jaylen completed 43-86% of the steps independently. Visual analysis of Jaylen's purchasing data shows no overlapping data between the probe trials and intervention conditions (PND = 100%). Maintenance data were not collected for Jaylen

on this skill owing to the COVID-19 quarantine. Jaylen's mother did not feel comfortable allowing him to go into the community. Jaylen's data for purchasing show an ascending trend with low variability, which demonstrates the intervention was highly effective for teaching him to purchase items using a debit card.

Nessa

ATM. Nessa performed all three initial probe trials with 50% accuracy. The introduction of the AR intervention resulted in an immediate increase in Nessa's ability to independently withdraw money. She achieved mastery in three sessions and independently performed 100% for all three intervention trials. Two weeks after completing the intervention, a maintenance probe was completed. Nessa maintained 100% accuracy in performing the steps of the task analysis for withdrawing money from the ATM. Her data show no variability and an abrupt change upon the introduction of the intervention in a positive direction.

Purchasing. In their interviews for participating in the study, Nessa and her father indicated that she did not know how to pay with a debit card when purchasing items. Initial probe data show that Nessa was able to complete 100% of the steps for purchasing independently, and, therefore, did not need to participate in the intervention for this skill.

Lola

ATM. Lola's data show she performed a mean of 42% (range = 25-50%) of the steps for withdrawing money independently during probe trials. Her data show an immediate increase in the percentage of steps she was able to complete independently once beginning the intervention. She reached mastery criterion after four sessions during the intervention phase. Lola independently completed 75-100% of the steps of the task

analysis during intervention. The percentage of nonoverlapping data between baseline and intervention conditions was 100%. Lola' data show low variability and an ascending trend, indicating the intervention was successful for teaching her to withdraw money from the ATM.

Purchasing. Initial probe data show Lola correctly completed a mean of 19% (range = 14-29%) of the steps for purchasing. After using the AR intervention, Lola's data immediately increased to 100%. Mastery criterion was achieved after five trials. During trial two of the intervention, Lola viewed the video model using the AR app and then realized she left her debit card in the car. She had a difficult time redirecting herself back to the task. Lola independently completed 71-100% during the intervention trials. Visual analysis of the data shows no overlapping data between initial probe and intervention trials (PND = 100%).

Nick

ATM. Nick independently completed a mean of 28% (range = 23-31%) of the steps in the task analysis for withdrawing money from the ATM during probe trials. Upon introduction of the AR intervention, Nick's independent performance immediately improved. Intervention data show Nick was able to complete 62-100% of the steps independently. He reached mastery criterion for the skill after five trials. Results indicate no overlapping data between initial probes and intervention (PND = 100%).

Purchasing. Nick began the intervention shortly before the COVID-19 pandemic. When it was time for him to begin initial probes for purchasing, the risk for going into the community was too great; therefore, he was unable to participate in instruction for this skill.

Social Validity

The participants were asked to participate in a questionnaire after their final session to determine the social validity of the intervention. They were asked to state whether they agreed, did not know, or disagreed with the following statements:

1. I thought it was easy to get to the app;
2. I thought the iPad app was easy to use when withdrawing money and paying for items with my debit card;
3. I felt embarrassed to use the iPad app in the community; or
4. I think the iPad app can help me learn other skills in the community.

All participants agreed that it was easy to use the iPad and to get to the AR app used in the intervention. All participants also agreed the app would be helpful for learning other tasks in the community. Lastly, three of the four participants disagreed with the statement, "I felt embarrassed to use the app in the community." Nessa agreed with the statement and said she was "a little embarrassed" about having to use it.

CHAPTER V:

DISCUSSION

As stated in the previous chapters, personal finance skills are essential for individuals with ID to make decisions on their day-to-day activities. The ability to access and manage money affords young adults with ID opportunities to participate freely in their communities and fosters self-determination. Research reports disparities in the ability to access money among people with ID and those who do not have disabilities. Therefore, this study was conducted to evaluate the effectiveness of an augmented reality intervention for increasing independence in performing personal finance skills. The final chapter of this dissertation reviews the research problem, methodology, and results. To conclude, recommendations for educators and implications for future research are discussed.

Review of Methodology

A multiple-probe design across participants with a replication of two behaviors (Gast & Ledford, 2010) was used to answer the following research question: How effective is augmented reality as a tool for improving the acquisition of personal finance skills within the community for young adults with intellectual and developmental disabilities? The participants were four transition-age individuals with ID whose ages ranged from 16-21. Sessions were conducted in various locations in the community where the students live. To promote maintenance and generalization of the target skills, trials for withdrawing money from the ATM took place at the individual's personal bank.

Trials for purchasing took place at two different locations: (1) a local department store where all three of the participants frequently shop; and (2) a local gas station where one of the participants visits daily. Data were analyzed visually across similar conditions, within conditions, and between adjacent conditions to determine whether a functional relationship was established. Social validity data were also collected to determine whether the intervention was accessible, easy to use, and if it was helpful for increasing their independence in the community.

Results of the investigations show that all four participants increased their independence in completing the steps for withdrawing money from the ATM, and two of the participants increased their independence in paying for items with a debit card with the use of the AR intervention. The overall PND was 100%, indicating the intervention was highly effective for teaching the participants the target skills (Scruggs & Mastorpieri, 2001).

Discussion

This study adds to the existing body of literature that evaluates video modeling as an instructional tool for teaching adaptive skills (Cannella-Malone et al., 2006; Mechling, Gast, & Gustafson, 2009; Mechling & O'Brien, 2010; Mechling, Pridgen, & Cronin, 2005; Mousa Al-Salahat, 2016; Taber-Doughty et al., 2011) and further validates video modeling interventions as effective tools for teaching personal finance skills (Ayers & Langone, 2002; Ayers et al., 2006; Cihak et al., 2006; Haring, Kennedy, Adams, & Pitts-Conway, 1987). In addition, the study adds to the growing body of research for using augmented reality to teach functional skills to individuals with disabilities (Cihak et al.,

2016; Johnson et al., 2013; McMahon, Cihak, & Wright, 2015; McMahon et al., 2013; Smith et al., 2017).

Results of the study extend upon both video modeling and augmented reality research in many ways. First, the majority of studies using VM and AR interventions for teaching functional skills are conducted in simulated environments. For example, Mechling et al. (2014) used a continuous video model to teach cleaning skills. Laarhoven et al. (2009) and Mousa AL-Salahat (2016) used video modeling to teach meal preparation. Multiple studies have used these interventions to teach individuals with ID to perform daily living tasks such as cleaning and performing home repairs in simulated environments (Bridges, Robinson, Stewart, Kwon, & Mutua, 2019; Cannella-Malone et al., 2006; Laarhoven et al., 2009). Studies that teach functional skills often include generalization sessions that take place in the community, but the instruction for how to perform the skills takes place in a classroom or simulated setting. Community-based instruction (CBI) is an evidence-based strategy that has been found to optimize generalization. Furthermore, CBI reduces the need for repeated instruction across multiple settings when learning new skills (Barczak, 2019; Nieptuski, Hamre-Nieptiski, Clancy, & Veerhusen, 1986). Results of this study add to VM and AR literature by implementing the intervention in the contexts in which the skills would actually occur, giving the participants a more realistic learning experience.

Another contribution to the body of AR literature is the use of the AR intervention for teaching personal finance skills. As discussed in chapter 2, AR interventions have been proven to be effective for teaching a multitude of functional skills including coin and bill identification (Cascales-Martinez et al., 2017), teeth brushing (Cihak et al.,

2016), scanning barcodes to identify food allergens (McMahon et al., 2013), and navigating to unfamiliar locations (McMahon, Cihak, & Wright, 2015; Smith et al., 2017). Although the aforementioned skills are critical for individuals with ID to acquire to attain independence, personal finance skills, such as withdrawing money from the ATM and using a debit card, gives individuals control over how they wish to spend their money. Knowledge of how to access and spend one's own money leads to opportunities to make decisions about daily life. For young adults with ID, the ability to access and spend their own money can lead to increased social opportunities, access to transportation, and participation in community activities and events.

Lastly, the use of the iPad as the tool through which video models were accessed also contributes to both VM and AR literature. Many studies have used video modeling interventions that were delivered through computer-based instruction for teaching participants to perform new skills (Ayers et al., 2006; Hansen & Morgan, 2011; Mechling & O'Brien, 2010). In these studies, participants learned the steps to perform the target skills on a computer in a classroom setting and then generalized the skill in the community. The use of a handheld device in this study adds to current literature by demonstrating the effectiveness of a portable intervention that can be easily accessed across multiple environments.

AR as an Instructional Tool

Benefits. This study demonstrates that AR is an effective intervention for teaching new skills in the community. Previous research evaluating instruction that incorporates AR technologies has shown that AR increases enjoyment engagement among learners (Akcayir & Akayir, 2017). Additionally, instruction that incorporates

augmented reality increases accessibility for learners with diverse needs, making it a viable option for educators working with transition-aged individuals. As stated in Chapter II, environment and accessibility can either hinder or promote participation among individuals with ID. The WHO (2001) identifies the need for products or technologies that can make environments more accessible, facilitate involvement, and support community participation for people with ID. AR technologies have the potential to make environments and activities accessible to people with disabilities that would otherwise rely upon family or staff to access.

There are many benefits to using AR as an instructional tool for teaching functional skills to individuals with ID. First, video-based instruction is already proven to be an effective intervention. Video modeling and video-based instruction are both evidence-based practices that have been scientifically tested and proven to be effective for teaching learners with disabilities (Bellini & Akullian, 2007; Clinton, 2015). Next, using AR as a platform to deliver video-based instruction is a seemingly simple way educators can offer video-based interventions with minimal support from personnel. Reliance on family members and staff have been cited in research as barriers for community participation among people with ID (Woolf et al., 2010), and video-based interventions delivered through AR platforms puts the students in control of their own learning. Augmented reality interventions allows users to control the pace and frequency of their instruction. The participants in this study were adolescents preparing for transition, and all four individuals had personal smartphones. Smart devices, such as smartphones, smart watches, and tablets, can provide unobtrusive methods for individuals with ID to access supports that can increase their independent functioning in the

community and alleviate reliance on adults and peers (Lin et al., 2016). Moreover, the use of AR with the iPad or other smart device makes it a portable option when participating in community-based instruction.

Cost and time are important factors for educators to consider when selecting instructional tools and resources for working with students with ID. Mechling (2005) and Shukla-Mehta et al. (2009) found video modeling interventions to be both cost and time efficient for educators wishing to employ them. For educators already comfortable with developing video models, it would be easy to incorporate the AR component to afford the student the opportunity to rely on technology, rather than personnel. HP Reveal, the app used in this study, was free and could be downloaded to any Apple or Android device. HP Reveal, however, is temporarily unavailable to new users as they are working to improve their systems. Other AR apps, such as Thyng and Metaverse, are also free and simple to use.

Perhaps most importantly for educators to consider when selecting instructional tools to use with students in transition is its social validity. The use of AR technology for accessing video modeling instruction is considered socially valid for providing instruction. Social validity data showed all but one of the participants disagreed with the statement, "I was embarrassed to use the iPad in the community." These findings were consistent with Cullen and Alber-Morgan (2015), who also found that the use of handheld technology was a socially valid method for supporting young adults with ID in the community. It is common to see same-age peers using smart devices in public spaces like the store, gas station, and bank used in this study. Teaching learners to utilize handheld devices for instructional purposes is a discreet and less stigmatizing way to

access instruction for performing functional skills in natural environments. For young adults desiring to live independently, augmented reality interventions delivered through smart devices can provide instruction for performing personal finance and other essential functional skills without having to rely on others.

Barriers. Despite the numerous benefits of using AR interventions for transition-age students, educators might experience barriers that make interventions using AR less feasible. McMahon and Walker (2014) stated that AR allows students to learn at their own pace. In addition, Lin et al., (2016) said AR has the potential to reduce reliance on teachers for providing instructional support. Teaching students to use this emerging technology, however, can be particularly challenging for teachers who are unfamiliar with the latest technology trends in education. Research shows there is a lack of support for teachers on how to use AR technology in classrooms (Antonioli, Blake, & Sparks, 2014; McMahon & Walker, 2014). Moreover, teaching students with intellectual and other learning disabilities poses additional challenges for special educators who are not comfortable using AR systems. Students who are not technologically savvy themselves will have an increasingly difficult time learning to navigate AR systems without explicit instruction from a teacher who is competent with the technology. Educators might find AR interventions intimidating without adequate training.

Lack of financial and physical resources are also problematic for teachers wanting to incorporate AR interventions in CBI for students preparing for transition. Access to handheld devices, transportation, and additional personnel to support students in the community all pose challenges to teachers when organizing CBI. Many school systems are unable to provide personal and/or classroom devices to teachers and students that can

be used for instructional purposes and using students' personal devices for delivering AR interventions might be unreliable. For example, the student might forget the device, or problems can arise with the technology that cannot be resolved by the teacher or the student if they are unable to access the students' phone system. Unless the teacher can use a classroom or personal handheld device, alternate strategies for CBI should be considered.

For teachers working on personal finance skills, specifically, the challenge of gaining access to students' personal bank accounts to replicate the intervention in this study makes it nearly impossible. None of the participants had their own bank accounts prior to the start of the study. All but one of the participant's parents agreed to open their child a personal account, giving them access to their own debit cards. One participant, Nessa, used her dad's debit card to participate in the study. Asking parents and students to provide personal bank account information and access to debit cards can be viewed as unethical and problematic, and it would be impractical to ask the parent to attend every session if the student does not have their own debit card. Alternative strategies should be considered when working with students on personal finance skills, as the use of the AR intervention in this study seems impractical for educators.

Community-Based Instruction

For educators working with students with disabilities, CBI is widely recognized as best practice as it has been found to increase the likelihood of generalization (Barczak, 2019; Cihak et al., 2004). Brown and colleagues (1983) also noted that CBI provides teachers with a clearer understanding of challenges students are likely to face when performing target skills in everyday life. Despite the vast benefits of using the AR

instruction in the community, the actions of others and the events that occur around a person can be unpredictable. These circumstances present distinct challenges. For a young adult with ID, these experiences may be new and require a specific skillset for navigating.

The participants of this study all experienced unique challenges in which they had not been prepared to overcome. For instance, Jaylen's ATM added two additional prompts in the period between intervention and maintenance. The ATM prompted him to select whether he wanted to withdraw money from one of three savings accounts. Although he only had one account, it prompted him to choose between "Savings 1," "Savings 2," or "Savings 3." In addition to selecting an account, the bank also added a step prompting customers to either return the debit card or make another transaction. During the intervention trials, the ATM flashed and reminded Jaylen to remove his card.

Nick also experienced similar challenges. His bank closed the lobby where the ATM was located because of the COVID-19 quarantine. We had to conduct our sessions at the drive-through ATM. Rather than driving through; we parked and walked to the ATM so the sessions could be recorded. There were several sessions where cars lined up behind us and waited for us to complete our sessions. The change in the environments, the additional noise, and the sense of urgency as cars pulled in behind us made it difficult for him to attend to the video model without several prompts.

Lola realized she lost her debit card after viewing the video model during her fifth intervention session. She viewed the video, and the cashier scanned her items and gave her the price before she realized her card was missing. Customers were behind us, making Lola very flustered as she shuffled through her purse and pockets to find her

debit card. She stepped aside and allowed the customers to go ahead while she searched but used her father's debit card to complete the session. Although she was able to complete the transaction, Lola missed a few of the steps she had previously mastered because of the change.

Finally, Nessa was witness to an attempted assault of a police officer before beginning her third probe session. As she was entering the store, a man who was accused of theft, became increasingly disruptive and aggressive toward the cop asking him to leave. The man pulled a knife from his pocket and was slammed against wall by the officer. Nessa was not involved in the incident in any way, but witnessing such an unusual and potentially dangerous event before participating in an instructional activity could have affected her ability to participate in the session.

The challenges of planning and effectively implementing community-based instruction make it a daunting task for educators, despite being identified as best practice for promoting generalization and improving postschool outcomes. As seen in the examples above, it is impossible to control for the ever-changing aspects of the community. It would be difficult for educators to anticipate the numerous unpredictable circumstances that students might face when using AR in the community. In a similar vein, it would be impossible for researchers to control all circumstances when studying the effectiveness of AR as an intervention in the community. The experiences of the participants in this study point to the need for educators to plan concurrent instruction for problem-solving some of the most predictable challenges that could arise while in the community.

In relation to the skills taught in this study, teaching students how to communicate to employees when there is a problem, such as misplacing a debit card, would be helpful for overcoming situations similar to Lola's. Additionally, instruction for alternate ways to withdraw money, such as completing a withdrawal slip and speaking with the bank teller or teaching the students how to use all ATMs available at their branch would ensure they can access their money should their usual ATM close. The results of this study demonstrate the effectiveness of augmented reality as a tool for skill acquisition. Instruction for coping with unforeseen challenges paired with explicit instruction with AR for skill acquisition would provide students with the skillset to independently navigate the unpredictable physical and social situations that arise while engaging in the community.

Simulated Instruction

Simulated instruction is a widely-used alternative to community-based instruction. Simulated instruction takes place in the school setting and approximates the natural environment (Bates, Cuvo, Miner, & Korabek, 2001). Community-based instruction has been found to be more effective than simulated instruction as it increases the likelihood for generalization (Rowe & Test, 2011). Simulated instruction, however, is an alternate method for working on personal finance and other functional skills that has been cited in research as a cost-effective, less time-consuming, and more practical strategy for educators (Rowe, Cease-Cook, & Test, 2011; Rowe & Test, 2012).

During the study, AR was used directly in the community, and the results are promising for educators desiring to incorporate AR technologies in their CBI. Cihak et al. (2004) proposed simulated instruction can be used along with CBI to promote

generalization and addresses many of the barriers faced by educators wanting to provide CBI to their students. Pairing AR interventions with simulated instruction in a classroom setting would be highly beneficial to educators who lack access to resources and personnel.

Simulated instruction coupled with AR would also allow teachers to correct technological errors. It is difficult to troubleshoot problems with technology in the community. For example, Jaylen experienced problems with triggering the video model while at the ATM. HP Reveal targets are triggered when pointing the camera on the device directly at it. Jaylen sometimes stood too close or pointed the iPad at the bottom of the ATM instead of holding it directly in front. This affected the size of the video model and the placement of it on the screen, and he found it difficult to recover. Providing opportunities for students to work with AR applications in the classroom before generalizing to the community would also allow teachers more time to work with students on using the technology correctly and more efficiently.

Personal Finance Skills Instruction

Provisions of the Individuals with Disabilities Education Act (2004) require that transition instruction begin no later than the age of 16, although some schools begin addressing transition at the age of 14. A critical element of transition includes instruction for managing personal finances. For students with intellectual disabilities who struggle to generalize and retain new skills, instruction for managing personal finances must begin sooner.

The Jump $tart Coalition for Personal Finance Literacy (2007) provide a broad definition of finance skills. According to their definition, finance skills include and

understanding of money identification, cash flow, supply and demand, and debit/risk management. These advanced concepts require an understanding of underlying foundational skills that include the ability to count, skip count, recognize numbers, and add and subtract. Instruction for these early numeracy skills begins early in a student's educational career, and there are numerous ways to introduce money concepts to students that would be considered age and developmentally appropriate.

The use of manipulatives when counting, adding, and subtracting is common practice. To promote generalization and to relate these concepts to real-world examples, educators should engage young students with ID in counting and number recognition activities using money. Similarly, a cash flow behavior management system would help students with ID practice personal finance skills before generalizing the skill to the community. A teacher working with students with disabilities could design a behavior management system where students earn fake money for good behavior or performing classroom duties; then, the students could exchange the money at the end of a determined amount of time for a preferred activity or a reward. For older students, incorporating check registers to track deposits and withdrawals would be a creative way to teach the students to balance their accounts.

Given that students with ID require multiple opportunities to practice new skills, students need ongoing opportunities to practice personal finance skills in the community. As part of their community-based instruction, students should become familiar with the banking services. Additionally, students should engage in activities where they have opportunities to earn and spend money as part of their transition instruction. Educators should plan instruction for managing finances that is developmentally appropriate and

that aligns with the student's age. Lastly, lack of resources has been identified as a barrier for educators wanting to provide CBI to students with ID. Schools must allocate money for educators working on these critical skills to adequately prepare young adults with ID to transition to their communities with the highest degree of independence possible.

Skill Acquisition

People with intellectual disabilities often require support while engaging in their communities, and research on community participation has shown that family or staff members most commonly provide this support. The rapid rate at which the participants in this study were able to acquire the target skills point to the potential of the intervention for teaching personal finance skills, but more importantly, brings to light the importance of presuming competence among individuals with ID.

Proficiency with the technology used in the study was part of the inclusion criteria for participant recruitment. When interpreting the results of the study, one should keep in mind that the participants were served in self-contained classrooms, and all of them participated on the alternate standards. Despite these facts, three of the four participants were able to acquire the target skills quickly and with 100% accuracy.

During my observations for participation, it became evident that they were comfortable and experienced in engaging with the technology. It was apparent that the participants possessed a level of understanding of how to work the technology that could have contributed to their success with the intervention. The notion that the participants would require more support for using the technology to engage in the activities in the community because of their placement in a self-contained classroom is a presumption of incompetence, and it is my hope that the results of this study demonstrate the opposite.

The participants of the study all stated they had no prior experience in using a debit card before beginning intervention. The rate with which they were able to acquire the target skills and the level of independence they were able to achieve shows that each participant possessed skills and knowledge that assisted them in quickly learning how use their debit cards. It is critical for educators and researchers to recognize that people with ID have skillsets that are not always apparent. Support and accommodations may be necessary for community participation, but presuming competence changes the way in which people with ID are perceived and can promote further participation in the community.

Limitations and Future Research

As with all single-case studies, the small sample of participants (n = 4) makes it difficult to determine whether the results are generalizable. Additionally, all of the participants in the study were white, despite the diverse makeup of the school system from which the participants were recruited. Two of the three students who were originally nominated by the teachers were students of color. It is also worth noting that all three of the other students also qualified to receive free or reduced lunch. Only one participant who actually participated in the study, Nessa, received free or reduced lunch, A more diverse make up of students would give insight to whether the AR intervention is equally effective among participants of various ethnicities and from low socio-economic backgrounds. Regarding age and disability, all participants were transition-age students with mild intellectual disabilities. More research is needed to determine whether AR instruction would be effective among other age groups, such as older adults with ID who

have already exited high school, those with other disabilities, and among individuals with varying ability levels.

Another notable limitation that could influence the interpretation of results was the number of probe trials Lola participated in before receiving intervention. During her first probe trial for using the ATM, Lola completed 25% of the steps correctly. Her second trial increased to 50% and was maintained across her third trial. An additional probe trial should have been conducted given the increasing trend followed by two stable data points. It is difficult to determine what caused the increase in Lola's performance between the first and second probe. An additional probe trial could have provided more insight as to whether her improvement was by chance or if additional instruction was taking place outside the study.

The use of handheld technology can also be perceived as a limitation in this study. The participants used an iPad to access the AR app. In addition, all of the participants hand personal smartphones that were capable of using the same AR app. For young adults with ID who do not have access to such technology, or for educators who cannot provide the technology to use AR as part of their instruction, the augmented reality intervention would be inaccessible. The availability and widespread use of handheld devices appear to make this intervention accessible to all. Students from low socioeconomic homes or those who live in rural areas where cellular data and Wi-Fi are unavailable, however, are limited by the lack of access to these technologies. Educators working with students in rural areas or from low socioeconomic homes should be mindful of their students' circumstances when planning community-based instruction.

Teaching the students to use this type of technology as part of their instruction would be unproductive as they would not be able to access the intervention outside of school.

Future researchers should aim to verify the efficacy of AR as an instructional tool for teaching personal finance and other functional skills within the community. According to the ICF (WHO, 2001), environmental factors are strong determinants of a person's level of functioning, and technology is identified as a factor that can increase independent functioning among individuals with disabilities. The use of AR technology would address concerns regarding community accessibility. Therefore, more research is needed for how AR can be implemented as an instructional tool to teach other functional skills that would allow individuals with disabilities to participate more independently within their communities.

Future research should also seek to explore other AR applications for teaching functional skills. Individualization is a key component to consider when planning instruction for students with disabilities. Like all instruction, learner preferences and needs should be considered when using augmented reality. Numerous AR applications exist, and each one includes unique components. HP Reveal, previously known as Aurasma, was the application used in this study and has been used in other studies examining the use of AR for individuals with ID (Bridges et al., 2020; Cihak et al., 2016; McMahon et al., 2016). As discussed in Chapter II, HP Reveal is a marker-based system. Digital content is displayed when the app detects a pre-determined target. The application works best for demonstrating video models of chained tasks. Learners who require video instruction to be broken down into more discrete steps or those who would benefit from having the option to pause or rewind the video content would need an alternate system.

Therefore, more research is needed to determine how other AR applications with different control functions can be used to teach similar skills.

Lastly, future research should assess whether simulated instruction coupled with AR is an effective alternative to community-based instruction. Given the unforeseen challenges of conducting research in the community, simulated instruction using AR for delivering video models followed by generalization sessions in the community seems more practical. For educators interested in incorporating AR in their instruction, setting up simulated experiences that imitate those that can be expected in the community would be a less expensive and more feasible method for teaching students to use AR technology to access video models.

Conclusion

Reliance on others hinders self-determination and interferes with the ability to make personal choices. For adolescents preparing for transition, the greatest level autonomy is often the goal. Many young adults have the desire to live independently and participate in preferred activities without support or supervision in their communities. Young adults with ID, however, face obstacles that can interfere with their independence. The limited adaptive functioning associated with intellectual disabilities leads to reliance on others for performing day-to-day activities. Augmented reality should be explored as an accessibility tool for supporting individuals with ID across multiple environments.

The overarching purpose of this study was to determine whether video modeling delivered through an AR application was effective for teaching personal finance skills. The underlying intention, however, was to discover whether students with ID found this technology to be a helpful and socially valid means for receiving instruction when

needing assistance in the community. The role of environment as a deterrent and the need for assistive technologies to improve independent functioning for people with ID has been noted in research on community participation (Fougeyrollas, Noreau, & Bergeron, 1998; Luckasson et al., 2002; Schalock & Luckasson, 2005; WHO, 2001).

This study demonstrates the effectiveness of the intervention for teaching the targeted skills, but application for this technology is needed on a significantly broader scale. Educators need access to technological resources and adequate training for how to embed augmented reality in their instruction. Similarly, schools need personnel available to support students as they learn to generalize these skills in the community. Communities can assist in the efforts to promote independent functioning and accessibility by developing instructional video models that can be accessed using AR technology. Large-scale efforts to implement AR instruction would lead to more accessible communities and more self-determined citizens.

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APPENDIX A:

IRB APPROVAL

THE UNIVERSITY OF ALABAMA | *Office of the Vice President for* Research & Economic Development
Office for Research Compliance

June 18, 2020

Shannon Romano
Department of SPEMA
College of Education
The University of Alabama
Box 870232

Re: IRB # 19-OR-153-R1 "Augmented Reality for Improving Personal Finance Skills in the Community"

Dear Ms. Romano:

The University of Alabama Institutional Review Board has granted approval for your renewal application. Your renewal application has been given expedited approval according to 45 CFR part 46. Approval has been given under expedited review category 7 as outlined below:

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

The approval for your application will lapse on June 17, 2021. If your research will continue beyond this date, please submit a continuing review to the IRB as required by University policy before the lapse. Please note, any modifications made in research design, methodology, or procedures must be submitted to and approved by the IRB before implementation. Please submit a final report form when the study is complete.

Good luck with your research.

Sincerely,

[redacted]

Carpantato T. Myles, MSM, CIM, CIP
Director & Research Compliance Officer

Jessup Building | Box 870127 | Tuscaloosa, AL 35487-0127
205-348-8461 | Fax 205-348-7189 | Toll Free 1-877-820-3066

APPENDIX B

TEACHER AGREEMENT TO PARTICIPATE IN THE STUDY

Teachers,

This letter is to ask for your assistance in selecting students from Oxford High School to participate in a research study. Five students who meet the following inclusion criteria are needed to participate in the study entitled *Augmented Reality for Teaching Personal Finance Skills in the Community*:

(a) Student's age must be 16-21 years of age;
(b) Student must have a diagnosis of a mild intellectual disability (i.e., a student with an IQ score of 70 or below who exhibits limitations in intellectual functioning and adaptive behaviors);
(c) Student must have an IEP goal related to financial management and/or community participation;
(d) Student must demonstrate basic iPad proficiency (i.e., turning on the device, independently opening apps, and logging into programs);
(e) Student must have access to a debit card.

Your participation in the selection of potential participants is completely voluntary. You are not obligated to participate, and you can opt out of participating at any time. If you would like to assist in identifying students who meet the above criteria, please carefully review the following guidelines:

(a) Your role will be to review special education documents (i.e., eligibility documentation and IEPS) to determine which of your students meet the inclusion criteria. If you have any questions pertaining to the inclusion criteria or whether a student should be considered for the study, you can ask Mrs. Romano, but you must not use student names or disclose any information to Mrs. Romano that would reveal the identify of the student until parental/guardian consent has been obtained.

(b) No work related to the selection of participants for the study should interfere with work hours. The reviewing of documents and discussions about potential participants with Mrs. Romano must not conflict with your day-to-day job duties. Participation in this study cannot disrupt instruction.

(c) Once you have identified the students who meet the inclusion criteria, Mrs. Romano will give you a letter to send home to the parent/guardian requesting permission to be contacted about the study. When the form is signed and returned, you will notify Mrs. Romano and provide the necessary contact information. At this point, your participation will be complete. Mrs. Romano will contact the parents/guardians of those who have signed consent to arrange a formal interview to review the consent and assent process for participating in the study.

(d) To protect the students' confidentiality, you are not to share the names of students included in the study with co-workers or community members at any point during the study. The participants will be informed that they can disclose that information, if they choose to do so. You cannot answer any questions pertaining to the participants or the study from personnel other than Mrs. Romano.

If you agree to the guidelines above and wish to assist with the recruitment of participants for Mrs. Romano's study, please select that you agree to these terms.

_____Yes, I agree to assist in the selection of participants for the study and agree to the above terms.

_____No, I do not wish to assist in the selection of participants for the study.

APPENDIX C

PERMISSION TO BE CONTACTED

Good afternoon,

My name is _____, _____ (position) for Oxford City Schools. I am contacting you on behalf of a doctoral student at the University of Alabama working to complete a research study with participants who are young adults with intellectual disabilities. The purpose of the study is to find out if an iPad app called HP Reveal is an effective tool for teaching financial management skills to students with disabilities. The goal is to teach transition-age students to perform financial management tasks as independently as possible.

You are being contacted because your child is eligible to participate in the study. If you are interested in your child learning to use this intervention to increase his/her financial independence, I will need your permission to give the principal investigator, Shannon Romano, your name and contact information.

Your participation would be voluntary. That means you may refuse to take part in this study or, if you decide to participate, you may decide to opt out of the study at any time. There are no risks associated with participation in this study, and the study does not influence your child's grades or academic instruction in any way.

If you are interested in your child participating in the study, I will need your written consent to allow Mrs. Romano to contact you to schedule a phone or face-to-face interview. A permission form will be mailed to you with a return envelope. Please sign and return it as soon as possible.

Thank you for your time, and Mrs. Romano will be in touch with you soon.

_____Yes, I agree to my contact information to be shared with Mrs. Romano because I am interested in my child participating in the study.

____No, I am not interested in my child participating in the study.

_____ _____

Signature of parent or legal guardian Date

APPENDIX D

PARENT INTERVIEW PROTOCOL

1. What are some activities your child likes to do in the community?
2. How does he or she pay for activities/items?
3. Does your child have his or her own bank account?
4. Does he or she have a debit card?
5. Has he or she ever used a debit card?
6. Does he or she independently use the debit card to pay for items, or does he or she need help?
7. If yes, please describe how you help your child pay for items using the debit card.
8. Does he or she withdraw money from any ATM?
9. Has he or she ever withdrawn money or assisted you in withdrawing money?
10. If your child does not have a bank account or debit card, would you be willing to open an account so he or she can learn to use a debit card, or would you be willing to allow your child to use your debit card, if selected to participate in the study?
11. Would you be able to provide transportation three times weekly to your local bank and Wal-Mart on Hwy. 21 in Oxford?
12. Would you be willing to refrain from providing additional instruction between sessions while your child is participating in the study?

APPENDIX E

STUDENT INTERVIEW PROTOCOL

1. What are some activities you like to do in the community?
2. Where do you like to shop?
3. What do you like to buy?
4. Who pays for activities and items you need?
5. Do you have your own bank account?
6. If yes, do you have your own debit card?
7. Tell me how you use your debit card.
8. Where do you want to live when you are an adult?
9. How will you learn to pay for the activities and items you need?
10. Do you have a smartphone or a tablet like an iPhone, Android, or iPad?
11. Would you like to learn how to use a mobile device to learn how to use a bank or buy items at the store?

APPENDIX F

PARENT CONSENT FORM

Using Augmented Reality for Teaching Financial Management Skills

Shannon B. Romano, Doctoral Candidate
The University of Alabama College of Special Education and Multiple Abilities

Your child is being asked to participate in a research study. This study is called *Using Augmented Reality for Teaching Financial Management Skills.* The study is being done by UA doctoral candidate Shannon B. Romano. The researcher is being supervised by Dr. Kagendo Mutua, professor at UA for the department of Special Education and Multiple Abilties.

This study is being done to find out if an iPad app called *HP Reveal* is an effective tool for teaching daily living skills. The goal is to teach transition-age students to perform financial management tasks as independently as possible.

Your child has been asked to participate in the study because his/her IEP goal identifies the need for individualized instruction for learning to manage money in order to participate independently in the community. The first part of the study will include interviews with you, the legal guardian, and with your child about his/or participation in the community. Next, your child will be observed using an iPad to assess whether he/she will be able to use it in the actual study. If selected to participate in the intervention, your child will work with a researcher to learn this intervention three times a week. Participation in the study will not take away time from your child's work or academic schedule, and your child will have the option to quit the study at any time.

As part of the study, it is important for you to understand that your child must have access to his or her own debit card or the debit card of the parent or legal guardian. The skills in the study will involve your child learning to withdraw money from an ATM. These sessions will take place at your branch to ensure the student can continue practicing the skills after the study is completed. Your child will also learn to pay for items using a debit card. These sessions will take place at the Wal-Mart located on Hwy. 21 in Oxford, Alabama. Agreeing to participate in the study means that you understand you will arrange sessions three times weekly with the researcher and agree to transport your child to and from the study sessions. After each study session, the researcher will oversee your child giving the debit card back to you to protect between sessions. It will be your decision whether the money withdrawn from the ATM is returned to you or if your child can keep it. The estimated duration of the study is approximately 6 weeks.

The benefits associated with participation in this study include increase financial independence, access to money that can be spent on the activities and items of your child's choice, and greater participation in the community. There are minimal risks associated with the use of the debit card in this study (i.e., loss of debit card, overdrawing

the account). Participation is voluntary, and your child can opt out of the study at any time. We hope that your child will learn to perform financial management skills more independently as the result of participating in this study. Please note that although we cannot ask you to prevent your child from practicing the skills between sessions, doing so will influence the outcome of the study. We believe that teaching students to use augmented reality for learning new skills will increase their independence and ability to participate in activities in the community.

Your child's confidentiality will be protected throughout the study. If selected to participate, your child will select a pseudo name so that his/her own name will not be revealed. All sessions with the researcher will be video and audio recorded to share with a research assistant. This is to ensure the procedures in the study are being carried out correctly. The only people that will have access to the recorded videos and data collected from the study are the researcher, the research assistant, and the IRB. All videos and data will be stored in a shared electronic document through the university that is password protected. All videos will be deleted and the electronic folder will be closed after the study has been completed.

If you consent for your child to participate, a copy of this signed document will be given to you for your records. The University of Alabama Institutional Review Board ("the IRB") is the committee that protects the rights of people in research studies. The IRB may review study records from time to time to be sure that people in research studies are being treated fairly and that the study is being carried out as planned.

If you have questions, concerns, or complaints about the study right now, please ask them. If you have questions about your child's rights as a person in a research study, call Ms. Tanta Myles, the Research Compliance Officer of the University, at 205-348-8461 or toll-free at 1-877-820-3066. If you have any questions about the study, please contact Shannon Romano at (256) 452-6311.

You may also ask questions, make suggestions, or file complaints and concerns through the IRB Outreach website at http://ovpred.ua.edu/research-compliance/proc/ or email the Research Compliance office at rscompliance@research.ua.edu.

_____Yes, I give consent for my child's participation in the study and to be video recorded.

_____No, I do not give consent for my child to participate in the study.

_____ _____
Name of Participant Date

_____ _____

Parent/Legal Guardian Date

_____ _____

Person Obtaining Consent Date

APPENDIX G

STUDENT ASSENT FORM

Dear Student,

We are doing a research study to learn more about teaching young adults with disabilities to independently access and spend their money. We would like to know if an iPad app called *HP Reveal* is helpful for teaching adults with disabilities to be more independent while performing these tasks. The goal is for people with disabilities to learn these skills so they can live as independently as possible.
We are asking you and a few of your classmates to participate in this study.

If you decide to be in this study, you will first need to be interviewed by a researcher to learn more about the activities you like in the community and how you pay for things you buy. Then, the researcher will watch you use an iPad to perform basic tasks like turning it on, opening an app, and adjusting the volume. If you are selected for the intervention, you will learn to use an iPad app called *HP Reveal* that will teach you to withdraw money from the ATM and pay for items at a department store using a debit card. You will work with a researcher to learn how to use this app three times a week for approximately 7 weeks. These sessions will last about 15-20 minutes. You will be video-recorded using the application so that we can make sure the researcher is teaching the steps correctly. The videos will be kept private and destroyed at the end of the study.

None of the other students will be told that you are participating in the study. If you want to talk about it with your friends and family, that will be your choice. We will write a report at the end of the study. You will get to choose a different name so that your real name will stay private.

You are a volunteer. You are helping us, but you do not have to unless you want to. This is your free choice. If you start the study and decide you don't want to continue, just let me know. No one will be mad at you. There are only minimal risks to for participating in study. These risks include loss of the debit card and possibly overdrawing your bank account.

If you have any questions about this study, please ask me now. If you have questions later, you can call me at (256) 452-6311. You can also ask your parents questions if you wish. If you have questions or concerns about your rights in a research study, please contact Ms. Tanta Myles, the University of Alabama Research Compliance Officer, at (205) 348-8461.

If you agree to be in this study, please sign your name on this letter below. You can have a copy of the letter to keep. Thank you very much for your interest.

____Yes, I will participate in the study, and I give consent for you to video record me.

____No, I do not want to participate in the study.

Sincerely,

Shannon Romano
Doctoral Candidate, the University of Alabama

_____ _____
Name of Participant Date

_____ _____
Person Obtaining Consent Date

APPENDIX H

TELEPHONE CONSENT FORM

AAHRPP DOCUMENT # 141

UNIVERSITY OF ALABAMA

HUMAN RESEARCH PROTECTION PROGRAM

GUIDANCE: MODEL TELEPHONE CONSENT

I am a graduate student at the University of Alabama working to complete a research study. This study is being done to find out if an iPad app called HP Reveal is an effective tool for teaching daily living skills to students with disabilities. The goal is to teach transition-age students to perform financial management tasks as independently as possible. If selected to participate in this study, your child will have the opportunity to learn to withdraw money from his/her bank and make purchases using a debit card machine.

If you consent to allow your child to participate in the study, I would first like to interview you and your child about his/her participation in the community and his/her experiences in performing these tasks. If your child is selected to participate in the study, I will also need your permission to observe him/her using an iPad to assess whether he/she will be able to use it in the actual study. The parent interviews can be done over the phone, or we can schedule a time to meet at Oxford High School. The parent interview will take approximately 10 minutes. The student interview and observation will take approximately 15 minutes. None of these questions in the interview will ask you or your child about personal matters and your answers will be kept confidential. By participating in this study, your child will learn to perform financial management skills more independently as the result of participating in this study.

Your participation is voluntary. That means you may refuse to take part in this study or, if you decide to participate in the interviews, you and your child may decide not to answer any questions that make you feel uncomfortable or to stop the interview at any time. There are no risks associated with participation in this study. Would you like to schedule a time to come to Oxford High School with your child for the interviews, or would you like to complete the interviews over the phone?

APPENDIX I

TRAINING DATA SHEET

Training

Name _____

1. Opens iPad by pushing the home button and sliding finger over the home screen
   - ❑ Independent
   - ❑ Indirect verbal prompt
   - ❑ Direct verbal prompt
   - ❑ Model
   - ❑ Partial physical prompt
   - ❑ Hand-over-hand assistance
2. Find and clicks on the HP Reveal app
   - ❑ Independent
   - ❑ Indirect verbal prompt
   - ❑ Direct verbal prompt
   - ❑ Model
   - ❑ Partial physical prompt
   - ❑ Hand-over-hand assistance
3. Locates the HP Reveal target
   - ❑ Independent
   - ❑ Indirect verbal prompt
   - ❑ Direct verbal prompt
   - ❑ Model
   - ❑ Partial physical prompt
   - ❑ Hand-over-hand assistance
4. Pushes the blue button on the bottom/center of the app home screen
   - ❑ Independent
   - ❑ Indirect verbal prompt
   - ❑ Direct verbal prompt

- ❏ Model
- ❏ Partial physical prompt
- ❏ Hand-over-hand assistance

5. Holds iPad up the the target with camera facing the target
   - ❏ Independent
   - ❏ Indirect verbal prompt
   - ❏ Direct verbal prompt
   - ❏ Model
   - ❏ Partial physical prompt
   - ❏ Hand-over-hand assistance
6. If needed, turns on sound using the button on the side of the iPad
   - ❏ Independent
   - ❏ Indirect verbal prompt
   - ❏ Direct verbal prompt
   - ❏ Model
   - ❏ Partial physical prompt
   - ❏ Hand-over-hand assistance
   - ❏ Not applicable
7. Watches video model
   - ❏ Independent
   - ❏ Indirect verbal prompt
   - ❏ Direct verbal prompt
   - ❏ Model
   - ❏ Partial physical prompt
   - ❏ Hand-over-hand assistance
8. Puts iPad down after viewing to initiate task
   - ❏ Independent
   - ❏ Indirect verbal prompt
   - ❏ Direct verbal prompt
   - ❏ Model
   - ❏ Partial physical prompt
   - ❏ Hand-over-hand assistance

APPENDIX J

INITIAL AND MAINTENANCE PROBE TRIAL DATA SHEET

Initial & Maintenance Probe Trials

Name, phase, and trial number

_____

1. Gave task direction "It's time to _____"
   - ❏ Observed
   - ❏ Not observed
2. Provided verbal praise upon completion of the task.
   - ❏ Observed
   - ❏ Not observed
3. Observer completed data based on the student's performance.
   - ❏ Observed
   - ❏ Not observed

APPENDIX K

PROCEDURAL FIDELITY DATA SHEET

Intervention Procedural Fidelity

Name, Phase, Trial Number _____

1. Gave student task direction “I want you to _____.”
   - ❑ Observed
   - ❑ Not observed
2. Allowed 5-second wait time for student to view video model with iPad
   - ❑ Observed
   - ❑ Not observed
3. If student did not view video model, researcher gave a reminder to use the iPad to view the video model
   - ❑ Observed
   - ❑ Not observed
4. Prompted student to view video model a 2nd time when first mistake is made in sequence
   - ❑ Observed
   - ❑ Not observed
5. Used least-to-most prompting to prompt the student through completing the task
   - ❑ Observed
   - ❑ Not observed
6. Provided verbal praise upon completion of the task
   - ❑ Observed
   - ❑ Not observed
7. Observer completed data based on student’s performance
   - ❑ Observed
   - ❑ Not observed

APPENDIX L

LOLA PURCHASING DATA SHEET

Lola Purchasing

Trial or IOA, Date, Session number

_____

1. Wait for cashier to ring up items and give price
   - ❑ Independent
   - ❑ Indirect verbal prompt
   - ❑ Direct verbal prompt
   - ❑ Model
   - ❑ Partial physical prompt
   - ❑ Hand-over-hang
   - ❑ Not observed
2. Inserts card chip first
   - ❑ Independent
   - ❑ Indirect verbal prompt
   - ❑ Direct verbal prompt
   - ❑ Model
   - ❑ Partial physical prompt
   - ❑ Hand-over-hang
   - ❑ Not observed
3. Selects correct method of payment
   - ❑ Independent
   - ❑ Indirect verbal prompt
   - ❑ Direct verbal prompt
   - ❑ Model
   - ❑ Partial physical prompt
   - ❑ Hand-over-hang
   - ❑ Not observed
4. Select green "yes" button to accept transaction
   - ❑ Independent
   - ❑ Indirect verbal prompt
   - ❑ Direct verbal prompt
   - ❑ Model
   - ❑ Partial physical prompt
   - ❑ Hand-over-hang
   - ❑ Not observed
5. Waits for transaction to process
   - ❑ Independent

- ❏ Indirect verbal prompt
- ❏ Direct verbal prompt
- ❏ Model
- ❏ Partial physical prompt
- ❏ Hand-over-hang
- ❏ Not observed

6. Removes card
    - ❏ Independent
    - ❏ Indirect verbal prompt
    - ❏ Direct verbal prompt
    - ❏ Model
    - ❏ Partial physical prompt
    - ❏ Hand-over-hang
    - ❏ Not observed

7. Takes receipt
    - ❏ Independent
    - ❏ Indirect verbal prompt
    - ❏ Direct verbal prompt
    - ❏ Model
    - ❏ Partial physical prompt
    - ❏ Hand-over-hang
    - ❏ Not observed

APPENDIX M

MAKING A PURCHASE DATA SHEET

Making a purchase

Indicate in comments below whether response is observation or IOA. Record the name of the participant, the date of observation, and whether response is trial or IOA.

Name, Observation or IOA

_____

1. Presses green "pay" button
   - ❑ Independent
   - ❑ Indirect verbal prompt
   - ❑ Direct verbal prompt
   - ❑ Model
   - ❑ Partial physical prompt
   - ❑ Hand-over-hand assistance
   - ❑ Not observed
2. Selects credit/debit on screen
   - ❑ Independent
   - ❑ Indirect verbal prompt
   - ❑ Direct verbal prompt
   - ❑ Model
   - ❑ Partial physical prompt
   - ❑ Hand-over-hand assistance
   - ❑ Not observed
3. Inserts card into machine chip side first
   - ❑ Independent
   - ❑ Indirect verbal prompt
   - ❑ Direct verbal prompt
   - ❑ Model
   - ❑ Partial physical prompt
   - ❑ Hand-over-hand assistance
   - ❑ Not observed
4. Presses "no" for cash back
   - ❑ Independent
   - ❑ Indirect verbal prompt
   - ❑ Direct verbal prompt
   - ❑ Partial physical prompt
   - ❑ Hand-over-hand assistance

- ❏ Not observed

5. Enters 4-digit PIN

- ❏ Independent
- ❏ Indirect verbal prompt
- ❏ Direct verbal prompt
- ❏ Model
- ❏ Partial physical prompt
- ❏ Hand-over-hand assistance
- ❏ Not observed

6. Presses "enter"

- ❏ Independent
- ❏ Indirect verbal prompt
- ❏ Direct verbal prompt
- ❏ Model
- ❏ Partial physical prompt
- ❏ Hand-over-hand assistance
- ❏ Not observed

7. Waits for purchase to finish

- ❏ Independent
- ❏ Indirect verbal prompt
- ❏ Direct verbal prompt
- ❏ Model
- ❏ Partial physical prompt
- ❏ Hand-over-hand assistance
- ❏ Not observed

8. Takes card out of the machine

- ❏ Independent
- ❏ Indirect verbal prompt
- ❏ Direct verbal prompt
- ❏ Model
- ❏ Partial physical prompt
- ❏ Hand-over-hand assistance
- ❏ Not observed

9. Takes the receipt

- ❏ Independent
- ❏ Indirect verbal prompt
- ❏ Direct verbal prompt
- ❏ Model
- ❏ Partial physical prompt
- ❏ Hand-over-hand assistance

- ❑ Not observed

APPENDIX N

USING ATM DATA SHEET

Using ATM

Observation or IOA _____

1. Locates the ATM
   - ❑ Independent
   - ❑ Indirect verbal prompt
   - ❑ Direct verbal prompt
   - ❑ Model
   - ❑ Partial physical prompt
   - ❑ Hand-over-hand assistance
   - ❑ Not observed
2. Inserts card in the machine
   - ❑ Independent
   - ❑ Indirect verbal prompt
   - ❑ Direct verbal prompt
   - ❑ Model
   - ❑ Partial physical prompt
   - ❑ Hand-over-hand assistance
   - ❑ Not observed
3. Types in 4-digit PIN
   - ❑ Independent
   - ❑ Indirect verbal prompt
   - ❑ Direct verbal prompt
   - ❑ Model
   - ❑ Partial physical prompt
   - ❑ Hand-over-hand assistance
   - ❑ Not observed
4. Presses enter
   - ❑ Independent
   - ❑ Indirect verbal prompt
   - ❑ Direct verbal prompt
   - ❑ Model
   - ❑ Partial physical prompt
   - ❑ Hand-over-hand assistance
   - ❑ Not observed

5. Chooses to get $20

- ❑ Independent
- ❑ Indirect verbal prompt
- ❑ Direct verbal prompt
- ❑ Model
- ❑ Partial physical prompt
- ❑ Hand-over-hand assistance
- ❑ Not observed

6. Removes cash

- ❑ Independent
- ❑ Indirect verbal prompt
- ❑ Direct verbal prompt
- ❑ Model
- ❑ Partial physical prompt
- ❑ Hand-over-hand assistance
- ❑ Not observed

7. Takes card

- ❑ Independent
- ❑ Indirect verbal prompt
- ❑ Direct verbal prompt
- ❑ Model
- ❑ Partial physical prompt
- ❑ Hand-over-hand assistance
- ❑ Not observed

8. Gets receipt

- ❑ Independent
- ❑ Indirect verbal prompt
- ❑ Direct verbal prompt
- ❑ Model
- ❑ Partial physical prompt
- ❑ Hand-over-hand assistance
- ❑ Not observed

APPENDIX O

NICK'S ATM DATA SHEET

Nick ATM

Phase, Trial #, Date _____

1. Locates ATM
   - ❑ Independent
   - ❑ Indirect verbal prompt
   - ❑ Direct verbal prompt
   - ❑ Model
   - ❑ Partial physical prompt
   - ❑ Hand-over-hand
   - ❑ Not observed
2. Inserts card correctly
   - ❑ Independent
   - ❑ Indirect verbal prompt
   - ❑ Direct verbal prompt
   - ❑ Model
   - ❑ Partial physical prompt
   - ❑ Hand-over-hand
   - ❑ Not observed
3. Selects "English"
   - ❑ Independent
   - ❑ Indirect verbal prompt
   - ❑ Direct verbal prompt
   - ❑ Model
   - ❑ Partial physical prompt
   - ❑ Hand-over-hand
   - ❑ Not observed
4. Enters 4-digit PIN
   - ❑ Independent
   - ❑ Indirect verbal prompt
   - ❑ Direct verbal prompt
   - ❑ Model
   - ❑ Partial physical prompt
   - ❑ Hand-over-hand
   - ❑ Not observed
5. Presses "Enter"
   - ❑ Independent

- ❏ Indirect verbal prompt
- ❏ Direct verbal prompt
- ❏ Model
- ❏ Partial physical prompt
- ❏ Hand-over-hand
- ❏ Not observed

6. Selects "withdraw"

- ❏ Independent
- ❏ Indirect verbal prompt
- ❏ Direct verbal prompt
- ❏ Model
- ❏ Partial physical prompt
- ❏ Hand-over-hand
- ❏ Not observed

7. Selects correct account

- ❏ Independent
- ❏ Indirect verbal prompt
- ❏ Direct verbal prompt
- ❏ Model
- ❏ Partial physical prompt
- ❏ Hand-over-hand
- ❏ Not observed

8. Chooses to withdraw $20

- ❏ Independent
- ❏ Indirect verbal prompt
- ❏ Direct verbal prompt
- ❏ Model
- ❏ Partial physical prompt
- ❏ Hand-over-hand
- ❏ Not observed

9. Selects to continue with receipt

- ❏ Independent
- ❏ Indirect verbal prompt
- ❏ Direct verbal prompt
- ❏ Model
- ❏ Partial physical prompt
- ❏ Hand-over-hand
- ❏ Not observed

10. Selects to return card

- ❏ Independent
- ❏ Indirect verbal prompt

- ❑ Direct verbal prompt
- ❑ Model
- ❑ Partial physical prompt
- ❑ Hand-over-hand
- ❑ Not observed

11. Removes card

- ❑ Independent
- ❑ Indirect verbal prompt
- ❑ Direct verbal prompt
- ❑ Model
- ❑ Partial physical prompt
- ❑ Hand-over-hand
- ❑ Not observed

12. Takes cash

- ❑ Independent
- ❑ Indirect verbal prompt
- ❑ Direct verbal prompt
- ❑ Model
- ❑ Partial physical prompt
- ❑ Hand-over-hand
- ❑ Not observed

13. Gets receipt

- ❑ Independent
- ❑ Indirect verbal prompt
- ❑ Direct verbal prompt
- ❑ Model
- ❑ Partial physical prompt
- ❑ Hand-over-hand
- ❑ Not observed