INTEGRATING INTERACTIVE TECHNOLOGY INTO A COMMUNITY SKILLS CURRICULUM: A DESIGN EXPERIMENT

by

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(Under the Direction of Lloyd Reiber)

ABSTRACT

The purpose of this study was to explore how videotapes and interactive multimedia software developed to teach community-based skills to students with moderate to severe intellectual disabilities could be integrated into a special education classroom. The research questions focused on two areas: 1) Generating findings to contribute to the existing literature on implementing computer-based training applications for teaching community-based skills to individuals with moderate to severe intellectual disabilities; and 2) uncovering specific patterns of use of the materials by teachers and their students. A design experiment methodology was used. The setting for this study was two special education classrooms in the southeastern United States. Teachers and students in those classrooms were the participants. Data were collected through interviews and observations. This study identified features of computer-based instruction that are effective when working with exceptional students. These included detailed database tracking features, a means for allowing teachers or facilitators to modify task and activity difficulty and allowing teachers options in controlling various factors of content presentation and assessment. Methods of using computer-based instruction effectively to teach community-based skills were identified, for example, combining a computer-based

activity on paying for groceries with a simulated classroom activity in which students practice using real money to pay for groceries. In addition, guidelines for facilitating student use of computer-based instruction were developed based on the findings. These involved using a combination of methods of prompting such as system of least prompts and constant time delay with prompting features afforded by the program. A theory of facilitation emerged to explain how teachers should work with students in partnership with the computer in order for the student to learn from the computer-based materials most effectively.

INDEX WORDS: Computer-based instruction, Technology integration, community-based instruction.

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CHAPTER 1

INTRODUCTION

A primary goal of the special educator is to help individuals with intellectual disabilities learn academic and social skills that will enable them to function more effectively within the community. For example, being able to shop for groceries and ride the bus allows individuals with disabilities greater independence and broader participation within the community (Morse, Schuster & Sandknop, 1996). A highly effective means for assisting individuals in developing these skills is community-based instruction (Hughes & Agran, 1993). Anchoring the instruction of these life skills in the actual settings where they are practiced holds much promise in preparing these individuals to function more independently in the community (McDonnell, Hardman, Hightower, Keifer-O'Donnell, & Drew, 1993; Snell & Browder, 1986).

Background to the Problem

The implementation of community-based instruction, however, can be costly (Wissick, Gardner, & Langone, 1999). The amount of time required to work with each student in the community may be too much for the teacher and staff. Just as overwhelming can be the complicated logistics and scheduling necessary to transport the students to the instructional setting on a frequent enough basis to meet their learning needs. Finally, the cost of transportation, staff, and other materials needed for community-based instruction may be more than the school's budget allows.

One potential solution to these problems is classroom simulations of community interactions. In this type of training, an area of the physical classroom or training area is transformed to resemble the actual target environment (such as a grocery store) with

materials that are realistic to what students would find in that setting (Bates, Cuvo, Miner, & Korabek, 2001). Although this training allows students to practice valuable real-life skills, unfortunately few resources exist to provide such classroom simulations (Langone, Clees, Oxford, Malone, & Ross, 1995).

To combat this problem, a more recent development in the area of simulated community interactions utilizes classroom or home computers to deliver training that simulates these real-life learning environments (Langone, Shade, Clees, & Day, 1999; Langone, Clees, Rieber & Matzko, 2003; Mechling, Gast, & Langone, 2002). Computer-based training allows for an increased number of meaningful trials for each community-based skill, while reducing the number of trips required to the actual target environment (such as a post office). Although the research literature on using interactive technologies to teach community skills in the classroom is limited--perhaps due to the lack of training materials-- literature has begun to show that the computer can indeed be a supplement for traditional community-based instruction curriculum (Langone, Shade, Clees, & Day, 1999; Mechling & Gast, 2002; Mechling, Gast, & Langone, 2002; Mechling & Langone, 2000; Norman, Collins, & Schuster, 2001; Wissick, Lloyd, & Kinzie, 1992). Even so, additional research is needed to judge the effectiveness and efficiency of implementing interactive technology activities with individuals with special needs.

Technology Integration in the Classroom

While there has been a significant increase in the number of computers placed in schools, as well as Internet access and other innovations, the question still remains as to what to do with them (Cuban, 2001). Computers are used to deliver instruction in a variety of academic settings (Alessi & Trollip, 2001), but merely possessing technology does not guarantee the achievement of learning outcomes.

An effective use for computers involves computer-based instruction, which includes instructional multimedia. In the traditional classroom, research indicates that at least under experimental conditions, well-designed computer software successfully assists

learners in achieving their instructional goals (Kulik & Kulik, 1991). Computer-based instructional programs can take the form of tutorials, drill and practice programs, simulations, educational games, and even more open-ended applications like microworlds (Alessi & Trollip, 2001; Rieber, in press). In traditional education, guidelines for developing successful computer-based instructional programs are plentiful, as is research on their effectiveness (e.g. Alessi & Trollip, 2001; Berson, 1996; Heinich, Molenda, Russell, & Smaldino, 2002; Weller, 1996). Developers of instructional tutorials or drill and practice programs typically develop their instruction using an objectivist framework such as Gagné's Events of Instruction (Gagné, Briggs, & Wager, 1992) or other general models of instructional systems development (e.g., Dick & Carey, 1990). Developers of instructional multimedia games or microworlds often follow more constructivist theories, such as constructionism (Kafai & Resnick, 1996; Papert, 1980; Rieber, 2003), situated cognition (Brown, Collins, & Duguid, 1989), or anchored instruction (Cognition and Technology Group at Vanderbilt, 1990).

Certainly, issues surrounding the integration of technology into mainstream education are not new. A great deal of research and practice in recent years has focused on integrating computers and other technology into the general curriculum. There have been significant gains in the amounts and types of computers and other technologies implemented in the schools. However, making these technologies available to teachers and students does not automatically guarantee that they will be used effectively or that students will learn more than they would have had the technology never been implemented. Indeed, some have argued that poor technology implementation methods have prevented much impact on learning (Cuban, 2001). Consequently, while these gains in multimedia development and their corresponding theories are important to the field of instructional technology, research on the successful classroom use of these technologies should continue.

This same problem, lack of research on successful implementation methods of technology in the classroom, appears in special education. This is unfortunate, because with the great deal of promise that technology holds for the special education community, not implementing new technologies or not implementing them well could take much away from the future growth of today's students with special needs.

On a positive note, many guidelines for integrating technology into the traditional classroom now exist (Heinich et al., 2003; Roblyer, 2003). Research trends in classroom technology integration have moved from investigating whether or not computers are present in the classroom to investigating what is actually taking place with the technology (Marcinkiewicz, 1994; Norton, McRobbie, & Cooper, 2000). With a growing focus on student-centered learning in the classroom, research is being conducted on the different ways that computers are being used to support different pedagogies (Niederhauser & Stoddart, 2001; Pierson, 2001). Despite the increased number of guidelines for developing and integrating instructional multimedia in mainstream education, however, similar guidelines for instructional technology in special education are rare.

A brief overview of technology use in special education classrooms helps one understand current overall needs. Fortunately, much like mainstream education, special education has embraced the integration of technology. Many of the technologies typically associated with the special education classroom are categorized as assistive technologies (Wehmeyer, 1999), technological interventions that increase or extend individual functional capabilities (e.g., single switch technologies in place of a computer mouse to allow an individual with physical disabilities to interact with a computer program using a single button). While the special education community has made strides in adopting this assistive technology (Fabry & Higgs, 1997; Roblyer, 2002), relatively little work has been done investigating the implementation of computer-based instructional technology in the special education classroom. More research in this area is needed to provide practitioners in the special education community more guidance on the effective use of computer-

based instructional technology. Instructional technologists have a great opportunity to develop effective computer-based instructional materials for the special education classroom, notably in the area of simulation of community-based skills.

Project Shop

In response to a deficiency of training materials and lack of research on their implementation and effectiveness, the Departments of Instructional Technology and Special Education at the University of Georgia have partnered to create a multimedia instructional package known as *Project Shop* (Langone, Clees, Rieber, & Matzko, 2003). This instructional package was designed to teach individuals with intellectual disabilities those skills required to engage in a successful shopping trip, as well as the skills needed for possible employment at a grocery store, hence the title Project Shop.

Project Shop begins with three engaging video episodes intended to gain the attention of students and to provide video anchors for later skills training. They depict two fictional shopping trips involving individuals with disabilities who are guided by a charismatic mentor character, whose goal is to assist them during their shopping. In addition to the video episodes, there are computer-based multimedia activities presented on a CD-ROM. The CD-ROM is designed in the style of an interactive book where learners can progress through the story of a typical grocery store trip, and the video storyline is interspersed with multiple examples demonstrating the skills required for a successful shopping trip. These examples address the areas of safety, mobility, literacy, purchasing skills, and the job skills needed to work in a grocery store. In addition to these models, simulated activities contained on the CD-ROM place the users in photo realistic settings where they can practice these skills. While engaged in these simulated activities, the learners receive feedback and guidance from a computer-based mentor figure modeled after the mentor presented on the videotapes.

Project Shop was designed and developed by experts and practitioners in the fields of special education and instructional technology. While the recommendations for

its suggested use by practitioners in the schools have been developed, questions remain about how it will be implemented successfully by special education teachers and others concerned with the education of individuals with intellectual disabilities.

Purpose of the Study

The purpose of this study was to explore the integration of the videotapes and interactive multimedia software developed for Project Shop into the existing curriculum of special education teachers. While working with those teachers, students, and others involved in instructing special education students, this study intended to transform the Project Shop software into a successful example of technology integration in a manner compatible with the teachers' existing special education curriculum.

This research had two main goals: The first was to generate findings to contribute to the existing literature on implementing computer-based training applications for teaching community-based skills to individuals with moderate to severe intellectual disabilities. The second goal was to uncover specific patterns of use of the Project Shop materials by teachers (both successful and unsuccessful) and if possible, address these patterns in the design and development of the software and videotapes.

Research Questions

The guiding research question for this study was as follows: How is interactive multimedia integrated into special education classrooms by special education teachers? These five subquestions were designed to guide this study:

- How well aligned are the goals and design of the training materials to a teacher's existing practice?
- What are the patterns of use by special education teachers as they integrate the materials into their curriculum?
- How do those patterns of use by the special education teachers relate to existing research on technology integration?

- Can the patterns of use that emerge form principles or guidelines for technology use in community-based instruction?
- Do these materials change the way Special Education teachers teach?

Overview of the Methodology

This research used design-based research methods. Using a design-based research method allowed for the combined goal of contributing to the literature in the area of computer-based instruction in the special education classroom, and for exploring the successful use and modification of computer-based instructional materials in their intended context.

Two classrooms in separate counties of Georgia provided the setting for the research. The primary participants in this study were special education teachers. Secondary participants were their students and any other individuals responsible for the instruction of the students. Over the course of three months, the investigator cooperated with, interviewed, and observed the participants during their class, and made use of the Project Shop materials.

CHAPTER 2

REVIEW OF THE LITERATURE

This review of literature examined theoretical and empirical sources pertinent to a study of integrating educational multimedia into a special education classroom. There were three areas of interest: 1) community-based instruction, 2) the use of technology to facilitate community-based instruction, and 3) technology integration in the classroom. All of these areas directly informed and guided a successful integration of the Project Shop multimedia materials (video episodes and interactive computer software) into the community-based instruction curriculums of special education classrooms.

The literature constituting this review was identified through two principal means. First, a systematic search was conducted using the ERIC database. Keywords used in this search included the following: *community-based instruction, simulation, technology integration* and *special education technology*.

In addition, the tables of contents of the following journals were scanned manually to locate articles that pertained to this research topic: *Journal of Research on Computers in Education*, *Computers in the Schools, Educational Technology Research and Development*, and *Journal of Special Education Technology*. Additional methods involved tracing the literature reviews of research articles to locate research that was pertinent to the research topics mentioned above.

Community-Based Instruction

For individuals with moderate to severe cognitive disabilities, developmental disabilities or mental retardation, strong efforts must be made to ensure they develop sufficient skills to function at home and in the community in such areas as personal

hygiene, shopping abilities, and the use of public transportation (Browder, 2001). Other areas like money management (Browder & Grasso, 1999) and employability skills are also critical if these individuals are to reach their potential for independence.

Preparing Students for the Transition to the Community

Possibly the greatest transition an individual with a developmental disability faces in his or her lifetime is the transition to the post-school world (Clees, 1996). During this transition, it is increasingly important for the individual to assert greater independence by moving into his or her own residence and starting a full-time job in order to function as an active member of the community.

In order to function as an active member of the community, an individual with moderate to severe special needs will have to demonstrate a variety of skills each day to maintain a consistent and ever-improving way of life (Browder, 2001). Examples of these skills include riding public transportation to work, possessing employability skills, practicing personal hygiene, preparing a meal, cleaning one's surroundings, and purchasing food (Westling & Fox, 2000). Some skills, such as a specific employability skill (e.g., working on an assembly line) are domain specific, while other skills (e.g., personal-social skills) are applied to many different domains and settings (Clees, 1996). In order to ensure that individuals are able to achieve these skills, it is important for them to be taught in a variety of settings and under varying conditions before they make the transition to the community from school. Instruction needs to prepare individuals for successful employability within a specific area, as well as for effective social communication across many domains.

To prepare an individual with disabilities for the transition to the community, instruction should take place across multiple skill domains including, but not limited to, those requiring the skills stated above (Browder, 2001; Clees, 1996; Halpern, 1985). One reason for this is that individuals with moderate to severe disabilities can have difficulty in discriminating between relevant stimuli across different settings. Additional

difficulties arise when they are required to make multiple discriminations between stimuli in these different settings (Morse, Schuster, & Sandknop, 1996). One way to address this learning goal is to train individuals in the actual community setting, where all domains are present.

Issues in Community-based Instruction

Community-based instruction has been used by teachers and community service personnel to address the goal of preparing individuals to function for themselves when they transfer to the post-education world (Hughes & Agran, 1993). Community-based instruction is a method for teaching effective employability and living skills so individuals will function better within the community (Hughes & Agran, 1993; McDonnell et al., 1993). The effectiveness of community-based instruction is well documented (Branham, Collins, Schuster, & Kleinert, 1999; McDonnell et al., 1993; Snell & Browder, 1986). As its name suggests, community-based instruction occurs when individuals are taught skills, such as grocery shopping, laundry, or cooking, in the actual environment where they would be used, like a grocery store or a laundromat (Hughes & Agran, 1993).

Community-based instruction can be difficult to implement. Logistical issues such as transportation, cost, and scheduling may prevent teachers and students from venturing out in the community frequently enough for the instruction to be effective. In addition, removing students from school to go to a community setting contributes to their exclusion from the rest of their peers. Because of these issues, many teachers have attempted to simulate the actual community experience in their classrooms (Branham, et al., 1999; Wissick, Gardner, & Langone, 1999)

Generalization of learned skills to non-training settings (Stokes & Baer, 1977; Stokes & Osnes, 1989) is the underlying theoretical perspective that supports effective classroom instruction in preparing individuals to function in the community. Ultimately, the ability of students to perform in the community will be a result of their ability to

generalize skills learned in the classroom (Browder, 2001; Clees, 1996). The danger of substituting the in-community training of students with total classroom training is that the students may not have enough opportunity to generalize the skills taught in the classroom to the community (Snell & Browder, 1986).

Prior to research on using computers in the special education classroom, common methods of preparing students to enter the community included using simple items in the classroom, such as flashcards to simulate groceries (Aeschleman & Shladenhauffen, 1984) or a rearranged classroom to simulate a grocery store shopping experience (Branham et al., 1999). The use of video was also a popular alternative to taking students out into the community. Research had mainly focused on using video anchors to depict either a same age peer or another individual with intellectual disabilities performing the required tasks to complete a successful trip to the grocery store, including skills such as using aisle signs (Mechling, Gast, & Langone, 2002), locating items on the shelf (Haring, Kennedy, Adams, & Pitts-Conway, 1987), purchasing items, and entering and exiting the store (Alcantara, 1994).

The introduction of technology for teaching community-based functional skills has forced a change from earlier methods of technology integration, however. More recent studies have focused on the use of computers to facilitate the learning of community-based skills (Mechling, Gast, & Langone, 2002). These studies have employed computer programs for simple tasks-- using the computer as an interface to view video, for example--and for more complex ones, such as interactive programs which require students to select items from the computer screen to determine the proper order of steps necessary to perform a certain simulated skill in the community.

The next three sections address research that has been conducted to analyze the methods used to teach community-based skills. These methods include non-computer-based techniques, video utilization strategies, and computer-based approaches.

Non-computer Methods for Teaching Community Skills

Branham, Collins, Schuster and Kleinert (1999) conducted a study which investigated teaching community skills to three secondary students; these skills included cashing a check, crossing the street, and mailing a letter. The format of the instruction was broken down into three interventions: classroom simulation of the community (community-referenced instruction) combined with community-based instruction, videotape modeling in addition to community-based instruction, and classroom simulation, videotape modeling, and community-based instruction. The classroom in this study was altered to resemble a community setting as closely as possible while maintaining a low cost; typical school materials such as masking tape denoted entrances and other landmarks. The video training consisted of video peer models performing skills in the community, and the community-based instruction aspect consisted of the students performing the skills that were being taught in the actual target setting.

All three students used these three different techniques for separate skills so that each participant alternated using one technique for each of the skills. The results of the investigation showed that all three participants were able to generalize the skills with 100 percent accuracy when placed in a non-trained or novel community setting, a location they had not used in the community-based instruction aspect of the study. The condition that was most effective in terms of instructional time required was classroom simulation combined with community-based instruction. However, the method that was most effective in terms of instructional sessions required for criterion mastery was the technique which used all three instructional interventions: classroom, video modeling, and community. The investigators felt that the strength of their study was its suggestion that instruction can be generalized even when community-based instruction cannot be conducted on a daily basis. In other words, methods other than those using actual community settings could be effective.

Aeschleman and Shladenhauffen (1984) investigated a program to teach grocery skills to individuals with severe intellectual disabilities. They investigated three different conditions for teaching: verbal instruction with mnemonic training, role playing in the classroom, and role playing in the community—referred to in this study as *in vivo*. First, students were trained in mnemonics, symbolic representations of groceries that could serve as a grocery list. After receiving mnemonic training, students participated in role-play training where the classroom was arranged to resemble a small grocery store. During this study, the investigators altered the methods and removed the community-based training portion before students were taken to a novel setting because all students met the satisfactory criterion for successful shopping behaviors in the simulated classroom. When the participants were introduced to a novel grocery store setting, they were able to generalize the grocery skills successfully to that setting. The researchers concluded that in this particular study, the classroom role-play procedure in the simulated store was the most significant method for teaching the acquisition of shopping skills. They also noted that the effectiveness of the mnemonic training, though not as effective alone, possibly contributed to the success of the role-play scenario.

Bates, Cuvo, Miner, and Korabek (2001) conducted a study to determine the effectiveness of classroom simulations and community-based instruction for students categorized with mild and moderate intellectual disabilities. Participants were placed in one of two conditions: simulated plus community-based instruction or community-based instruction only. The community skills were grocery skills, laundry skills, restaurant skills, and janitorial skills. The implications of this study were intended to show that students with mild intellectual disabilities required less instruction using these techniques. However, an analysis of the data showed that the combination of simulated and community-based instruction was more effective than just simulated classroom instruction for students with moderate disabilities. The authors suggest that their methods of simulated instruction in the classroom may have been too abstract, and that other

methods of simulated classroom instruction, like those used in Branham et al., (1999) could be more effective.

Using Video to Teach Community Skills

As mentioned in Branham et al., (1999) above, video-based modeling has been used to demonstrate community-based skills to individuals in the classroom. This type of intervention has met with success in research studies conducted to evaluate it as a teaching technique (Alcantara, 1994; Haring et al., 1997; Kyhl, Alper, & Sinclair, 1999).

In order to assess generalization across multiple grocery store settings for three individuals with autism, Haring et al. (1987) conducted generalization training using community-based instruction and videotaped models of actors performing purchasing skills at three different grocery stores. In this study, the teachers first conducted community-based instruction with the students until they achieved 90 percent of the tasks required for purchasing an item. This was followed up with video modeling where the students viewed videotapes of similarly aged peers without disabilities demonstrating the correct behaviors in a grocery store. After the students viewed the video tape, it was found that two of the participants were able to demonstrate immediate improvement in their demonstrated responses in a novel community setting. The third participant demonstrated improvement after two weeks. This participant demonstrated greater ability to function in the community at the onset of the study, so the investigators modified their methods so that they did not play as active a role in accompanying him on his community-based outings, making a comparison to the other two participants difficult. Regardless, all three students were able to improve their generalization to all three novel stores as a result of the community-based and videotape training. The results of the Haring study suggest that using videotapes for modeling community-based behavior is a cost-effective method of teaching community-based skills by reducing the required number of trips into the community.

Alcantara (1994) played video clips of models in classroom-based simulation training and then subsequently used the same video clips in conjunction with community-based instruction to teach three students with moderate intellectual disabilities how to enter a store, locate an item, pay for it, and then exit the store. When the students were taken to the store that was modeled in the video, the teacher provided additional prompts to assist students who were not performing the skills correctly. Upon introduction to a store where there had been no prior instruction, all three students demonstrated an increased level of performance. The research showed that students who used both the video and in vivo instruction showed improvement of their performance and generalization to untrained settings.

Another example of the effective use of videotaped instruction was the research of Kyhl et al. (1999), who used videotaped instruction to teach three individuals with moderate intellectual disabilities selected grocery terms in order to allow them to better navigate the aisles in grocery stores. The investigator videotaped all of the words that were displayed on the overhead aisle signs at a grocery store and presented them on video in the classroom. All three students showed a significant increase in their ability to identify functional words after videotaped instruction took place. When students returned to the store after a five-month period (for a measurement known as maintenance) they were still able to demonstrate generalization to the community site. The investigators concluded that video tapes allowed the teacher to make more efficient use of her time with all the students in the class, thus reducing the amount of time that students needed to be in the community. The investigators also reported that their participants enjoyed watching the video tapes, even viewing them independently of the instruction sessions. They concluded that the students were motivated by the video tapes and were able to learn valuable functional skills while also engaging in an activity that they felt was enjoyable.

Computer-based Methods for Teaching Community Skills

This section reviews research that has investigated the use of computer-based methods for teaching individuals skills to function in the community. Typically, these computer-based applications simulate a small aspect of the community so that students can practice skills without actually having to venture out of the classroom. While there has been little research on the fundamentals of computer-based simulations in the special education classroom, there has been a significant amount of research addressing computer-based simulations in the traditional classroom. It is important for this review of literature to address the areas where the literature on simulations transcends the differences between the traditional and the special education classroom.

Simulations. A simulation is defined by Heinich et al. (2002) as an abstraction or a simplification of a real life situation or process. Alessi and Trollip (2001) define an educational simulation as a "model of some phenomenon or activity that users learn about through interaction with the simulation" (p. 128). In a computer-based educational simulation, learners can take advantage of the affordances provided by the advances of computer processing and practice a simulated activity without the costs or risks that would be involved in learning about the activity in real life. This is especially pertinent when addressing the use of simulations in special education.

Some popular forums for simulations in the traditional classroom are in the areas of the social and physical sciences (Berson, 1996; Weller, 1996). Simulations have also become popular in teaching interpersonal skills by facilitating role-playing situations in such areas as teacher education (Brown, 1999). The future of simulations is exciting when one considers advanced technologies such as artificial intelligence and virtual reality.

Research on simulations has also focused on areas such as hypothesis generation (Quinn & Alessi, 1994) and discovery learning (Swaak, van Joolingen, & de Jong, 1998). These investigations involve interventions where learners interact with a simulation in

order to learn about the underlying model upon which the simulation is based. In repeated iterations with the simulation, learners are able to manipulate the variables or characteristics of the activity to discover for themselves the implicit processes that control the activity or theory that is being simulated.

Another area of research in simulations is that of modeling. In these activities, learners build their own knowledge of an activity by creating their own simulations instead of viewing an existing simulation (Penner, 2001). Modeling tools such as STELLA (1985) give learners the opportunity to create their own simulations of phenomena. Subsequent reflection, evaluation, and discussion of these models, usually guided by a teacher, lead students to understand the underlying principles that affect certain phenomenon (e.g. the Laws of Motion) (Schecker, 1993).

Fidelity is an important concept in the design of simulations for use in both the traditional classroom and the special education classroom. Fidelity refers to how accurately a simulation resembles actual phenomenon being simulated (Alessi, 1988). One reason fidelity is an important consideration when designing simulations in special education is that lifelike computer situations will reduce the number of actual trips needed by special education students into the community (Branham et al., 1999).

It is likely that the research literature on simulations in the traditional and special education classrooms will converge as technologies such as virtual reality become more accessible to educators (Roblyer, 1999). Opportunities for research in these areas are vast.

Computer-based simulations in special education. While classroom role-play simulations and the use of video have been proven to be effective in teaching individuals with intellectual disabilities community-based skills, the use of computer-based interactive multimedia to teach community-based skills has also shown promise for the improvement of training in this area (Langone, Shade, Clees, & Day, 1999; Mechling & Gast, 2002; Mechling, Gast, & Langone, 2002; Mechling & Langone, 2000; Norman,

Collins, & Schuster, 2001; Wissick, Lloyd, & Kinzie, 1992). This method of instruction takes advantage of the affordances provided by advances in computing by allowing for the presentation of potentially limitless true-to-life exemplars for as many repetitions as necessary.

For example, interactive computer-controlled videodisc training was used by Wissick et al. (1992) to teach students how to locate and purchase snack items in a convenience store. A computer touchscreen presented photographic images of aisles where the items were displayed. The students were able to touch the screen to make discriminations based on store section and the item they were trying to locate during the simulated trip. The computer provided feedback to the students through video from the videodisc and from the computer. Results of the study showed that the older students who already had experience with community-based instruction demonstrated of improved skills after using the video and computer training, thus revealing the benefit of using community-based training in conjunction with a videodisc computer program. This study also addressed the computer's ability to assist in research as an efficient means of storing participant data.

In a study focusing on teaching individuals with severe intellectual disabilities to recognize photographs on an augmentative communication device, Mechling and Langone (2000) used a presentation program on the computer with embedded video models. Augmentative communication devices are typically small computers that enable individuals who are not able to communicate through normal speech to express a need or question. The photographs Mechling and Langone used were designed to provide these individuals with an iconic representation of an event, individual, or setting that they could use to communicate with other people. This study used three sets of video recordings for each of the two participants, and a computer program served as the interface for presenting the pictures and corresponding video anchors which represented the activity or object that each icon referenced. After using the computer-based video instruction, both

participants in the study were able to identify the photographs and were able to generalize iconic representations on their augmentative communication devices to express their need or desire for a particular object or activity. These findings suggest that the use of computer-presented video can assist individuals with severe disabilities in using augmentative devices when out in the community or at home to better communicate their wishes to other individuals.

In a study involving four individuals with moderate intellectual disabilities, Mechling, Gast and Langone (2002) used computer-based video instruction to generalize the reading of item names found on aisle signs and to locate items in aisles using a shopping list composed of photographs. A computer-based simulation was created and tested that used video representations of aisle signs and grocery items presented in such a way that to show a realistic view of an individual traversing an aisle in a grocery store and then zooming in on a specific grocery item contained in that aisle. The computer program served as an interface where participants could control what aisle they needed to proceed down in order to select a specific item on their shopping list. The researchers found that the computer-based video program was effective for the students to improve their generalization of reading aisle signs and locating items in novel settings. They also suggested that this type of instruction could be particularly effective as a companion to community-based instruction and as a means of providing multiple exemplars of items without requiring as many trips to an actual community setting.

In a related study, Mechling and Gast (2000) conducted research using a program designed to teach individuals with mild to moderate intellectual disabilities how to locate grocery items using aisle signs. The instructional materials used in this study expanded on those in the study by Mechling, Gast and Langone (2002) by also including text related to grocery items that were not contained in the text presented on aisle signs. This gave the students the opportunity to associate a word on their shopping list with a related word on an aisle sign, resulting in a simulation that better represented a real-life shopping

situation. When the students were observed at a novel grocery store that was not shown on the videotapes, all three students were able to match words on their grocery list to an associated word on an aisle sign depicting the items present in that aisle. The significance of this study was that participants could use aisle signs to locate items on their list, even though the aisle items were not identical to the items on their shopping list.

Langone, Clees, Shade and Day (1999) investigated the use of a computer-based multimedia program designed to assess the participants' ability to discriminate items on the shelf that matched those items that were on their shopping list. Again, the participants in this study were four individuals with moderate to severe intellectual disabilities. The use of the computer program allowed for the increased generalization of shopping skills for the participants, reinforcing the finding that multimedia instruction can be effective in teaching community-based skills to individuals with intellectual disabilities.

In most of the studies that were reviewed, video-tape modeling was found to be a time- and cost-effective way to teach individuals to generalize purchasing and shopping skills when placed in a novel community environment. The capabilities of computing, initially as a method of controlling video and currently in a capacity for displaying video within the program itself, holds great promise for instruction of the exceptional student. Nevertheless, studies have yet to be conducted on the value of combining digital video models with immersive and interactive multimedia activities to help students with special needs practice successful discrimination and identification skills. Indeed, very few of the affordances of multimedia instruction have yet to be researched with special populations.

Technology Integration

A review of the current literature addressing technology integration has shown that there are many issues affecting how technology is integrated into the classroom. Integrating technology into the classroom typically refers to the implementation of

computers and related software into the school curriculum. This section discusses the factors that affect such technology integration.

The first factor affecting integration is the simply the availability of technology that can be integrated into the classroom as a whole. The second factor involves the characteristics of teachers which determine the use or nonuse of computers in the classroom. The third and final factor addresses how teachers' beliefs about learning affect their use of computers in the classroom.

Availability

According to the research, lack of access to appropriate hardware and software for use in the classroom continues to be important. Access to computers is a critical aspect of their integration into the classroom, and teachers still feel they need to have more technology available for classroom use. In one needs assessment conducted in Idaho, it was found that teachers who were more likely to implement technology possessed more computers in their classroom than teachers who were less likely to implement technology (Mathews & Guarino, 2000). Also, a survey conducted among K-12 teachers in West Virginia and Virginia found that 67 percent of teachers surveyed used computers in their teaching; however, many of those who did not implement computers reported a lack of available technology (Jaber & Moore, 1994). Clark (2000) conducted a qualitative study to investigate teachers' perspectives on technology integration, and his findings suggested that teachers believed they needed more technology and that they wanted more computers and software for their classrooms. At the university level, Groves and Zemel (2000) surveyed university faculty and graduate assistants about their perceived barriers and needs for technology adoption and integration. Their participants asserted there was still a need for more accessible hardware and software, emphasizing that the software and media address specific subject matter.

These findings differ from published research that reveals instances where teachers may not be using available computers. These cases highlighted situations where

teachers were not making adequate use of computer resources even though hardware and software were available.

In a school where technology was considered to be abundant, Norton et al. (2000) found that mathematics teachers rarely used available hardware and software. Through interviewing, they found that the teachers' self-perceived lack of access to technology and lack of knowledge about appropriate mathematical software was one of the causes of their lack of technology use. Another factor that contributed to their lack of integration was how technology related to their beliefs about learning, an idea researched years earlier.

Marcinkiewicz (1994) studied teachers from four schools and found that about half of them were not using available computers. Marcinkiewicz's research suggested, like Norton et al. (2000), that there were many other factors that contributed to the lack of technology integration by teachers. While availability of technology is important, these findings suggest that there are many other factors that contribute to successful integration of technology by teachers.

As the ratio of students to computers continues to drop, the issue of availability is slowly dissipating (Bowman, 2001; Cuban, 2001). The United States Congress Office of Technology Assessment estimated that the number of computers in K-12 schools increased by 300,000 to 400,000 a year during the 1980's (OTA, 1995). The National Center for Education Statistics (NCES, 1998) indicated that between 1984 and 1996 the percentage of 4th, 8th, and 11th graders who reported using a computer at school at least once a week increased significantly.

While the number of computers clearly has grown, research about technology integration has turned to questions about computer usage rather than availability. While the importance of available computers is an obvious factor for successful technology integration, there has been a trend away from discussing how many computers are in a classroom towards how computers are actually used. Despite these trends, many studies continue to discuss how many computers there are, how many schools have internet

access, and how many classrooms have internet access. However, except for rural and poor areas, these issues are not at the forefront of school-based research in educational computing.

Teacher as the Cornerstone of Change

Many factors contribute to the successful integration of computers into the classroom. A recurring theme in the literature is the role of the teacher in enabling the continual use of technology. As the primary contact with the students and the designer of the instruction, the teacher is the gateway for any successful effort to integrate technology into teaching. Teachers are in charge of determining what happens in the classroom and how or what innovations are integrated (Bowman, 2001). An extensive survey conducted by Niederhauser and Stoddart (2001) suggests that the ultimate decision to integrate computers is made by the teacher. Efforts to promote the greater use of technology by teachers should account for the assimilation of computers into teachers' existing styles (Richardson, Anders, Tidwell, & Lloyd, 1991). In other words, for long-term success, integration needs to focus on the teacher, not the student (Rieber & Welliver, 1989).

Now that more computers are available and that research has shown that some teachers are still not using them, the question remains as to why this is so. One factor that contributes to teachers using the technology is their own ability to use computers. Teachers who report more competence with computers, who use computers more in their free time, and who have had training in computing are more likely to integrate them into their classroom.

Characteristics of Teachers That Affect Integration

The trend in research on the integration of technology in education has shifted from a discussion about the quantity of available computers and software to one of how the characteristics of teachers affect the integration of technology. Researchers now examine not only how computers are being used but also the factors that affect why teachers are using (or not using) them and whether the computers are being used

effectively. Lowther, Bassoppo-Moyo, & Morrison (1998) suggest that an educator who is technologically competent understands the relationship between technology and student learning. The authors emphasize the consideration of technology as a *learning* tool, not a teaching tool.

Teachers' technology ability and confidence. A strong predictor of whether teachers are making use of technology in the classroom is their own ability to use the technology as either assessed by them or reported by them. Many factors affect teachers' overall ability to use technology. Some predictors discussed in the literature include how often teachers use computers in their personal time and how (or if) teachers were trained to use computers. These factors can have an effect both on whether teachers will implement technological solutions to learning in their classroom and how successful that implementation will be. Teachers rated as having lower levels of ability in using computers had to expend more effort in planning technology use for their classes while teachers with greater ability were more able to easily infuse technology into their teaching (Pierson, 2001). As asserted in the research literature, the ability to more seamlessly adopt computers into their teaching style affects how much teachers will integrate technology.

Ability in using computers is linked to confidence when using them in the classroom. In a study investigating factors that contribute to teachers' use of technology, Van Braak (2001) used a scale that measured attitudes towards computers. He concluded that teachers' confidence in using computers was important in determining how they were used in the classroom. Also, when examining factors that predicted a teacher's use of available computers, Marcinkiewicz (1994) found that teachers' reported level of computer confidence played a role in whether they implemented them in the classroom.

Teachers' personal use of computers. The ability to use computers effectively is typically learned through training or personal exploration. One predictor of technology integration is whether teachers used technology in their personal time. Clark (2000)

found that the majority of teachers he surveyed were confident about using computers. All of them had access to computers in their classroom, and most of them had computers in their home. He concluded that much of their comfort with computers could be because they were using them outside of the classroom. In their survey of teachers, Sheingold and Hadley (1990) found that those who integrated technology often learned how to use computers on their own time and through their own effort.

Training teachers for technology. Training teachers to use technology is an important factor affecting a teacher's ability or decision to implement technology. Becker (1994) found that teachers who spent a lot of their personal time working with computers and who had extensive training in computers combined with a lot of teaching experience were more effective at using technology in the classroom (Becker, 1994). In a study by Yaghi (1996) addressing computers in schools, teachers and administrators were interviewed about their perceived role of computers in teaching. Both parties considered the training of teachers, especially prior to teaching, to be the most important factor for the success of incorporating computers into educational activities.

Training in applicable software is also important. Teachers participating in a qualitative study conducted by Norton et al. (2000) reported that the lack of knowledge about appropriate mathematical software was an important factor that limited their use of computers in their classrooms.

Due to the rise of technology integration in universities, students recently graduating from college are better equipped to incorporate technology into their teaching because of the technology training they received in their own education (Mathews & Guarino, 2000). The methods of how teachers are being trained to use technology vary. In a study of the factors that influence teachers' use of computers, Jaber and Moore (1999) focused on the type of training that influenced the ways that teachers implement computers in their teaching. They found that the majority of teachers who were surveyed reported that their peers taught them. The second highest reported method of training was

self-teaching. Ironically, those teachers who reported that they had not received training, but desired it, showed the least interest in receiving it by either of those two methods.

Teachers' levels of teaching experience. While experience and confidence with using computers is important to a teacher's ability to integrate them, the additional factor of overall teaching experience can contribute to usage of computers in the classroom. Becker (1994) concluded that a teacher's experience level was a contributing factor to the integration of computers into his or her teaching methods. In a needs assessment study, Mathews and Guarino (2000) discovered that teachers with more years of experience reported higher levels of computer usage. Ironically, those same teachers reported lower levels of computer literacy and competency. The investigators suggest that those teachers who reported higher levels of computer use in the classroom "knew how 'little' they know about computers and instructional technology compared to teachers who reported higher computer literacy skills and lower computer usage" (p. 390).

Teachers' willingness to change. Teachers who are considered to be innovators or to have a greater willingness to change are also more likely to integrate technology into their instruction (Marcinkiewicz, 1994; Van Braak, 2001). In a study investigating factors that contribute to teachers' use of technology, Van Braak (2001) combined scales that measured attitudes towards computers, feelings about computers in education, and individual technological innovativeness. He found that technological innovativeness was a strong predictor of whether a teacher used computers in class. In a similar measure, Marcinkiewicz (1994) found that when he assessed computer use among teachers who had technology present, innovativeness or "willingness to change" was a factor that predicted a teacher's use of computers in the classroom.

Teachers' beliefs about learning and technology

Teachers' epistemological beliefs and their considerations of how learning takes place play a strong role in how they ultimately decide to implement technology (Norton et al., 2000; Pierson, 2001). Norton et al. (2000) interviewed and observed five teachers

and found that only one of the five wanted technology to play a greater role in the classroom. Out of the five teachers, she was also the only one who believed that technology could have any benefit for student learning and achievement. In another study, Yaghi (1996) set out to determine how the roles of computers are perceived by teachers and administrators in schools, and how they use them. He found that teachers who believed that technology assists in instruction also wanted more technology integration and related training. The results of the study conducted by Clark (2000) indicated that teachers believe that technology is a key component in educating their students. It was discovered that the techniques that the teachers used to integrate technology into the classroom were aligned with their individual definition of technology (Pierson, 2001).

Teachers' use of technology according to subject matter. There is a relationship between the use of technology in a classroom and a teacher's use of technology to teach a specific subject. The use of technology in a technology-related class seems to be implicit for what would be an effective class. Van Braak (2001) reported that teachers were more likely to use technology in a technology-related class. Yaghi (1996) reported that teachers were more likely to want to use computers in classes involving graphic arts, math, and sciences. In addition, he found that teachers who taught technology classes still expressed their need for a more clearly defined computer education curriculum for both themselves and for teachers who were responsible for the traditional subject matter classes. Conversely, teachers who taught a specific subject matter first considered their curriculum before making decisions on how to integrate computing into their teaching.

Teachers' views on student motivation and technology. Student motivation can be a factor for teachers wanting to use computers in their classes. Students have repeatedly shown that they are motivated to use computers in the classroom (Clark, 2000). Also, teachers consider computers to be excellent tools for motivating students to learn (Yaghi, 1996). When interviewed, some teachers claim to use it to maintain their students'

motivation (Berg, Benz, Lasley, & Raisch, 1998), which may not be the most appropriate reason to use technology in the classroom.

Technology and teachers' epistemological beliefs. There has been continuing research to explore the relationship between the use of computers in the classroom and the epistemological beliefs of teachers. This research has attempted to show the connection between teachers' beliefs about how students learn and what types of technology are used in their classrooms. Becker found that teachers who use technology effectively use more student-centered learning activities. These teachers view computers more in terms of what they can do for the student rather than what the student does with them (Becker, 1994). Many studies conducted since then seem to support this relationship.

Berg et al. (1998) conducted a study with the goal of constructing a profile of teachers who demonstrate exemplary use of technology in their teaching. The researchers were concerned with how computers were used by the teachers who implemented technology most successfully. They found that "exemplary technology-using teachers are using technology in their classrooms in ways that are overwhelmingly constructivistic" (p. 120). Students in these classrooms were using programs like multimedia authoring systems and problem-solving applications. The research determined that the exemplary teachers used technology in their instructional planning to allow students to learn in constructivist ways.

In a study of forty-seven teachers who participated in a questionnaire, an interview, and whose classroom practices were observed, Dexter, Anderson, & Becker (1999) found that thirty-two of the teachers could be categorized as constructivist. Thirty-one of these teachers used computers in class with their students. Of these teachers, twenty-five reported that they valued more constructivistic technology use in the classroom like research with digital information sources and multimedia authoring tools. Five of the teachers considered instructional software like drill and practice games to be

the dominant type of computer software used in the classroom. The researchers concluded that most of the constructivist teachers utilized more student-centered activities that successfully integrated technology.

These findings are supported by the work of Niederhauser and Stoddart (2001), who argue that constructivist-oriented computer technology by itself does not have an epistemological orientation. To investigate the relationships between teachers' perspectives on learning and their use of technology, they surveyed over a thousand teachers on their perspectives about the effective use of technology and software, separating the teachers into those who were considered to be more learner-centered (they considered technology as a means to support learning) and those who were less learner-centered (they considered technology as something that should be used to teach). In essence, the research found a consistent relationship between learner-centered teachers' use of open-ended learning tools, and non learner-centered teachers' use of skill-based software applications. The researchers also emphasized the importance of considering teachers' beliefs when integrating a technology solution into the classroom. Overall, the investigation concluded that teachers tended to select software that is consistent with their epistemological perspectives. Presenting an appropriate type of software may not facilitate its integration if it does not agree with the particular epistemological perspective of the teacher.

Norton et al. (2000) studied this relationship by interviewing five mathematics teachers at a school who consistently failed to make use of technology even though it was highly available and accessible. Four out of the five teachers considered computers to be a distraction to learning. These four teachers believed in a teacher-transmission model of instruction. The fifth teacher, who subscribed to a more student-centered learning model, did not use technology, but this was because of her lack of experience. When interviewed, she said that she believed that technology could be a benefit in the classroom. While not

an expansive study, this investigation shows a possible link between a teacher's beliefs about learning and technology integration.

Recommendations from the Research

The results of the studies discussed in this section offer many recommendations to facilitate the successful integration of technology into schools. The first is that teachers should be exposed to examples of good computer practice during in-service training (Van Braak, 2001). The second is that teachers, and the education community as a whole, should look beyond the acquisition of technology and focus their efforts on creating environments that are more instrumental to the further development of a more effective pedagogy for technology integration (Pierson, 2001). A third recommendation is advocates the need for leadership to spearhead the charge to integrate technology. Those individuals who lead reform should have status and support (Norton et al., 2000). Finally, teachers should integrate only the most effective and necessary computing resources (Liu, Macmillan, & Timmons, 1998).

Teachers are the gateway to change when integrating technology into the classroom; therefore, they should be empowered by being included in the decision-making process. This increases their likelihood of being amenable to training and of being (at least partially) committed to using computers (Bowman, 2001). For diffusion of technology to be successful in education, the teachers who are implementing technology should be provided with extended and continuous support and training (Bowman, 2001).

Chapter Summary

This review of research has dealt with many topics relevant to the integration of innovative and interactive multimedia in the special education classroom. Community-based instruction is important for preparing individuals for the transition to more independent living. However, removing students from the classroom to go into the community presents logistical problems as well as expense in terms of money and time. The effectiveness of classroom simulations has been researched by looking at various

methods, including role-play, video modeling, and more recently computer-based simulations of the community. Computer-based simulations hold great potential for this type of learning; however, the capabilities of the computer need to be thoroughly researched in order to take advantage of their potential.

Integrating computers into the regular classroom has also been a popular topic of educational researchers. A primary factor affecting the successful integration of technology revolves around the availability of technology. In addition, teachers have been shown to be a catalyst or gatekeeper for computer integration into the classroom, and therefore their technological abilities and experience are important areas to explore in determining success in integrating technology. Also, teachers' beliefs about technology in education, as well as their philosophical beliefs about teaching, are growing concerns in research investigating technology integration in the classroom.

A great deal of research literature addresses technology integration and a growing amount of research focuses on using computers in the special education classroom; however, specific research focused around integrating technological interventions into the special education classroom presents a gap in the research (Edyburn, 2001) that this study will address.

CHAPTER 3

METHODOLOGY

The purpose purpose of this study was to explore the integration of the videos and interactive multimedia software developed for Project Shop into the existing curriculum of special education teachers.

This research had two main goals: The first was to generate findings to contribute to the existing literature on implementing computer-based training applications for teaching community-based skills to individuals with moderate to severe intellectual disabilities. The second goal was to uncover specific patterns of use of the Project Shop materials by teachers (both successful and unsuccessful) and if possible, address these patterns in the design and development of the software and videotapes.

The guiding research question for this study was as follows: How is interactive multimedia integrated into special education classrooms by special education teachers? These five subquestions were designed to guide this study:

- How well aligned are goals and design of the training materials to existing practice?
- What are the patterns of use by special education teachers as they integrate the materials into their curriculum?
- How do those patterns of use of the materials by the special education teachers relate to existing research on technology integration?
- Can those patterns of use that emerge form principles or guidelines for technology use in community-based instruction?
- Do these materials change the way special education teachers teach?

Research Design

Design-Based Research Methods

The multimedia materials that were used in this study were continually revised over the course of the study. Likewise, the approach to their integration into the special education classrooms evolved during the study. My role in the study was a combination of participant, educator, designer, and researcher. For these reasons, a design experiment approach, one that allows the research to be conducted within the environment where the learning materials will be integrated and implemented, was used (Brown, 1992). This approach contrasts with traditional research that would take place, at least historically, in a controlled laboratory or clinical setting, similar to a qualitative study. Although this study was based almost exclusively on qualitative data, the research, as a design experiment, was concerned with identifying a process and improving an innovation into the classroom.

Brown (1992) and Collins' (1992) work has continued to inspire discussion in literature advocating design experiments as an educational research method. They introduced the idea that adopting research methods from the fields of product design and engineering into the area of educational research would improve educational practice and student learning outcomes. In using these adopted methods, the investigator's aim is to introduce an innovation, study its implementation, and revise the innovation and its implementation as necessary while at the same time documenting the design story and theorizing about its implementation. Cobb, Confrey, diSessa, Lehrer, & Schauble (2003) purported that the purpose of a design experiment is to develop theories about the process of learning and the means that are designed to support that process. In fact, according to Cobb et al., (2003) the "intimate relationship between the development of theory and the improvement of instructional design for bringing about new forms of learning is a hallmark of the design experiment methodology" (p. 13).

Although use of methodology of design experiments is increasing and published examples are beginning to appear in literature (Cobb, 2000; Herrington & Oliver, 1999), finding these published studies can be difficult (Reeves, 2000). In addition, it is also very hard to identify specific methodological guidelines about how a design experiment should be conducted (one notable exception is Bannan-Ritland, 2003).

The Design-Based Research Collective (2003) reports that no one correct method exists for conducting design-based research. According to some critics in the field, the literature has yielded no agreement on the terminology or on the requirements of this type of research design (see Shavelson, Phillips, Towne, & Feuer, 2003). Consequently, the methods that should be used in design experiments are those that establish a connection between educational intervention and the successful outcomes of its practical use.

Unlike experimental research, the purpose of design experiments is to study the innovation in the actual environment or context in which it is intended to be used (such as with actual students and actual practitioners in real world learning environments). Also, unlike traditional research objectives, the goal of design experiments is to study an innovation while also purposely and iteratively revising the innovation based on data gained in the field. Finally, design experiments go beyond mere formative evaluation; the expectation in a design experiment is to create and test theories. With these goals in mind, the investigator's role in a design experiment proves to be difficult because he or she may have to criticize the very innovation that is being introduced (DBRC, 2003). It is also possible for an individual or group who has planned, designed, created, and implemented a new educational innovation to have a conflict of interest with the level of success achieved from the investigation.

According to Cobb et al. (2003), educational design experiments are intended to construct theories about processes of learning and also about the means that support that learning. The characteristics of design-based research include "…thick descriptive data sets, systematic analysis of data with carefully defined measures, and consensus building

within the field around interpretations of data" (DBRC, 2003, p. 7). Out of the five categories of design-based research presented by Cobb et al. (2003), this study would be classified as a one-on-one (teacher-experimenter and student) design experiment. In this type of experiment, the researcher or the research team engage in repeated instructional sessions with a small number of students. The goal is to create a small version of a learning environment that can be studied in-depth.

The design experiment conducted here primarily used qualitative methods (Merriam, 1998) to collect and analyze data. Qualitative research methods were suitable because this study was concerned with a deep exploration of the processes surrounding the integration of Project Shop materials (Savenye & Robinson, 1996). Also, since one of the goals of the investigation was developmental in nature, it was important that the activities taking place during the study were not constrained by strict conditions and were allowed to remain flexible. The use of methods traditionally associated with qualitative design allow for this flexibility (Merriam, 1998; Patton, 1990). However, a small amount of quantitative data was collected within the context of the design experiment. The technical features of the Project Shop CD-ROM allowed for the recording of archival data of both student information and their progress throughout the CD-ROM, as well as their achievement levels on the simulated activities. These data were collected and analyzed both as archival data for use by the teacher and as quantitative data for use in this research.

An insider's perspective was achieved through fieldwork, where data were collected through observations and interviews in settings familiar to the participants. Tracking data that was generated by the computer-based materials was also explored to uncover any trends in use of the software. As the researcher, I was the primary source for data collection and analysis in this investigation. The analysis followed an inductive approach; the interviews and observations were reviewed in order to find common themes as data collection progressed.

Research Settings

This research was conducted in school districts from two counties in northeast Georgia. Arrangements were made with the special education coordinators of these counties to implement the Project Shop materials in middle school and high school classrooms. The specific setting where the implementation and research took place was primarily the special education classroom. As the need arose, however, the research setting expanded to the community location depicted in the instruction--a community grocery store. The initial methodology also called for work in the homes of the students using the Project Shop materials in collaboration with their parents if necessary;, however, that alternative was not needed.

Special Education Classrooms

Mrs. Truman's Classroom. The classrooms that were used were already providing instruction in the special education curriculum. Mrs. Truman's classroom was actually two rooms that were joined via an open doorway in the wall. In the larger of the two rooms, there was a kitchen, washer and dryer and a bathroom. There were also two separate tables in there for the students to work on any classroom activities. The videotape materials were viewed in this room, as it was larger and better able to accommodate all the students and their chairs. The television had to be obtained from another room.

The second, smaller room, contained individual student desks where students kept their personal items. Next to the student desks, a table held the computer that was used for the Project Shop materials. At an additional, nearby table, students and teachers or paraprofessionals were able to work on activities together. Other than when the videotape was used, all of the observations, including classroom, computer, and the majority of the interviews of Mrs. Truman and her paraprofessionals, took place in this classroom.

There were from six to nine students in Mrs. Truman's classroom at any given time during the study. Those students who participated in the study were present for the

entire duration. Responsibility for the students was divided between Mrs. Truman and the two paraprofessionals who were always present. Mrs. Truman directed the paraprofessionals to work with students depending on the instructional goals. A typical day in the classroom could have Mrs. Truman working with two students at an activity at a table in one of the classrooms while one paraprofessional facilitated a student using the Project Shop Materials. In addition, the other paraprofessional could be escorting a student who was participating in a physical education class with traditional students. It was not uncommon for students, Mrs. Truman and the two paraprofessionals to be leaving and returning to the classroom at various times during the day to either attend other classes, perform vocational skills in the school(such as working in the cafeteria), or to leave the school for community-based instruction.

Many of the students had been in Mrs. Truman's classroom for a number of years, which is typical in Special Education. Her students remain in her classroom in the middle school until they are old enough or have progressed enough in their studies to "graduate" to the high school. It is not uncommon for students of "high school age" to still be present in a middle school special education classroom.

Mrs. West's Classroom. Mrs. West had one room where she conducted class. Her classroom contained a kitchen and a bathroom. There were two tables where students could work on activities either by themselves or with a paraprofessional. One of these tables was in a U-shape so that a teacher or paraprofessional could sit inside the "U" and work with multiple students at the same time. A TV mounted on the wall with a VCR was available to show videotapes, and the computer station was placed against the wall on the side of the classroom. The classroom included special accommodations for students with special needs, including a cot that could be disassembled and a reclining chair.

Like the students in Mrs. Truman's classroom, many of the students in Mrs. West's classroom were older than a typical high school student. When the study first

started there were eight students in her class. When the study was completed, there was one additional student into her classroom. In addition, many of Mrs. West's students had been in the classroom for multiple years, some had even been there prior to Mrs. West, who was in her second year of teaching.

The day-to-day structure of Mrs. West's classroom was slightly different than Mrs. Truman's. Mrs. West's classroom went into the community four days a week and the entire class — students, Mrs. West, two paraprofessionals and a student intern — go together into the community. When they were in the school, the class functioned in a very similar fashion to Mrs. Truman's class, where students, accompanied in some cases by paraprofessionals, would leave to participate in other classes or to participate in vocational activities.

Community-Based Settings

A primary goal of the instructional materials was to prepare students to generalize shopping skills across multiple grocery store settings; therefore, the researcher made observations of students and teachers in two grocery stores used as training sites. The first grocery store, used by Mrs. Truman, was BI-LO, a smaller grocery store with a friendly community feel. Many of the students who received instruction and practiced shopping skills in that store knew the employees and interacted with them by name. The second store, Kroger, used by Mrs. West, was a much larger, more modern grocery store. The stores varied in franchise and layout, but these differences did not pose any significant barriers to the integration of the Project Shop materials.

Participants

Three categories of participants took part in this study. The first consisted of special education teachers who were implementing the Project Shop training materials in their classrooms. The second category consisted of individual students with moderate to severe intellectual disabilities in middle school or high school special education programs. The final participant category was composed of other individuals who

assumed an instructional role with the students in the special education classes. Examples included paraprofessionals and regular education students who volunteered to work with the special education students.

Participant Selection Criteria

Participants from this study came from two of the counties that participated as part the U.S. Department of Education grant that funded the original development of the Project Shop materials. The teachers, paraprofessionals, students, and their parents or guardians from these counties were the original pool of participants. (No parents, however, were contacted directly to collect data for this investigation, as noted above). From this pool, purposeful sampling was used to select participants to provide a rich source of data for analysis (Patton, 1990). An additional criterion for selection was the ability of the individuals to appropriately interact with the Project Shop materials; no participants were selected who had physical disabilities that would prevent them from using the computer software. Initial discussions with participating teachers determined which students would serve as users of the Project Shop materials and participate in the research. In the first classroom, four students were selected who could interact with materials. In the second classroom, the teacher identified one individual as appropriate to handle the learning materials, with the potential of possible others. After selecting the candidates, the students and their parents were approached by the participating teachers about the study. The study was explained to them, and they were asked to sign the provided consent forms. Those teachers and students whose parents signed the consent forms formed the pool of participants. The names of all teachers, students, and paraprofessionals were changed to pseudonyms in the following chapters.

Instructional Materials

The goal of Project Shop is to provide training materials that will better enable individuals with moderate to severe intellectual disabilities to develop generalized community-based shopping skills and employability skills. The Project Shop materials

consist of three ten-minute videos on one videotape, an interactive CD-ROM, and instructional print materials which were developed and revised over the course of this research study.

Videos

The video materials of Project Shop consist of three highly engaging ten-minute videos that were written and produced by both the Project Shop staff and ASV, Inc., a professional video company based in Atlanta, Georgia. These videos tell the stories of two pairs of roommates who embark on a journey to the grocery store. One roommate from each pair has an intellectual disability, yet demonstrates the proper skills for shopping and working at a grocery store, serving as the guiding character to the other "normal" roommate. Shopping skills include making a list, looking for items on the shelf, and paying for groceries. Examples of the employability skills include stocking shelves and bagging groceries. The videotapes also feature Shopper Bob, a "wizard in training," who is the narrator for the videos and an invisible mentor to the four shoppers. The roommates without disabilities provide comedic elements as they continuously fumble and need guidance because the Project Shop staff felt it was important to have the characters with disabilities take on the role of mentors in order to avoid pejorative portrayals and to provide good role models for disabled students watching the videos. The three videos were designed to be used by themselves or in conjunction with the interactive multimedia produced on CD-ROM and the instructional print materials.

Interactive Multimedia

Interactive multimedia, produced on a CD-ROM, offers more intensive instruction than the videotapes by using digital video and animated models, time delay, and corrective feedback. Many of the skills modeled on the three ten-minute videos are also portrayed as video anchors on the CD-ROM. The interactive CD-ROM provides students with a virtual shopping trip complete with learning activities and practice exercises on the skills needed to shop in a real grocery store. For example, Figure 1 illustrates one activity

where the user needs to find a particular grocery store item by matching an item on the shelf to a picture of the item on a shopping list. Figure 2 illustrates an activity where the learner practices paying for his or her groceries.

Figure 1. Match to Sample Activity

The CD-ROM is also designed as a stand-alone product, but it closely mirrors the videotape episodes and includes digital video "thumbnails" of skills portrayed on the videotape. Several actors in the video thumbnails are individuals with intellectual disabilities who were cast in the roles in order to provide a more accurate representation of an individual performing the skills. A cartoon version of Shopper Bob acts as the guide and coach, providing users with demonstrations, assistance, and corrective feedback. The CD-ROM is designed in a storybook format, similar to that of a Living Book (1992). The simulated activities are embedded in a short story of a grocery store shopping trip, along with an additional storyline related to working in a grocery store.

Figure 2. Dollar Plus Activity.

The story is divided into twelve pages. Most of the pages have portals to highly interactive activities practicing the following skills:

- creating a grocery store list
- locating items on a grocery store shelf
- maneuvering a shopping cart properly
- identifying the appropriate check-out lane
- paying for groceries using the "dollar plus" method
- stocking shelves and bagging groceries.

Embedded in the activities are social communication (asking employees for help), literacy (discriminating product labels and store signs), and safety skills (avoiding spills). Each of the activities uses “instructional best practices” identified in the literature such as task analysis, modeling, and corrective feedback.

The interactive activities offer students unlimited opportunities for practice. Each one begins with a demonstration of a particular skill and then prompts the student to practice, with the activity’s difficulty level adjusting based on the student's performance. Task difficulty increases for students who are performing well, and task difficulty decreases if students make repeated errors. Management features are also included in the CD-ROM to store and track student data.

Print Materials

The print materials consist of a teacher guide that explains how to use and integrate the Project Shop materials in a special education classroom. The first section of the document describes technical issues pertaining to the CD-ROM, including how the program collects data on users and where that data will be stored. The second section describes the pedagogy of the materials and their suggested use in the classroom. During the course of the research, teachers, facilitators, and students provided the source of data that was used to develop this Teacher’s Guide. (A copy of the Teacher’s Guide can be found in Appendix C.)

Data Sources

This study gathered data through three primary sources: observations, interviews, and artifact analysis. Usability studies were conducted on two of the activities in the Project Shop materials before this study began to determine how well students could interact with the software. In this study, however, usability studies were not conducted. The goal of data collection was to develop one or more implementation profiles of how the Project Shop materials could be used successfully in the intended classrooms with teachers with different teaching styles and philosophies.

Observations

Observations were made while the students interacted with the materials, both alone and with their teachers. As additional users of the materials, the teachers were also observed. Prior to the onset of the investigation, teachers were considered to be users because it was projected that many students would require the teacher to guide them when using the software. This prediction proved correct for most student use.

The Project Shop materials created digital artifacts about each student, and a portion of the research was dedicated to observing how teachers made use or non-use of these artifacts. The artifacts will be described in the artifact analysis section in this chapter.

A goal of the Project Shop materials was to affect student learning and the transfer of learning to the community; therefore, students and teachers were observed as they practiced the skills taught in the instructional materials in the community. When in the community, I tried to remain as unobtrusive as possible--not serving an instructional role--so as to minimize any effect on what I observed. However, the situation in the community went more smoothly when I served more as a participant-observer. For example, the paraprofessionals in Mrs. Truman's class were not able to accompany her into the community as they were needed in the classroom to work with students who were not able to venture out into the community due to special conditions. In this situation, I

adopted the role of an assistant to Mrs. Truman and helped the students navigate through the store and locate items. When the group was divided, I took responsibility for one or two students as they navigated the store. I used my experience working with students with exceptional needs to ensure that the instructional experience that they received with me was valid. Also, I made sure that the instructional techniques that I practiced with the students were the same that were used by Mrs. Truman.

Copious field notes were taken during the observations. They were used as source data and served as a springboard for further development of areas of investigation within the research.

Interviews

Interviews were another primary source of data for this investigation. Both semi-structured and informal interviews (Merriam, 1998) were used to collect data from the various participants. According to Merriam, a semi-structured interview is one where the interviewer combines a set interview protocol with open-ended questions that allow for an exploratory approach for collecting data. An informal interview also uses open-ended questions, but is more conversational in nature. Both forms of interview were used at different times in this research as outlined in the procedures section. Anecdotal evidence that arose during the course of the investigation also dictated how both types of interviews were used. (A sample interview protocol is included in Appendix A.) Questions, both structured and open-ended, were intended to serve as the guide for the research. Interviews were not limited to those questions contained in the interview protocol, but that protocol was used as a foundation for other lines of questioning.

Archival Data

The interactive CD-ROM was developed with the capability of recording user actions and responses while they interacted with it. These actions are recorded as text files on the computer's hard drive and are organized by individual user name. The files include detailed information about the user's interactions with the activity portion of the

CD-ROM and serve as an additional source of data. These data are stored in an Excel spreadsheet and contain the following information: user's name, date, time, length of time spent on the activity, the difficulty level achieved in that activity, the stimulus presented in the activity, and the user response to that stimulus. These files were also analyzed for to detect if consistent trends arose after repeated use of the activities.

Triangulation

In order to provide for triangulation of the data collected in this study (see Patton, 1990), I made use of multiple data sources and methods. Table 1 outlines the major research questions and the data sources used in this study to answer them.

Table 1. Research questions and data sources

Research Questions	Data Sources
How well aligned are goals and design of the training materials to existing practice?	Observation Interviews
What are the patterns of use by special education teachers as they integrate the materials into their curriculum?	Observation Interviews Archival Data
How do those patterns of use of the materials by the special education teachers relate to existing research on technology integration?	Observations Interviews
Can those patterns of use that emerge form principles or guidelines for technology use in community-based instruction?	Observations Interviews
Do these materials change the way Special Education teachers teach?	Interviews

Role of the Investigator

In this study, I served as much more than an observer since I was heavily immersed in many aspects of classroom activities. I played a small role in the instruction of students in the community, but no direct role in student instruction in the classroom. In the classroom, I was available for questions and provided guidance throughout the course of the study, primarily to paraprofessionals and students.

As one of the programmers of the Project Shop materials, I also played a development role and was responsible for the modifications and new features of the Project Shop computer-based materials.

Data Analysis

This study was designed to be flexible and used an analytic approach known as constant comparative analysis (Strauss & Corbin, 1994). In this method, data collected gradually evolves into emerging themes that can guide data collection throughout the remainder of the process (Merriam, 1998). In addition, an open coding (Merriam, 1998) format was used to place subcategories within those existing themes. Field notes and interviews were reviewed daily. At the end of each day of observations or interviews, all notes and interview transcriptions, along with any other artifacts or collected data, were arranged in order by time and location in journal format. By thoroughly and repeatedly reviewing all of the data that had been collected, potential trends or themes became evident. Using this method, the interview protocol and observations were modified over the course of the investigation to address themes that had emerged from prior interviews and observations. These findings were then identified and categorized to guide possible improvements to the materials. These categories were maintained and adjusted as the developments and modifications of the material occurred.

Procedures

The procedures were organized into five phases:

- Phase 1: Completion of the Project Shop Materials, and Initial Interviews
- Phase 2: Introduction to the Project Shop Materials
- Phase 3: Use of the Project Shop Materials
- Phase 4: Modification of the Project Shop Materials
- Phase 5: Final Interviews and Follow-Up

Because the research activities that took place in each phase often overlapped, the phases are delineated to allow for better categorization of the findings. Data collection

took place across all five phases based on observations, interviews, and artifact analysis. The research occurred across different community settings. A model of the study and how the data was collected is depicted in Figure 3 below.

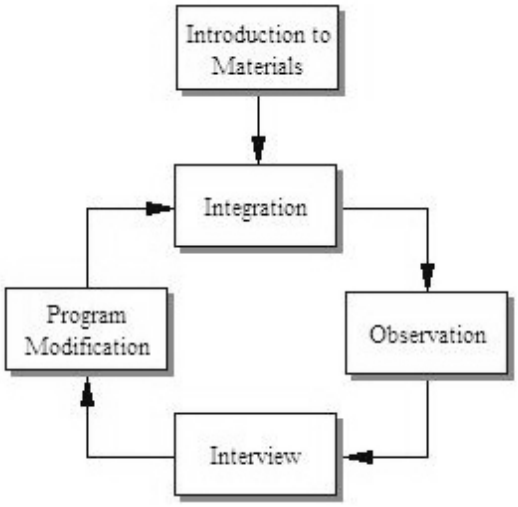

Figure 3. Data collection process. After introduction of the materials to the teachers, there were integrated in the classroom. Iterative cycles of observation, interview, modification and reintegration followed.

Throughout the course of this study, taped interviews and observation notes were transcribed as soon as possible after these data were collected. The transcripts were analyzed in accordance to the constant comparative analysis procedure. Some trends or anecdotal evidence not noted during the course of the data collection arose in the analysis sessions. These trends and their subsequent reintegration supported the theory-building process inherent to a design experiment. Questions and ideas that supported or explained

the theories being generated were integrated into the interviews or observations as additional observation prompts or interview questions.

Phase 1: Completion of Project Shop Materials, and Initial Interviews

Completion of the Project Shop materials. This research study was based on how well the Project Shop materials could be implemented into the special education classroom. Therefore, it was important that the materials be sufficiently developed before their introduction into the classroom. Because the intent was to complete and revise the CD-ROM materials during the study, the materials were left slightly incomplete to allow for possible modifications during their integration into the classroom. Revisions to the CD-ROM materials proved to be an important area of data for this study. The videotape portion had been entirely completed.

For clarification, prior to the onset of the study, the interactive CD-ROM was 90% complete, and had not yet been satisfactorily tested to the extent that its use in the classroom would be free from problems or malfunctions. Over the course of the study, the CD-ROM was completed and through rigorous use by the participants in the study, it was tested thoroughly. Currently, the impact of any remaining malfunctions or incompatibilities is negligible.

Also, at the outset of the study, the Teacher's Guide for the Project Shop materials did not exist. One of the tertiary goals of this research was to present findings that allowed for the completion of an effective teacher's guide. At the conclusion of the study, a basic guide was created with input from data collected through observation and interviews. Modifications and additions to the Project Shop materials that took place over the course of many iterations of the program into the classroom were also included in this guide (see Appendix C).

Initial Interviews. To develop an idea of how teachers had integrated technology into the classroom *before* the study and to find their general views on technology and its integration, teachers were interviewed before the formal introduction of the Project Shop

materials into their classrooms. After those interviews were completed and any follow-up questions had been answered, they were introduced to the Project Shop materials. The teachers and I went through all of the features of the CD-ROM materials together. They were given the videotape to view on their own.

Phase 2: Introduction of the Project Shop Materials

Phase 2 began with the teachers' introduction to the materials. I worked with them to install the materials onto their classroom computers. Subsequently, each teacher was given the opportunity to use the materials at his or her discretion whether I was present or not.

Phase 3: Use of the Project Shop Materials

Throughout the course of this phase, I was available whenever possible to observe how the teachers were implementing the materials and how the teachers and students were using them. If questions arose that needed clarification, informal interviews were conducted either on the-spot or shortly thereafter. During this phase of the study, teachers developed patterns in how they used the Project Shop materials.

While the planning this study, the possibility was considered that the materials might have a greater impact when the students used them with their parents or guardians outside of the classroom. However, the teachers didn't consider it practical to monitor the students' home use of the materials, so that observation context was never utilized in this study.

Phase 4: Modification of the Project Shop Materials

During Phase 4, in keeping with the intent of the design experiment process, the Project Shop materials on CD-ROM remained flexible in their design and implementation. In addition to correcting any malfunctions with the program that occurred, many modifications to the program were made. These changes were suggested by the participants and by my own initiative as I observed the students' and teachers' interaction with the materials. The changes were iterative and many areas were modified

more than once, until the teachers were satisfied with the end result or a better solution was discovered.

Other areas of the materials did not lend themselves to drastic or repeated changes. For example, changes to the audio, graphics, and video components would have required significant time and expense and were not considered an option for direct modification. However, several of these suggestions for changes that were not practical at the time are described in chapter 5. All changes that were made were noted and served as observations of the work done and, where applicable, as artifacts to be analyzed.

Phase 5: Final Interviews and Follow-Up

Although the predicted estimate for the duration of time required for this study's data collection was approximately two months, the process actually took about three months. The investigation concluded when there were no more practical changes to be made to the materials and the data that were being collected became redundant, resulting in data saturation. A few follow-up sessions with the teachers after the end of the investigation were held to clear up any areas of confusion and to fill in areas of incomplete data during the final session of data analysis.

Investigator Subjectivity

The nature of a design experiment places the investigator in the potentially conflicting roles of innovator and critic. Consequently, in this design experiment it is important to note how much time and effort I had devoted to the creation of the materials that served as the basis of this study prior to the course of the investigation:

- Project Coordinator/Manager of the entire DOE grant
- Co-designer of the CD-ROM
- Co-developer of the CD-ROM
- Co-writer of the scripts for the embedded video anchors
- Director of the filming of the video anchors

While I clearly had an invested interest in the successful implementation of these materials, I believe I was able to maintain an objective view of the findings of this study. As a researcher, my interest lay in the successful instruction of individuals with intellectual disabilities to function in the community. Keeping accurate records and findings to achieve this ultimate goal held more value to me than proving the effectiveness of the materials that had been created. The choice of using a design experiment approach to this study, where the materials could be modified and improved en route, represented a means to satisfy both my desire to achieve the short term goal of the successful implementation of the Project Shop materials, and the ultimate goal of helping community-based instruction curriculums by contributing to the scholarship in this area.

During the design and development of the Project Shop materials, many teachers of special education classrooms were consulted for advice about various aspects of the content. The enthusiasm of the teachers who assisted in the development of the materials and of those teachers who agreed to participate in this study prior to the investigation should be noted.

I have little expertise in the instructional theories surrounding special education. I am also not well-versed in the capabilities of exceptional learners. However, I have been designing and developing computer-based instruction for over ten years and believe that it can help learners of all abilities to achieve specific instructional goals. I do not believe this bias affected this study to any great extent, as student achievement was not measured.

In my capacity as a graduate student in instructional technology I have researched numerous learning theories and epistemologies. Despite this wealth of information, I am still not sure how to apply what I have learned to the classroom of the exceptional learner. With this in mind, I have done my best to evaluate the results found during this study, using what I know and acknowledging the areas of literature in which I am not well-versed.

Ethical Considerations

Approval from the Institutional Review Board (IRB) at the University of Georgia was given before the beginning of the study. Permission was also granted by the participating special education coordinators.

Research Timetable

As stated above, this study was broken down into five phases. This timeline describes the activities that occurred during the different phases.

Table 2 presents the major events of this study. The overall duration of the data collection portion of the study (interviews, observations, and modifications) is listed below.

Table 2. Timetable for research

Major Event	Time
Phase 1 / Prepare Project Shop materials / Preliminary Interview	June-July 2003
Phase 2 / Introduction / Integration / Early Observation	August-September 2003
Phase 3 / Detailed Observation / Interviews	September-October 2003
Phase 4 / Modifications / Final Interview	October 2003
Phase 5 / Data Analysis, Follow-up Data Collection / Dissertation	November 2003 – May 2004

(See Appendix B for a detailed schedule of research activities).

Chapter Summary

In this chapter, I outlined the methodology used to address the purpose of this study — to investigate how special education teachers integrate the Project Shop materials into their classrooms. A design experiment was used to achieve this goal. Two classrooms were used for this study in counties in northeast Georgia. Data were collected primarily through participant interviews and observations. Data were analyzed using constant comparative analysis. The next chapter will address the findings that resulted from the data collection.

CHAPTER 4

RESULTS

The purpose of this study was to explore how videotapes and interactive multimedia designed to teach community-based skills could be successfully integrated into curriculum for students with moderate to severe intellectual disabilities. The first half of this chapter will address teacher views of technology integration, describing the teachers' philosophies and goals and the issues surrounding their experience with community-based skill training. The second part of the chapter will explain how the teachers learned about the capabilities of the software and the videotapes, discussing the integration or non-integration in these three general areas: 1) What materials and portions of materials that the teachers applied in the classroom; 2) How the materials were used; 3) How the teachers and I were able to modify the materials to better suit the classroom curriculum. Prior to the introduction of the materials to the classroom, I interviewed the teachers for their definition of technology integration. This chapter addresses the following two research questions:

- How well aligned are the goals and design of the training materials to existing practice?
- What are the patterns of use by special education teachers as they integrate the materials into their curriculum?

The underlying theme of this investigation involved how teachers integrate technology into their classroom. Prior to using the Project Shop materials, both teachers in the study were asked for their definition of technology integration.

This chapter will be organized according the five phases of the design experiment addressed in the previous chapter.

Phase 1: Completion of the Project Shop Materials, and Initial Interviews

Before the implementation of the Project Shop materials, both teachers were interviewed about their teaching backgrounds and experiences with technology integration. It was important to determine a "baseline" for how both teachers integrated technology into their classrooms.

Definition of Technology Integration

When asked for their definition of technology integration both teachers first referred to assistive technology. Mrs. Truman referred to its use in one area--how she considered instruction to be geared towards the individual. Mrs. West defined it the same way:

> **Investigator:** How do you define technology integration?
>
> **Mrs. West:** I guess I think about assistive technology, and with that, communication devices and the computer.

According to Mrs. Truman, assistive technology fits in with the concept of accommodation. In accommodation, devices are integrated into the instruction, a process as simple as using picture cards so that a student can identify a response or a need. The other concept, modification, is when the instruction is specifically geared towards a certain child based on his or her need.

> **Investigator:** How do you define technology integration?
> **Mrs. Truman:** We define technology as assistive technology--anything you insert…to help teach, um…if a child needs some type of accommodation, we even make a difference between accommodation and modification. Modification, we're talking about changing the curriculum and we're getting more into the inclusive thing, we have kids going to the regular classroom…If we accommodate that student we are making changes to how that information is presented or how that child responds, or how that child gets to...or how to get around that disability. So in terms of technology, a flash card, if a child needs to pick up a picture exchange, if they need to pick up a picture of something and tell you what they want, that's assistive technology…You have to look at how you're going to use this

> technology and what's the purpose of it and whether or not it's going to be able to be generalized to the many environments that a child is going into.

Mrs. Truman also considered assistive technology in terms of how much it costs a child to use. It is important for her that an assistive technology communication device used in the school can also be used by the child in his or her home environment.

> **Mrs. Truman:** We use assistive technology for a child who may need a modification to get around a disability, like a flash card or picture exchange. Or switches. Voice out put device…We look at the least sophisticated method of doing communication, 'cause we need something that can work across all environments. If a child can use a picture board instead of a very expensive voice output 32-array switch that costs $500 dollars, I will go with the picture for four dollars. Because the family can get that picture board.

Mrs. Truman's first experience with teaching special education was over twenty-five years ago. As a result, she has seen a great deal of change in what she considers to be technology integration.

When she first began teaching, materials that she integrated into the classroom were primarily hand-drawings and slides in a slide carousel. In addition, when she wanted to film video, she had had to cart around what she called a "Big Heavy Camera" that had to be transported via a video camera wagon. She was very pleased with the progress that had been made in that area of technology over the years.

Teacher Experience with Video

Mrs. Truman's use of videotapes in general involved those that depicted someone demonstrating a skill incorrectly. She preferred to show the video and then have her students discuss what was being done incorrectly on the videotape. With moderate students, she believed that it was not very useful to show them the video first and then go out into the community, assuming they could demonstrate the skill correctly. Rather, she preferred go into the community, have the student practice the skill, and then have them view the videotape so that they have a frame of reference.

At the time of the interview, Mrs. West did not have any systematic use of video in her instruction. When students in her class did watch videotapes, it was solely for entertainment purposes.

Teachers Experience with Computing

Mrs. Truman used computer-based instructional materials in the classroom before using Project Shop. She described the programs that had been used as discrimination-type activities that covered the material too rapidly for her students. She believed the pace of the software was too quick because the software had been designed for a milder population than her class. In addition, she felt that that those programs and others listed in specialized catalogs, such as the ones by the Attainment publishing company, were too expensive for her to purchase.

Mrs. Truman described herself as computer literate. Also, she considered her technology abilities to be of higher ability than other special education teachers in her school.

> **Mrs. Truman:** What bothers me is that teachers don't have the basic skills in word processing. They don't know how to cut and paste.
>
> **Investigator:** Special education or traditional teachers?
>
> **Mrs. Truman:** The ones that I deal with are special education teachers. They get frustrated because they don't know how to save or save to a disk, to me very simple stuff, so they look at me as an expert because I can show them how to save to a disk….They're learning, but now the state requires that we get ongoing training with computers. I think it's because they haven't had to do it.
>
> **Investigator:** Do you mean teachers with a lot of experience or new teachers?
>
> **Mrs. Truman:** I don't know. I'm sure the newer teachers are much better at it because they are coming through school.

When Mrs. Truman did use the computer in her class for instruction, it was primarily for math and phonics. However, Mrs. Truman described her use of computers as infrequent.

> **Investigator:** What other instruction do you use the computer for?

Mrs. Truman: We do math on it, reading, phonics…

Investigator: How often?

Mrs. Truman: Not often, because I have two computers that are needing some severe assistance. In the past I used to rotate kids through the computers a couple times a day, where I set up a program and they would work on a vocabulary development program or we have programs that were developed for preschool/kindergarten/first grade where they might be matching sounds, and basic counting, some of those basic academics, number recognition, being able to do the other huge one, recreation.

Mrs. Truman had clear beliefs as to how computers could be used effectively in her classroom, and one of the areas that she considered to be the most beneficial to her students were recreation and leisure use.

Investigator: How do you define the effective use of a computer?

Mrs. Truman: There's several ways, one is for rec/leisure, teaching a child to enjoy using a computer as a recreation outlet because these guys are pretty limited in what they can do recreationally and part of that has to do with transportation issues…The other way is to use it in a focused way, learning consonant sounds, or this child's parents really want them to learn how to read; yes they're thirteen, no they can't read, so you have to go, there's not too many programs that can teach reading to thirteen-year-olds, so you have to go back to things that are relevant for younger children. I try to avoid Barney. I want you to play this particular game. So I use it a lot…

Mrs. Truman: Hard to find computer programs age appropriate when they are down here at a really low level, I think they enjoy…we aren't teaching out of context, in my classroom, instead of teaching 1 to 10, I look at where should we be counting and try to make it functional LIKE counting silverware.

In Classroom B, Mrs. West made infrequent use of the computer in general with the exception of more administrative tasks like email or using clip art programs to create materials for her students to use during class activities. The computer was used as an instructional tool occasionally for the students in her class:

Investigator: You don't really use the computer for anything?

Mrs. West: Leisure skills, if they have the free time and they want to, but I don't have very many, I feel like I'm lacking in resources but I don't have many

> software programs. I do have the menu math thing--they enjoy doing that--but that's mainly an extra, something they can do independently as a leisure type skill.

The integration of the Project Shop materials represented the first time any software to simulate community-based interactions had been introduced into Mrs. Truman's class or Mrs. West's class.

The Teacher's Philosophies of Teaching

In order to develop a clear picture of how different teachers would use the Project Shop Materials in their class, I asked both teachers to describe their teaching philosophy for their classroom.

> **Investigator:** Would you have any way to describe your teaching philosophy?
>
> **Mrs. Truman:** Yes
>
> **Investigator:** What would that be?
>
> **Mrs. Truman:** Flexible, functional and very specific to the child's needs. It really is one where we're moving towards helping the child be a more functional member, a more evolved member…whatever level they can in their world--starting with home and family, and then into the community and eventually if they are able to go into the work setting or be a consumer of things. And for some it might be as little as being able to go into the store with someone and behave appropriately all the way to let them out to run and get something and all the way to having their own supervised cart and managing their own life so to speak.

When interviewed, Mrs. West did not identify a particular teaching philosophy, but rather described the overall structure of how she organized her classroom. Her overall goals for her students were very similar to those of Mrs. Truman.

> **Investigator:** Do you have a teaching philosophy?
>
> **Mrs. West:** I use the picture schedule, not really a philosophy, but a goal I have is to get my students to be as independent as possible, and everything we do in the classroom is what we've determined to be functional for them. They're all one or two years from graduating, so we're doing a lot of focus on job skills and preparing them, the ones that can work independently, to do that, and they do have a picture schedule so we make sure that their environment is very predictable, and they know what's going on and it's on done on their level, everything individualized. The ones that just read sight words, their schedules are written just

> using one word on each card, and ones that have no reading ability are pictures, and some of them can read sentences so their schedule….everything in the classroom is individualized based on their IEP objectives, and those objectives are written to try to get them as independent as possible when they leave for me.

Teacher Goals for Community-Based Skill Training

When discussing her class, Mrs. Truman felt it was important to teach skills that enabled her students to function better in a community environment.

> **Mrs. Truman:** But if we don't teach those skills, that's what shuts doors in the future for them. If they can't do some of the shopping on their own, they may not have the option of being in a supportive apartment, because they have to have some of those skills in place.

In dealing with various levels of disability within her own classroom, she felt that the more severe the level of disability, the more important it was to provide hands-on instruction in the context of the place where you are hoping they will be able to execute the skill.

> **Mrs. Truman:** …depending on the level--the more severe the mental retardation--is the more you have to do it hands on in the context of place where you're trying to teach the skill, and there may come a point with some, maybe…Christopher's hard, I really don't know what he gets, Lindy is at the point, she has the level of mental retardation where we can do that; we may have to do some minor instruction to adjust to a new setting, but she can with a little bit of help and talking and saying now remember at BI-LO, she can do that verbally, she has a verbal skill, she has a language in her head that does that, but if you get a youngster who has very limited language in their head…they really have to do it in the location where they are going to use it.

Mrs. Truman taught in a middle school in a small community in north Georgia. Within her community, there were three grocery stores, and she believed that it was more important to familiarize her students to that store that their family used since it was most likely the store they would use when they graduated. She believed that generalizing across many stores is the appropriate idea theoretically; however, in her situation, it was not practical.

> **Mrs. Truman:** …you choose the store the family uses; you don't even try to generalize from BI-LO to Ingles to Winn Dixie. If that family goes to BI-LO, that's where you instruct that child, because as you have more mental retardation, you have less ability (to go) from one place and apply it to another.

Both teachers had set goals for what they hoped their community-based instruction would achieve. Mrs. Truman taught middle school, and her students ranged in age from ten to sixteen. She felt that because of their age, teaching them individual shopping was not the biggest priority.

> **Mrs. Truman:** …I don't know of any child who is thirteen years old who does independent shopping….or plans a meal, or cooks a whole meal. At that age, they need to be helping their Mom or their Dad or whoever's cooking; they need to be able to go into an environment in the community and behave appropriately. I don't anticipate Lindy taking off and going to the store independently--Mom's going to be somewhere close by or Dad…maybe at the curb…even when you fill up with gas to be able to say, "Lindy, run this in to pay for it," to save Mom a few steps.

In Classroom B, Mrs. West's students ranged in age from sixteen to twenty-one. Thus, the primary focus in their education was to prepare them for employment after graduation.

> **Investigator:** What are your goals for your students?
>
> **Mrs. West:** For them it would be to increase the speed that they do tasks, increase their on-task performance, to teach them to take breaks for a certain period of time and get back to work independently, to reduce the amount of prompts that they need when they're out there working, and to perform a job to certain specifications--make sure that they're doing the job as you want them to--all to try to increase their independence in vocational skills so we can get to the point that they can work with a job coach for a while when they leave us and hopefully can do a job just as a person without a disability or with as little support as possible… the ones that are capable of doing that.

Phase 2: Introduction to the Project Shop Materials

In this phase of the study, teachers were observed as they proceeded with their classroom activities, including their methods of teaching community-based skills both in the classroom and the community. During this phase of the study, the teachers were also

introduced to the Project Shop Materials, and Mrs. Truman began to make use of them in her classroom.

Methods of Teaching Community-Based Skills

During the first two weeks of the study, I was able to observe how the teachers taught community-functioning skills in their classrooms. Mrs. West used worksheets with her students where they could practice their literacy skills for such items as macaroni and cheese and apples. The students would practice reading the names of the items for clearer identification when they were looking for them in the store. These worksheets contained those items that the students were able to prepare on their own as meals.

Mrs. Truman provided her students with a unique opportunity for learning about money skills. Her class became responsible for running a "school store" that consisted of a cart that went door to door to every classroom in the morning to sell items to students throughout the school, such as loose-leaf paper, mechanical pencils, and erasers. This experience provided many of the students with the opportunity to learn the following important skills:

- Communication skills—They were required to greet and thank the customer and respond to customer inquiries.
- Money skills—Students accepted payment for items and gave back change. In addition, students were responsible for counting the money when it came back. They rolled coins and also deposited money earned in a local bank when they went on community outings. Sometimes this involved the skill of endorsing checks.
- Ordering/Stocking skills—Students conducted an inventory, and ordered new items when they were low. They needed to be able to determine if they could afford that item with the money that the school store earned. Once they received the needed items, they stocked them on the cart.

- Life skills—Working for the school store was considered to be a privilege. Students signed in for work on a ledger and got paid every Friday. According to Mrs. Truman, because it was their money, they were much more motivated to count it and make sure it matched the ledger dictating how much they should be paid. If students were insubordinate or behaved inappropriately, or acted in any other way that is detrimental to the school store activity, they were "fired" for a period of two weeks, where they earned no pay.

Money received at the school store was used for classroom activities, and money that students earned individually was used by them in the community to purchase their own items. One example of what students were able to learn in the school store activity involved a girl named Lindy who was able to increase her money skills. For example, prior to Lindy's work at the store, Mrs. Truman had to instruct her to get "two quarters, a dime, and a nickel." After handling money at the school store, Lindy's skills had progressed to the point where Mrs. Truman could ask her to get sixty-five cents.

Classroom Schedule and Community-Based Instruction

Mrs. Truman's students' class schedule was complex and based on many activities that the students were engaged in, both in the special education classroom and outside of it. As the students became more involved in activities that were not in her control, it added a level of complexity to organizing her weekly schedule.

During the school day, Mrs. Truman's students participated in vocational training opportunities in the school such as working in the cafeteria after lunch, doing custodial work, and cleaning the art room. Many of these activities had to be planned around someone else's schedule. As a result, Mrs. Truman's ability to schedule trips into the community was affected.

> **Mrs. Truman:** …this year it's been a lot more chaotic--it's a lot easier to do schedules if you are truly self-contained, if you truly just have a classroom where they come to you and leave at the end of the day. This year we have become much

> more involved in activities that are outside the realm of my control...going into the connection classes, we have a variety of vocational training opportunities that go into the media center, cafeteria, custodial types of things, where we use the art room and go into her class, during the day, so we have to schedule so much depending on other people's schedules. We can only go into the art room at certain times of day, we can only go back into the cafeteria and help set up; you're very time limited.

Mrs. Truman preferred that everyone in her class be able to go into the community at least twice a week. However, this was not always possible, as the students in her class were also taking regular classes with non-special education students. In the beginning of the study, Ace was attending a science class with one of the paraprofessionals, Mrs. McDonald, and Christopher participating in a physical education class. Lindy and Amber both went to an art class. Towards the end of the study, Ace was planning to attend a health education class which Mrs. Truman thought would be very satisfying for him.

While these extra classes reflect the growing trend of mainstreaming and inclusion, they had an effect on how well Mrs. Truman was able to teach her students in the special education classroom. In the beginning of the study, which coincided with the beginning of the semester, Mrs. Truman wasn't sure how she was going to be able to schedule trips out into the community for all the students concerned. One solution was to break the class up, sending the paraprofessional, Mrs. McDonald, out with the students at one time, and Mrs. Truman out with the students at another. She had never tried this before, but the mainstreaming issue was causing her to seek out new methods.

> **Mrs. Truman:** We're becoming so involved in the normal ebb and flow of this school--we're not truly self-contained anymore--Ace's going out and Christopher, I'm not sending him out right now, but he'll be going out to PE, and we have some others going out to things different times of the day, so there's not much time that I have everyone here at one time because we're going into the regular classrooms, going into work settings…I haven't figured out community yet, its going to be a bear this year...and what we may end up doing is sending out like Mrs. McDonald with a couple and she's the one that goes out…in the past we've always gone out as a whole classroom, go out together, all three staff, all the kids…

Another difficulty stemming from with the practice of students leaving the classroom throughout the day related to the student assistants who came into the classroom to work with the students. Planning these times became more difficult because the schedules of both the students and the student assistants had to be taken into account. Nevertheless, despite scheduling difficulties, these peer tutoring experiences provided valuable social interactions for both Mrs. Truman's students and the student assistants.

> **Mrs. Truman:** …and the other piece is the regular kids coming in during their periods and that's caused—what we're getting out of it is so valuable, what's happening socially, it's such different concept from what I grew up learning.

Mrs. West taught in a school district with a very favorable situation for taking their students into the community. She was able to take her class out into the community Monday, Tuesday, Thursday, and Friday. However, as many of her students were nearing graduation, shopping skills were not as critical to reinforce with her students as employability skills. Consequently, on Mondays the students worked on bagging groceries at a local store. When they did not work on bagging, they worked alongside store employees, focusing on stocking shelves or any other tasks that needed to be completed. On Tuesdays and Thursdays, the students went to a local restaurant and practiced filling the sugar/sweetener containers, wiping tables, or washing windows. Wednesday was the only day Mrs. West's students did not go into the community. On this day, they focused on vocational skills within the school. During the second period students had school jobs: four of the students shadowed custodians, one delivered messages for the front office, and one student worked in the school nurse's office. When all of this work practice was combined, students were actually receiving job skill instruction four days a week, one of which was in the school.

Friday was the one day of the week that students focused on shopping skills in the community. Mrs. West stated that she was able to go into the community often without posing any real conflicts with her classroom schedule.

Investigator: You go into the community four times a week; that's quite a bit.

Mrs. West: From what I've heard, funding is a big issue, but I'm in an unusual situation.

Investigator: How often do your students go to other classes?

Ms. West: Every day, they go to general education fourth period.

Both teachers provided compelling differences to measure the integration of the Project Shop materials, as well as interesting situations to assess how valuable the materials could be.

Teacher Introduction to the Project Shop Training Materials

I introduced the Project Shop training materials to the teachers informally, using contexts and equipment familiar to them. The methods and procedures for these orientation sessions are discussed in the next section. Different options for introducing these types of materials and their implications will be addressed in chapter 5.

Orientation to the Materials

I oriented Mrs. Truman to the CD-ROM materials in an off-site location close to her home. Together, Mrs. Truman and I went through every level of the program on the CD-ROM, mutually participating in every activity from the login through all those included on the CD-ROM. (For a detailed description of the structure of the CD-ROM, refer to Appendix C.) In addition, Mrs. Truman was presented with a diagram of all of the skills that were covered in both the videotape and the CD-ROM (refer to Appendix D). I gave her a copy of the videotape and told her what was presented in all three episodes. She agreed to view the videotape on her own time before presenting it to her students.

Mrs. West was already familiar with the Project Shop Materials. Although she had briefly been exposed to them during a very preliminary usability test, she had heard of their development by the Project Shop team. I oriented her to the materials using her classroom computer. Just as with Mrs. Truman, she and I went through every level of the program, from the login to each of the following activities. During this orientation, Mrs. West made some comments regarding which sections she thought would be useful for

two of her students, one of which she particularly had in mind throughout the orientation. She was also provided with a diagram of the skills that were to be covered on the videotape and the CD-ROM. She received a videotape and said that she would view it on her own time.

Lack of a Teacher's Guide

There was no teachers' guide prior to the beginning of this study. In addition, the results of this study did not present a strong need for one, with the exception of a detailed description of the skills covered in the materials telling in which section of the videotape or CD-ROM they were addressed. The design of the CD-ROM was done primarily with the belief that the directions would be explicit for the audience using the materials, with some consideration that they would also benefit the teacher. Indeed, these directions were so explicit that they made the CD-ROM content self-explanatory to the teacher and the other individuals using the computer-based materials. This was discussed in an interview with Mrs. Truman:

> **Investigator:** How could I have better prepared you to use these materials? We discussed earlier that there was no teacher's guide.
>
> **Mrs. Truman:** It's pretty self-evident, I think probably now that you have some of those built-in capabilities, <*Teacher Options Screen, discussed below*> I want this to be set up at this level, I want the pay to the next dollar to go up to two or three dollars; you will need something to let them know how to do that…you did go in and show me how to look at the trials in the records.
>
> **Investigator:** Do you think that was adequate?
>
> **Mrs. Truman:** Yeah, I think that's good.

As part of the investigation, I should have more clearly organized the actual content and skill areas that were represented in the materials with specific reference to what skills were covered in specific sections. This would have facilitated some usage of the videotapes in Mrs. West's class. Realizing this significantly influenced how the

Teacher's Guide was eventually written. (See Appendix C for a copy of the Teacher's Guide.)

Phase 3: Use of the Project Shop Materials

This section discusses in detail the patterns of use of both the videotape and the multimedia materials contained on the CD-ROM. First, the use of the videotape and the issues surrounding it will be discussed. The second and much larger portion of this section will address the integration of the CD-ROM materials and the patterns of use that followed, including the multiple iterations of refinement to make the materials more effective for the teachers in their classrooms.

Videotape Use

The videotapes produced for Project Shop were designed to be a highly motivational introduction to the skills required for a successful trip to the grocery store. They were also designed as anchored instruction where each video presented a series of scenarios, decision points, and models that could be followed up with detailed exploration and practice by students when using the CD-ROM activities. However, the teachers did not share this view. The videotape was used on only one occasion in Classroom A and not at all in Classroom B. I was present for the first and only viewing of the videotape in Mrs. Truman's class.

Prior to showing the video to her class, Mrs. Truman viewed the tapes. First, she observed and made a mental note of the skills that were useful for her students. Second, she decided that Part three of the tape that dealt with employability skills was not age-appropriate for her class. Therefore, she decided that only Parts one and two were to be shown to her students. The whole class was placed in front of the television before viewing, even though it was intended for only three students who were present that day.

As Part one of the tape was being viewed by the class, Mrs. Truman asked the students about certain skills that the actors were engaged in. These skills included creating a shopping list, what happened when the door malfunctioned, the first task that

the customer completed (getting a shopping cart), and what Brad (the character without disabilities who was designed to be the person needing help) was doing that was not safe (i.e. navigating the cart too fast).

Mrs. Truman played the role of a "second narrator" for the videotape (Shopper Bob, a character in the video, is the actual narrator in the video). She did this for two reasons. First, she knew which skills were being focused on in the video. Second, she knew which students to ask about a particular set of skills.

In one scene in the first video episode, the grocery store's automatic doors don't open. During this scene Mrs. Truman whispered to the group, "What's happening here?" In addition, to point out the differences in correct and incorrect shopping navigation behavior between Robbie, the character with disabilities who modeled all skills correctly, and Brad, the character who did everything wrong, she asked one specific student, Ace, "Who would you rather be, him or him?" She then followed up by asking the group, "Is Brad being safe, when he is pushing the shopping cart around like a wild man?" In the portion of the video where Robbie navigates around a broken jar of mayonnaise, then notified a store employee about it, she asked the group, "What did he do?" Two of the students were able to respond correctly as to what happened, even though this particular skill was not explicitly pointed out in the video by Shopper Bob.

After completing the first video, Mrs. Truman asked the students what they learned. One student responded enthusiastically, "The Shopping Cart!" (referring to Brad moving the cart in an unsafe manner on the video) When Mrs. Truman followed up and asked for a more specific answer, both Ace and Pamela responded, "He was going too fast!"

Mrs. Truman immediately showed the tape a second time to revisit the portion of the tape that showed Robbie talking to an employee about the broken mayonnaise jar. However, before showing it, as an advance organizer, she told the class, "Look to see how Robbie is polite…how he found his items." As a final example of how she worked

instruction into the context of the video, she asked the class, "What did Robbie do that was polite?" She asked this at a point in the video when Robbie acknowledges that someone was waiting ahead of him in line at the deli and that the deli clerk should be waiting on that customer.

After these two showings during this one class session, Ms. Truman never used the videotape again. One reason she gave for this was the lack of availability of a television and VCR (there were none that functioned in the classroom; she had to get them from another part of the school). She also said that there was not enough time.

Features of the video that were not mentioned at all included the medals and the concepts of wizardry, etc. However, this must be viewed in the light of the fact that the videos were not shown again after the first viewing and that Ms. Truman did not feel that the videos were resources she wanted to use in her curriculum. This exchange describes the issue of availability and content areas of the tape.

Investigator: You never looked at the videos again.

Mrs. Truman: No.

Investigator: Any reason why?

Mrs. Truman: It's been chaotic, I would like to do that, now that we're actually working in the cafeteria and they're going back in the back and I want to get them to where they go and see--some of the older ones, like Lindy and Ruth and we got Heather now, we got in the afternoon and we're doing the trip to the store--and look at the store not as the place where you buy groceries but as a place for your jobs, so that will be that video that you have that is the jobs, would be kind of a fun thing to look at when we go to the store.

Investigator: You don't have a TV in the room that you use full time?

Mrs. Truman: I have a TV but I don't have anything to play on it *<referring to a VCR>*, so I have to go get it and bring it in, or take the video to them *<technology coordinators>* and say put it in at 10:15. *<to play on the School Video Network>* **Is your italics stuff okay?**

Mrs. West's class did not opt to use the video at all. According to Mrs. West, the class rarely if ever used the television and VCR--with the exception for entertainment, and then only once a year.

Investigator: Do you use video much?

Mrs. West: We use our digital camera a lot, but we don't use the video <VCR>.

Investigator: Entertainment if you ever use the TV at all?

Ms West: Usually, just one time a year or something, we may show a movie at the end of the year, but would just be for entertainment.

The reasoning provided by Mrs. West during interviews was that the students in her class were already skilled in the subject matter that was taught in Project Shop videos. Additionally, most of her students were experienced shoppers and were learning instead how to better serve as employees at stores (only one of which was a grocery store). However, as mentioned above, she was not aware of the third video which dealt exclusively with job or occupational skills, even though this was the primary area of teaching for her class. When reminded by me that the third video dealt with job skills that could be used in a grocery store, Mrs. West was surprised and said that she would view the tape.

Even though I oriented her to the content of all of the videos at the start of the study, she obviously did not remember. This most likely occurred as a result of the fact that I did not properly prepare her for how to effectively use the video instruction. I would have preferred have viewed the videotapes *with* the teachers prior to their use, but they assured me that they would preview them at home using the list of skills that I had provided.

Video Content Matching Class Content

There were many similarities between the instruction presented in the Project Shop materials and that used by Mrs. Truman. For example, the shopping product cards that the characters in the video use to create grocery lists (called a "flip book") were very

similar to those used by Mrs. Truman's students when they were on a community shopping trip. I observed this when I accompanied the three students from Mrs. Truman's class on a community-based outing.

In addition, the safety skills that were displayed in the video were the same concepts that Mrs. Truman reinforced with her students when we went out into the community. Parking lot safety was very important to Mrs. Truman, and she was very adamant about her students being careful when entering and exiting the store.

Also the social skills in the video, including being polite to other shoppers, were skills that Mrs. Truman taught in the grocery store. Students would even apologize to each other when their carts collided in the aisles.

Both teachers provided reasons for not using the videotapes. Mrs. West felt that while the content in them was useful, she wasn't easily able to fit the videos into her schedule, and in fact she never used video in her classroom for any instructional purposes. In contrast, Mrs. Truman believed they were useful, but apparently their value was not great enough for her to acquire the equipment to view them on a regular basis.

Use of the CD-ROM Materials

This section explores the circumstances surrounding the use of the CD-ROM by the participating classrooms in this study. The following areas will be discussed in this section: 1) how the CD-ROM was used; 2) how the content of the CD-ROM was perceived and used by both teachers and students; and 3) how the program evolved over the course of the research to facilitate more effective usage and integration. A measure of how the content of the CD-ROM matched the class content can be determined by looking at what sections the teachers were primarily interested in using with their students.

Many of the topics discussed in this section will appear at first glance to be mere descriptions of the software program. However, in trying to determine a best practice for technology integration of these kinds of materials for students with moderate to severe intellectual disabilities, it is important to describe general aspects of computer-based

training design, regarding them in a way that is specific to their use by teachers of special education classes.

After I introduced the computer-based materials to both teachers, the patterns of use between the two classrooms differed tremendously. For example, there was a large difference simply in how often both teachers used the software with their students. In Classroom A, Mrs. Truman used the program almost daily. Certain portions of it became an integral part of her community skills curriculum. In addition, the students were given the opportunity to peruse and interact with the CD-ROM in its entirety when they had recreation leisure time, and many students chose to do so.

Investigator: How many times have you used the program since I was last here?

Mrs. Truman: Every day. The students go to it. They want to do it.

Mrs. West's classroom, in contrast, showed very different results regarding how the CD-Rom was integrated into classroom practice. Simply put, the CD-ROM was not used at all as part of the class curriculum. In fact, without my direct intervention, it would never have been viewed or used at all by the students. As a result, the bulk of the data in the following paragraphs will refer to Mrs. Truman and her students, unless otherwise noted. A detailed analysis of the reasons and factors contributing to the nonuse of the CD-ROM materials and the video materials by Mrs. West will be addressed in the next chapter.

General Type of Usage

The program was used primarily in two different ways. The first and less structured method was having the students interact with the program by themselves, where they were free to log in and view the storyline and interact with whatever activities they chose. The second more structured type of program usage was when a traditional classroom student or paraprofessional worked with the student on the computer. This was the first discussion of this type of practice.

> **Mrs. Truman:** In fact, yesterday one of my student assistants came in and had some down-time because I had to be pulled out of the classroom for a few minutes, and I came back and he was in there doing it. He had a good time with it and so I just said to him, I want you to sit here and monitor and put Ace on it; I want you to sit here and deal with this issue of click click click click.

In this type of interaction, the student used the program with the cooperation and assistance of the teacher, paraprofessionals, or the student assistants. This technique became the predominant method for students to use the Project Shop materials throughout the study.

Two main categories best organize the findings related to the use of the CD-ROM: program features and program content. Program features refer to those aspects of the program that are used throughout the program (such as directions and introductions) or that do not contain any content on their own (such as the login screen). Program content refers to specific sections of the program, such as the shopping storyline, video thumbnails of community skills, or the practice activities.

Each of the following sections reviews the use of each portion and discusses any modifications that were made in order to make the program more functional for the teacher and more accessible to the students using it.

Program Features

Hardware. Both classrooms had computers which were compatible to run the computer-based materials. Both machines were IBM-PC compatible computers running Windows XP. They were configured with a CD-ROM player and a sound card with external speakers. The computer in Classroom A also included a 20” touchscreen monitor. Neither configuration in either class posed any difficulties in running the video-rich software.

Login Screen. After the title screen of the program, a login screen (see Figure 4) appears where users can enter their name if they have not used the program before, or, if they have used the program at least once previously, they can select their name from a list of names.

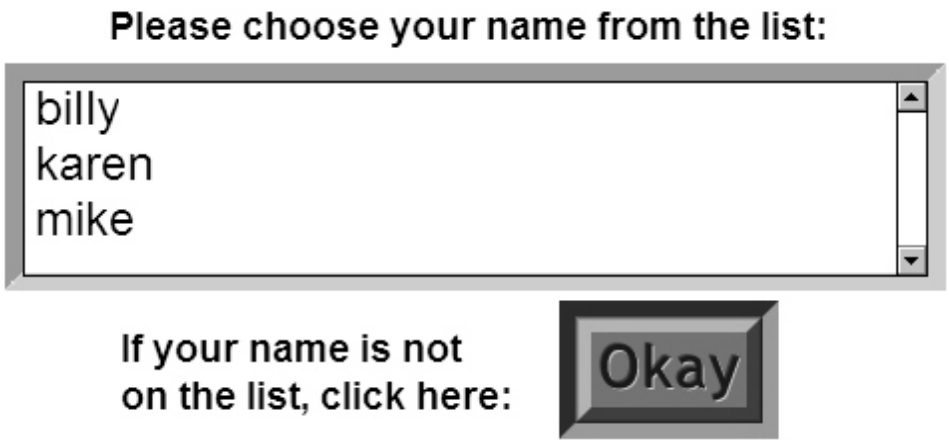

Figure 4. Login screen (not drawn to scale). Students selected their name from a list or entered their name if it was not on the list.

In order to maintain difficulty levels in certain activities and provide external data tracking for success in those same activities, it was important for the program to identify who was using it. When students used the program for the first time, they needed assistance entering their name into the system. However, when they returned to the program, they were able to select their own name from the list. None of the students in the class could read functionally, but all of them were able to recognize their own name. When they entered their names for the first time, it was done with assistance from the teacher or a paraprofessional. When a student finished, the program automatically recorded all of the tracking and scoring information to the computer into a special folder saved on the computer's hard drive dedicated to that student.

Navigation. Students were able to navigate throughout the program (between pages and levels) without difficulty. This result alone was very encouraging. With the

assistance of the teacher, paraprofessional, student assistant, or me, students were easily able to proceed to different areas of the program. In fact, students were quickly able to navigate to different areas on their own without any assistance after only brief experience with the software. The program was designed in a similar fashion to a Living Book (1992), and the interface posed no significant difficulty for the students.

Directions. Directions are an important aspect of this program, as they are in most software. The directions for this program were designed to be very explicit as required by the intended audience. They served as prompts for certain features, prompts on menu screens, and introductions to different activities. In addition, most menu buttons had an accompanying audio that automatically activated when a student placed the mouse over the button. The audio would read aloud what was written on the screen button.

> **Mrs. Truman:** There's places where when your cursor gets close to it and tells you what it is, that's good.
>
> **Investigator:** Really?
>
> **Mrs. Truman:** Well they can't read. So if I'm not there and they're looking at something, they're not going to be able to read what I read to go get to it. Having it say what the word says is good…because that bypasses their inability to read.

The directions for this program were in the form of text and audio. There were no text directions that did not have an audio narration. However, some directions were provided only with audio and without accompanying text.

The directions were equally useful for students and teachers alike. However, the explicit, detailed nature of the directions became a hindrance to the students who were using the program. As a result of having to listen to a lengthy series of directions, students frequently became disengaged or "twiddled their thumbs," according to Mrs. Truman.

Directions specific to the activities were based on a pattern typically used when dealing with individuals with intellectual disabilities. The following describes this pattern: Describe the procedure, and then model the procedure. When the procedure was

modeled, the narrator gave detailed step-by-step directions of how to perform the procedure correctly. The program was designed and programmed to do this every time a student initiated an activity and also in some activities when students switched to a different type of grocery item. For example, in the "Match to Sample" activity, a student who switched from cereals to canned goods would trigger the directions. In reference to this Mrs. Truman commented, "If I had a choice I would just click through it," implying that if she were the user, she would not want to have to sit through directions again, she would prefer just to continue navigation through the different portions of the program.

Students also would become disengaged from the program while waiting for Shopper Bob to provide directions on the screen before they were able to continue. Based on Mrs. Truman's comment, I changed the program to prevent the detailed directions from appearing as often. In the cases where students had already viewed this introduction it would not play at all. The student could then proceed directly to interacting with the activity. Finally, after multiple cycles of use and modification, this feature became part of the Teacher Options Screen (which will be discussed in more detail later).

Feedback. Closely related to the use of directions was the use of corrective feedback in the activities. Corrective feedback in the activities consisted of a negative response, such as "I'm sorry, that wasn't the correct item." Then, Shopper Bob would correctly model the respective skill and then allow the user to try again.

There were some unexpected findings related to the role of feedback. Because the feedback was in an audio format, Mrs. Truman was able to determine if a student was having a problem with a certain activity even if she was not sitting at the computer. As long as she was in close proximity to the computer's speakers, she could keep track of a student's progress on an activity, even if she was engaged with another student in a different part of the classroom. This was one unexpected way in which the audio feedback proved to be quite useful.

Data tracking. As mentioned earlier in the login section, two of the activities were designed with a data tracking feature that kept track of various information based on each student's interaction (see Appendix E for an example of a data tracking file). This aspect of the program was part of the original design and was introduced with the initial installation of the program. The teacher considered this to be a positive feature of the software.

Program Content

This section addresses specific sections of the program, such as the shopping storyline, video thumbnails of community skills, and the practice activities. These areas were observed as part of the study to explore how this program was specifically integrated into the community-skills curriculum of the classroom.

Storyline / video thumbnails. An enormous amount of time and work was dedicated to the design and development of this part of the program. Frankly, it was discouraging to see its use primarily relegated for leisure and casual browsing by the students. While Mrs. Truman remarked that she and the students thought is the section was very engaging, there was never any emphasis on using it as a formal and explicit learning tool within the curriculum.

> **Mrs. Truman:** I like those thumbnails. They're great and the students like them too. Lindy was going back and listening to the story and exploring that part of it.

Only the highest functioning student, Lindy, explored the video thumbnails on a regular basis, and when she did, it was unguided by any assistant. There was no way to determine if this had any effect on her learning in the community.

Early in the study, after discussing this with Mrs. Truman, an effort was made to streamline the interface and to remove the icons for the video thumbnails from the storyline and relocate them to a separate file. Although this was endorsed and received positively by Mrs. Truman, it never became part of the class curriculum.

Investigator: What kind of value did you see in the storyline?

Mrs. Truman: Fun, they enjoyed it.

Investigator: I remember you mentioned that the mild students enjoyed it.

Mrs. Truman: Lindy would watch, but it got to the point where she would just go straight to the activities, I think the storyline, there's a novelty to it, it was kind of neat. For Pamela, the language issue--she doesn't follow stories, she has trouble even when we're doing simple reading activities--she can do one liners and show comprehension of one-liners but the storyline for her other than just watching a movie didn't connect to her, but I think that's an issue of her language disability.

Investigator: What about the little thumbnail movies?

Mrs. Truman: They were watching those at first…that may be more me than them, because I would say, "Sandy, I want you to do this," and so they didn't have as much access.

Investigator: If you could have all the video on one screen—

Mrs. Truman: This would be easier to do if it was one-on-one. They look at it more for entertainment… that's a good way of setting up--we're going to focus on pushing the cart and here's some things we need to watch for--and then you go into the community and also do the same thing, you're dovetailing the two events.

Mrs. Truman: The mild kids say, "It's fun because it's easy," so it's a neat format to do things, so it probably, if you're willing to do that. This answer doesn't make sense without the question

However, one issue that arose was the connection between the videos for the thumbnails and the videos on the videotape. Due to scheduling conflicts, the actor who played Robbie's roommate in the video episode could not play this role in the digital video used on the CD-ROM. Therefore, a different actor had to be used. This was noticed immediately by the teacher. However, this did not seem to matter to the students.

Activities. This section will discuss the patterns of use or non-use of the six activities that comprised level three of the CD-ROM. In the Project Shop materials, level three was the activity level of the program that had the most interactivity and was where students were able to practice the skills taught in the video exemplars or the skills that they used in the community. Level one and level two of the software were the narrated

storyline and the video exemplars, respectively. These levels did not contain a high degree of interaction.

The activities contained on Level three were the most visited and used part of the entire software program. As a result, they were under the most scrutiny by the students, teachers, paraprofessionals, and me. Of all of the activities, "Dollar Plus" (Paying for Your Groceries) was used the most frequently and was most often featured into the daily class lessons. Over the course of the study, all of the software activities were used by students in the class for either instructional or recreational purposes.

Investigator: How much have you been using the program lately?

Mrs. Truman: Pretty much daily.

Investigator: The part of the program that they're using, what's the majority of what they're doing?

Mrs. Truman: We've focused on the pay to the next dollar and in looking for items. <Match to Sample>

Investigator: Any of the other activities?

Mrs. Truman: We've been doing the bagging cart and it's hard; because of the concept, you really have to know the item to be able to judge if it's light or heavy. They still like the one where they're looking at stuff, driving around, running into people <Cart Smart>, so we do that.

Investigator: Which part is more fun for them?

Mrs. Truman: Running into people. That's kind of fun, that's a little bit of a slower activity, because we have trouble finding things, we have to go up and down the aisle looking. We really like the ones where we put the item up here, now we have to find it. A faster moving program.

The following paragraphs discuss each separate activity contained on the CD-ROM, the frequency of their usage, and other issues surrounding them.

Making a shopping list. The goal of this activity is to simulate the creation of a flipbook for shopping by clicking and dragging on items to the graphical flipbook. This activity was used only briefly by the teacher and the students.

Mrs. Truman expressed a desire for the items that were placed in the flipbook to be used as items in the Match to Sample exercise later in the program, but this change was not practical given the time, programming, and graphical constraints. This change would have allowed the activities to function together and thus better simulate the planning and implementation of an actual shopping trip. It is an idea that should be considered for future versions of software of this type.

Cart Smart. This activity, also called "Navigating your Cart Safely," was enjoyed by all the students, which was consistent with its "edutainment" design. Not surprisingly, choosing the inappropriate behavior—pushing one's shopping cart into a fellow customer—proved more entertaining to students than choosing the appropriate behavior of avoiding other customers because of the video that would come up on the screen after an incorrect behavior.

> **Mrs. Truman:** The first time I saw it I said, "Wow!" We went back and started running into people just to see what they would say...you know it was fun…(Laughing) Now that's one place where it did get stuck. We got stuck there where it kept apologizing and we couldn't get away from this guy, and we were really trying to say I'm sorry and backing up, and this may have been a click click click issue….there was an instance where Lindy got stuck and we just rebooted to get out of it, Lindy's not one.. she sometimes does get impatient with this program, this little conversation I had with her, you just have to wait, computer's a little slow and because she wants to move on…she really enjoyed that program, she was talking about (how) we had a hard time finding that soup, she was referring to going up and down the aisles and you have to just …just like the store, you have go up and down the aisles and try not to run into anybody and it took us a little while to figure out that you had to turn the cart at that point for the computer to recognize that you found the item but that's what she was referring to, she and Mrs. Burroughs just had a real hard time finding that Chunky soup…One way that I do it, if they want to do it on their own…but the idea of moving the cart around really intrigues them.

The controls for Cart Smart were also similar to a computer car driving game that students had used during their recreational use.

> **Mrs. Truman:** Ace…that's the same type of motion on the keyboard that he uses on his racing game, the arrow keys, that was an easy transfer for him, so he's driving a cart…he's using the same thing as a race car, now remember you're not going to crash walls here on purpose, but he did that…..

The use of the Cart Smart activity provided some interesting insights about the generalization of this type of activity to a community setting. This also provided a good example of how an experienced teacher could work with this type of activity in conjunction with actual community-based practice. Mrs. Truman preferred to use activities that simulate the community after her students have practiced the skills in the community first.

> **Investigator:** How much do think Ace and Lindy can generalize/understand what that game is all about? (Cart Smart)
>
> **Mrs. Truman:** We talk about it. We make that connection.
>
> **Investigator:** OK.
>
> **Mrs. Truman:** And that's going to be a part of us talking, when we sit up and say, "Okay, pretend you're at BI-LO, you're looking, remember how we did at BI-LO where you had to be very careful not to run into people? And do you see that thing sitting…now Ace, don't run into that thing, watch out" because he was more doing this, making it move without paying attention to what was on the screen. But we have to make the verbal connect, and that's why going into the store and doing it, then they have that experience to connect to, and with this group, I think you have to…I wouldn't want to use this as a preliminary instruction, it needs to be a concurrent instruction, where you are going out in the community, you're doing it you're coming back, you're using this to support what you're doing in the community. The community is your primary instruction, this is supplemental, and use it that way. Now with kids with mild disabilities, mild MR, might be more able to do this and then as a follow up go into the community.

Match to Sample. The purpose of the Match to Sample activity is for students to use their discrimination skills to match an item on the shelf to an item in their flipbook (shopping list). The flipbook is displayed on the upper left hand corner of the screen (see Figure 1). This activity was used occasionally by the class as a discrimination activity. Also, students were able to make use of the computer's touch screen feature for this portion of the program. This was an example of a guided computing activity where the teacher, paraprofessional, or student assistant worked alongside the students to ensure that they were using the program correctly by working with the corrective feedback that was built into the program.

Some changes to the program had to be made regarding the interaction of the screen in the initial integration of the materials because of the tendency of many students to click on various different portions of the screen. The screen's "hotspots" had to be made smaller to avoid inadvertent clicking by students. The following conversation describes a collaborative discussion between Mrs. Truman and me talking about this issue in the Match to Sample activity:

> **Mrs. Truman:** That's good do that, because we're dealing at this age with probably taught practices, where you look at this one, and we touch it to cue them into looking at it, so we may have them touch it to really have them look at that piece, and they've been taught to touch-touch-touch.
>
> **Investigator:** Really?
>
> **Mrs. Truman:** It would be my guess, and I do it too, where I say, "Right here look at this one," and they may touch it, and that focuses them on that so we're using a physical prompt as well as a…where they have a self-physical prompt, so that would be good thing to deactivate.
>
> **Investigator:** The way it's programmed is that the entire screen behind the boxes registers a negative click, so what I could do is make it so it's only behind where the actual cereals are.
>
> **Mrs. Truman:** And that's good because if it does it, they need to be very specific about what they touch, so now if they miss it, I'm assuming that my touch screen is accurate, I can program it; I can go in and make sure that it's accurate, if they touch the one next to it, it's going to respond as incorrect, but that might be good. If you could add the extra time, then we would have time if we have a peer tutor that we could say try again if we need to.

Picking a Line. Although I was not present to observe when it occurred, the "Picking a Line" activity was used by Lindy when she was using the computer as a leisure activity. Mrs. Truman made a note of this and was able to tell me later that Lindy was looking at the lines at the BI-LO Grocery Store during a community-based interaction and reported back to Mrs. Truman the similarities between what was contained in the activity and what the circumstances were in the community grocery store. This activity was not used or discussed in any formal context of this study.

Paying for Your Items (Dollar Plus). Dollar Plus was the only activity that was used frequently as a means of instruction. In fact, Mrs. Truman used this portion of the program nearly every day in conjunction with a classroom activity where the children used replica dollar bills.

> **Mrs. Truman:** But I'm finding that that part, "pay to the next dollar" <Dollar Plus>, may be something that they could actually find useful in terms of practice, so I may expand the use of this program outside your population.

This activity was utilized a great deal by the students in the class. The ways that Mrs. Truman facilitated the students as they participated in this activity will be discussed below when talking about facilitation of the students during the computer-based instruction. It was this activity that provided the basis for much of the discussion in the next chapter.

Bagging Groceries. I observed that the students had been using the bagging groceries activity as entertainment when they were browsing through the program. Mrs. Truman also reported that the students had been using the bagging groceries activity at other times. While they had fun attempting to do the activity correctly, they were generally not very successful completing the exercise. Mrs. West explained specifically why Pamela had trouble with it in terms of breaking down the skills. She explained that the challenge involved three steps the students had to master:

- Identify the item
- Relate it to real life as to how it would feel, heavy or light
- Come back to make the connection with the computer

These three steps proved to be more than the students could master correctly on a consistent basis.

Phase 4: Modification of the Project Shop Materials

At this point in the study, the above findings were carefully considered and played an important role in determining what final changes and modifications needed to be made to the program. The next section discusses what occurred in the fourth phase of the data

collection portion of the study and the final phase, where there was significant data collection.

This design experiment dealt primarily with how teachers integrated multimedia technology into their classroom. To this end, and in keeping with the repetitive cycle of design iterations to achieve a successful innovation, the program from its original form was modified in specific ways to make it more usable to the students and the teacher. This section will address specific issues affecting the use of the program and changes that were implemented in order to increase its effective use. The changes were based on observations of usage and interviews with the teachers involved in the study. Finally, this section will address patterns of use of the materials by the teachers, which will provide a basis for the models and theories discussed in chapter 5.

Login Screen

Over the course of the entire study, correct usage of the login screen grew to be an issue when it became apparent that multiple students were using the program during a single session. This resulted in the software recording all user interaction data from the moment of login by the first student, thus including the data of multiple students in the record of the student who first logged into the program. The solution to this problem was for the teacher or the paraprofessional to exhibit more control over the login process and to ensure that the student who was logged in was, in fact, the student who was interacting with the program. The students themselves were also taught to log themselves off when they were finished.

> **Mrs. Truman:** We have a long list of names, and what I'm trying to do is, teach them to close it out all the way when they are through, so the next person has to find their name, because I'm getting over there saying who are you, is this your name you're working under? I don't know. So we may have the issue of garbled data. So that's a logistical issue.
>
> **Investigator:** Do you think that this is going to be the case that every class that this is used in like yours, is going to be side-by-side with a teacher or a parapro? Is that always going to be the case, that the first time that they use it, there's going to be somebody with them, and then sort of eventually wean them off?

> **Mrs. Truman:** For them to be able to move into this and to log on and for me to swing by and make sure they're in the right place, your logon is very similar to commercial logons, with a multi-user capacity so they know that routine. I've taught them how to do it.

Also, another problem arose when the students used the program during their recreation and leisure time. Students would typically log into the program without a paraprofessional or student assistant accompanying them. As a result, they would often log in under someone else's name or type in a different variation of their own name, resulting in two different entries for the same individual. In further discussion with Mrs. Truman at the conclusion of this study, this was again noted as a trouble spot with the program.

> **Investigator:** What could been done better?
>
> **Mrs. Truman:** The login sequence—keep teachers and student assistants from going in and playing on a child's name--so I'm not sure when I look at Ace if that's Ace or Mrs. Burroughs, that's got nothing do to with the software…what's happening with it is Ace goes in there and he's making mistakes and Mrs. Burroughs goes in there and she shows him how to do it, but that's not, she's answering it for him, so the computer goes in and shows a correct answer, but it's not his correct answer, there's nothing you can do to prevent that. I might have (to) do something like set up a probe, where I would supervise that, where I know that would be him, but when he's just using it with other people's interactions, I don't see where that would have to be different from just the general list of people.

By the end of the cycle of program design iterations, this problem was not solved. However at the conclusion of the data analysis, two solutions became apparent and should be implemented with the next release of this software. First, in order to make it clearer which student is logged in at a certain time, each screen should identify the name of the current user. This will help the teacher or the paraprofessional know if the person using the software is in fact the individual who is logged in. The second idea is to remove the login feature from the program when it is being used solely for recreation and leisure. Recording the user's name and tracking their data is only important to the teacher when the software is being used as a probe trial.

Record Keeping

By the end of the study, it was apparent that this feature was not being used as part of the actual curriculum in the classroom. Data tracking files were created when students were interacting with the computer, but the teacher did nothing with the information. Mrs. Truman did indicate that she envisioned using that feature when she conducted probe trials with the software. However, no probe trials were conducted during the duration of the research. As a result, these data files were not used as data for research in this area. They were still useful, however, for me to evaluate the program's use when I was not present in the classroom, by observing the times and dates of students' logins. A review of the records that were kept reinforced the finding that the program's login feature was not working effectively. Students had been logged in under the same name, but with different spellings. Also, the records indicated that the paraprofessionals and the student assistants had also logged in using their own names, rendering the record keeping feature useless for tracking individual progress of students. Some names that were included in the data files were not even recognized by the teacher.

The records indicated that the login screen was being used incorrectly or inappropriately, and due to the fact that the records were not being used with any regularity, serious consideration should be given to removing the login screen and providing an option for logging in only when maintaining records for a specific student when the teacher deems it necessary.

Directions

The program was designed so that the buttons or choices in menus and activities became active only after the audio directions for their use had concluded. However, many of the students in Mrs. Truman's class exhibited something she referred to as the "Click Click Click Syndrome." Once the individual students became familiar with the use of a certain menu or prompt, they would ignore the audio directions and proceed to start clicking on a button, often many times, until they got a response. This caused difficulties

with the functionality of the software, and would sometimes cause a software failure or crash.

> **Mrs. Truman:** And part of it is where they need to slow down, too, but yeah the only time we had a problem is making the exit work, and I think that has to do with they weren't waiting for it, too. They want to click on it before the instructions are finished—Just getting out of the program they get stuck there sometimes, and we decided that was an issue of wait time, they need to wait, they try to click on it before the instructions are finished, or click on it before it finishes saying exit, and they need to wait until after the talking is finished and then you click on it.

To alleviate this problem with directions, but without removing them, a programming change was made to make buttons immediately active even while the audio was playing. This way, a student who was already familiar with the navigation and the menus could continue through the program without having to hear the entire audio piece.

Storyline

In the middle of the study, the program was modified and the video thumbnails were removed to alleviate user confusion with the large amount of information presented on the screen. Also, the video thumbnails were placed in a new interface where the teacher could review them all with a student on one screen. This video menu program was not used in the classroom, however.

After a discussion with members of the design team, it was decided that the video thumbnail icons will be returned to the storyline interface in a more streamlined fashion to enable students to continue viewing them in their recreation and leisure use. Mrs. Truman did believe that eventually they would be part of her curriculum.

Activities

By the end of the study, the Project Shop materials had become part of the everyday curriculum in Mrs. Truman's class. The activity that was used most frequently was Dollar Plus.

Investigator: Have those activities become genuine parts of your training day?

> **Mrs. Truman:** Every time Sandy comes in, his job is to get the program up, get it ready for them, because I'll be working with the money, Mrs. McDonald's working over here with the reading; when he comes in, would you go ahead and pull up Shopper Bob and get it ready for Ace?

Dollar Plus. Because Dollar Plus was the activity that was used the most by the class, it also received the most scrutiny and refinement over the course of the research. Areas that went through various changes and modifications were the introduction to the activity, the difficulty levels, the maximum dollar value, and even the type of feedback that was provided (i.e. right/wrong or corrective feedback, or no feedback). In addition, limited use of this activity in Classroom B under the supervision of Mrs. West yielded the same results. Notable among the issues that arose after long-term use of the materials was the time-delay that was programmed into the activity.

> **Investigator:** Would you like it if there's a way that I could allow you to set up different time delays? I know that we ran into trouble because some of the questions were timing out too quickly.
>
> **Mrs. Truman:** If there is a longer wait time, it won't keep some from doing it slower will it?
>
> **Investigator:** No
>
> **Mrs. Truman:** A lot of the commercial programs have a….where you can go in as an option and I want a five second, thirty second… now that may not be bad…if you have a youngster that has physical disabilities overlaid, where it just takes them a while to get their hand over where they want it to be, and it has nothing to do with their mental ability to find the right answer, you may need something where it needs a minute, a minute would be reasonable to make their body do what they want it to do. I don't know whether it would be easier to say, we're just going to make it a minute and if a child responds quicker, then great, but that gives people time, or go in where someone can say, oh, I want sixty seconds, oh I want ninety seconds, I want it to be one hundred and twenty…

After frequent discussion about the Dollar Plus activity and the numerous interactions and features that it contains, the idea of a teacher option screen was introduced. It was decided that placing many of the variables that affected the use of the

activity in the control of the teacher was the best option for the effective use in the class. The result of this was the Teacher Option screen as illustrated in Appendix F.

The Teacher Option screen allowed for greater control of the variables within the Dollar Plus activity and became a valuable innovation for the Project Shop materials. The programming of the Teacher Options Screen into the Dollar Plus activity was the result of various iterations of changes made to the program in the areas of time delay, directions, displaying the dollar value, and when to show feedback.

For practical reasons of time and expense, some features of the Dollar Plus activity could not be modified. Mrs. Truman wanted the video on the program changed so that it would display $5 bills in addition to $1 bills because one of her students had progressed to the point where she was using multiple denominations in the community. In addition, in Classroom B, Mrs. West expressed an interest in having the last dollar run perpendicular to the rest of the bills used to make a purchase, forming a “plus” sign, which is a common practice when using the skills taught in Dollar Plus in the community. However, due to programming and (especially) video constraints, these types of changes were not possible.

Guided Computing

Mrs. Truman initially directed Sandy, a student assistant, to work with the students when they interacted with the software to prevent the “Click Click Click Syndrome.” However, his role and the role of the paraprofessionals evolved into much more. As the study progressed, it was observed and uncovered in the interviews that the most effective use of students’ time interacting with the software occurred when the teacher, paraprofessional, or student assistant worked with the student.

Due to the complexity of all sections of the program, including the login sequence, the story, the video thumbnails and the activities, Mrs. Truman usually had an individual working with each student when they were using the program. The individuals that were responsible for this duty were Mrs. Truman, Mrs. Burroughs (a

paraprofessional), and Sandy, a middle school student who was doing a cooperative internship in the class. At times, Mrs. Truman even had her students view the program with students from one the of the mild disability special education classes. The role of these individuals was not only to ensure that the students were staying on task, but also to monitor their use of each screen to make sure that the students were getting the most out of the instruction that was available.

The student or paraprofessional was also responsible for integrating the computer instruction into the classroom instruction. When the students were practicing the dollar plus method, for example, Mrs. Truman first instructed the paraprofessional or student assistant to guide the student through the login, then directed them to the portion of the program that contained the activity relating to the dollar plus method.

> **Investigator:** How does the interaction work between Sandy and the other students?
>
> **Mrs. Truman:** It's been good, I've had several students come in; he's been one of the better ones, because he thinks about what he's doing, because he goes out of the classroom and thinks about what he's doing.
>
> **Investigator:** Tell me a standard session.
>
> **Mrs. Truman:** For him, he comes in , greets everybody and does his thing--he sets up the program, so he'll work with one person on the program, that may be five minutes or ten, so I might let him do the next dollar (Dollar Plus), and then I'll let the student pick which one that they want to go to next and then he'll go to the table with the play dollar bills and he'll work on that for the next ten minutes--he probably has a student a total of ten to fifteen minutes--and then we switch students, so he does Shopper Bob, focusing on pay to the next dollar, and he's gotten to where he knows what to look for.

By the end of the first week, the students didn't require assistance with basic functions, such as the login and menus. At the conclusion of the study, the primary role of the individual who facilitated the student use of the computer was to help the students with learning specific content issues. As this was the case, paraprofessionals and the

facilitating students needed to understand the learning goals of the teachers so that they could practice the appropriate instructional methods with the students.

Initially, neither the paraprofessional nor the student assistant was entirely effective in using system of least prompts to guide the student through the program and especially the activities. The idea of using a computer in the same way one would do an activity on a tabletop was not familiar to them. In fact, early on both the paraprofessional and the facilitating student were observed telling the students the correct answer. Once while observing Mrs. Burroughs working with Ace on Dollar Plus, I realized that she was not using the system of least prompts effectively. When Ace thought that he was at the right dollar amount, i.e. when he had clicked on the video the appropriate amount of times, he would look back at Mrs. Burroughs and she would nod that he was correct. Therefore according to the program, he was not getting any wrong, but in reality, he was checking his answers with Mrs. Burroughs every time. This had a direct effect on how Ace generalized this skill into the community. The very next day I accompanied Ace and the rest of the class to a grocery store and observed the entire shopping experience. I followed Ace to the register to observe him paying for his items and he executed the dollar plus procedure. He counted dollars until he believed that he had reached the correct amount. Then, just as he had practiced in class, he turned around and looked to me for some assurance that he was correct before he handed the cashier the money. He had learned the procedure in class to the extent that he had begun to rely on the paraprofessional to help him make sure that he had the correct answer. I brought this to the attention of Mrs. Truman to point out the importance of the facilitating individuals using the same techniques with the computer-based activity as they would for classroom-based activities.

Eventually Sandy learned about the technique known as the system of least prompts. When Mrs. Truman worked with Sandy early in the research, she explained to him that he was to let them answer the question and only to give them enough help as was

required to assist them in making the right decision. Sandy had a moment of illumination, when he remarked back to the Mrs. Truman, "Oh, you want them to learn how to do it!"

At the end of the study, which coincided with the end of Sandy's elective class where he worked with Mrs. Truman, he presented her with notes he had about how to work with the students at the computer.

> **Mrs. Truman:** He came in after lunch and he handed me two pieces of paper; "Here are my notes that I want you to give to the next person, from what I have learned on what to do with each of these students," and I looked at it and it said, "Pamela, make sure she's paying attention, don't do anything over ten, watch out…" I was jaw-dropped; he said that he is really upset that someone is coming in and taking his job. So that has been just a really good situation, I have talked to him about the issues of disabilities and the issue of prompting, providing, cueing, wait time, just some basic instructional issues of people who have disabilities. So I think he'll walk away from this with a better understanding of values and understand issues of confidentiality and basic respect and how to interact with someone who may not be real quick to learn something.

Phase 5: Final Interviews and Follow-Up

One of the research questions in this study dealt with how using the Project Shop materials could affect the way the teachers conduct their class. There was no effect on Classroom B, under the direction of Mrs. West, as there was no real use of the Project Shop materials.

On the other hand, the case could be made that the materials had a substantial effect on how Mrs. Truman conducted her class since the software became a key activity in her classroom. Whether it was for learning, primarily using the dollar plus technique in conjunction with practicing the same skills at the table, or for recreation and leisure, where the students were allowed to interact with portions of the program of their choosing, Project Shop became part of Mrs. Truman's everyday routine.

> **Investigator:** How does everything--the videotape and the CD-ROM--tie in with how you already teach these skills?
>
> **Mrs. Truman:** You're fine-tuning me; what I'm doing is fine-tuning what I do--I need to have someone fine-tuning me--is when you teach a lot sometimes you sort of get away from what you've done that works well, because it's hard work to

> keep this stuff going, so I think what I'm doing, basically we do a lot of this stuff already. However, what I am doing is kind of aligning what I teach to go with this program so that it's not a discontinued, there's no discordance…it's continuous form, so that they can go from me working with it here on next dollar and actually practice the physical aspects of them doing...you're using best practice to teach this stuff and I try, and it was really kind of nice to have something keep me more…(unintelligible)

The video of Robbie shopping indirectly led Mrs. Truman to switch to using a flipbook for when her students went out into the community.

> **Mrs. Truman:** …and what we're going to do is next time I get to Wal-Mart I won't buy those Attainment flipbooks that are so expensive, they want like fifteen or twenty dollars a whack for those; you just go to Wal-Mart in the photography department, where you have the little ones… just those cheap ones, dollar each type of thing and just start using that in the shopping. In the past we've just had it on a sheet of paper, put their items on a flat piece of paper, so we need to switch the flipbook as a part of instruction to start and because that's gonna make more sense for some of these kids.

Teacher's Guide

An additional activity that took place in Phase 5 was the creation of a teacher's guide to assist teachers who would be using the Project Shop materials for the first time. This guide was created based on the findings presented in this chapter. (See Appendix C).

Chapter Summary

This chapter discussed teachers and their beliefs about technology integration into the special education classroom. It also addressed how the program features were used (or not used) as part of their curriculum. The Teacher's Guide, created as an outcome of this study, was addressed with a discussion of how research findings informed its design.

Also, this chapter discussed how program content and features were modified through cycles of observation, interviews, and reprogramming. The most frequently used section of the program was the Dollar Plus activity. It was also the activity receiving the most significant software modifications, including a Teacher Options Screen for maximum control over the directions and interactions presented during its use.

Obviously, individual teachers, paraprofessionals or fellow students play a tremendous role in facilitating usage of this program in the classroom. As seen, Mrs. Truman utilized the CD-ROM to the point of everyday familiarity with her students, while Mrs. West largely ignored it. Chapter 5 will discuss individual qualities that lead to usage or nonuse of the program.

CHAPTER 5

DISCUSSION

This chapter will discuss the results of this study and the impact in the classrooms in which the Project Shop instructional materials were integrated, as well as the implications of these results for other special education classrooms. The guiding research question for this study was this: How is interactive multimedia integrated into special education classrooms by special education teachers? To answer this question a computer-based innovation designed to teach community-based instruction skills to individuals with moderate to severe intellectual disabilities was introduced into two special education classrooms. The integration of the materials into Mrs. Truman's classroom and curriculum was a success. In contrast, the materials were not successfully integrated into Mrs. West's classroom. The findings suggest that computer-based training in specific situations can be integrated into the curriculum of a special education classroom of students with moderate to severe intellectual disabilities, but only under certain conditions. In addition to these findings, this study provides guidelines for meeting the instructional goals of special education teachers using computer-based training materials. Based on an analysis of the results, a tentative theory of the interactions that took place in the classrooms is presented.

The format of this chapter revolves around the supporting research questions used to guide this study. Recall that the previous chapter discussed what was found during the course of the study, primarily answering two of the research questions:

- How well aligned are the goals and design of the training materials to existing practice?

- What are the patterns of use by special education teachers as they integrate the materials into their curriculum?

This chapter will first revisit the first of those two questions, and then address the remaining three research questions:

- How do those patterns of use of the materials by the special education teachers relate to existing research on technology integration?
- Can those patterns of use that emerge form principles or guidelines for technology use in community-based instruction?
- Do these materials change the way special education teachers teach?

This study was conducted using a methodology best known as a design experiment. An educational design experiment involves the creation and modification of methods for learning within the context in which they are implemented. The design and implementation are then systematically tested and revised in order to produce a bounded but capable educational innovation (Cobb et al., 2003; Visscher-Voerman, Gustafson & Plomp, 1999). In this design experiment, video and computer-based training materials were designed and developed in order to teach community-based training skills to individuals with moderate to severe intellectual disabilities. The materials were implemented in a special education classroom context that included a community-based skills curriculum. Successive iterations of implementation, observation, interviews, modification, and reimplementation of these instructional materials produced findings leading to the development of principles and a theory that could be applied to future instruction in this context.

This chapter discusses four primary results of this study. First, it will discuss how the program content and features aligned with the instructional goals and existing practice of the teachers who chose to participate. Second, it will relate the technology integration behaviors of the two teachers involved, explaining how the actions those teachers took align with existing literature on technology integration. Third, it will propose a theory

outlining how multimedia instruction designed to teach community-based skills can be used effectively in the classroom of a special education teacher. Finally, this chapter will discuss how this type of instruction changed the way the involved teachers taught their classes. Also addressed in this chapter are the implications of this study, the study's weaknesses, and recommendations for future research.

Alignment of the Goals and Design of the Materials

The overall goal of this study was to generate findings and theories that would contribute to the existing literature on implementing computer-based training applications to help teach community-based skills to individuals with moderate to severe intellectual disabilities. The second goal was to identify specific patterns of use of the Project Shop materials. In order to achieve these research goals, it was important to determine how well the Project Shop materials were aligned to the actual instructional goals of the special education teachers who participated in the study.

This section discusses two questions: 1) How well matched are the skills that were taught in the Project Shop materials to the instructional goals of the teacher? and 2) What are the specific design features of the Project Shop materials that were particularly effective for both the teacher and the students when they made use of them?

The first research question is concerned with how well the instructional goals and the design, both instructional and technical, were aligned to the classroom curriculum where the instructional materials were integrated. The goal of this study was not to evaluate whether or not the Project Shop materials were effective as a learning tool, but rather, how the materials and their specific features were effective in becoming part of a curriculum for teaching community-based skills to students with moderate to severe intellectual disabilities.

The fundamental problem that led to the creation of the Project Shop materials, and the one faced by special education teachers in general, is the inability to teach students in the actual context due to lack of access to the community (Wissick at al,

1999). Even during this study, Mrs. Truman could not get out into the community as much as she would have preferred:

> **Investigator:** How often do you get out in the community these days?
>
> **Mrs. Truman:** We did not go to today, because we had a visit from the special education director. Last week, our bus driver was sick, so we've really not gone out in two weeks. I'm going to sit down and try to make sure that everyone gets out twice a week.

A fundamental premise of the Project Shop effort was that the materials were never meant to replace instruction in the community. Instead, the Project Shop materials were designed to complement community-based skills instruction by providing a motivating and authentic video-based story and interactive software to give students ample opportunities to explore and practice these skills in a safe environment. The materials also provided a simulated community for students in classrooms where the actual community was not easily accessible. In this respect, the Project Shop materials were a success.

> **Investigator:** Project Shop was my example of technology integration of this type of software into your class; what do you think about this technology integration into your curriculum?
>
> **Mrs. Truman:** I think it's great. You've seen the problems I've had getting out into the community.
>
> **Investigator**: Do you think it's great because it pulls the community back into the classroom.
>
> **Mrs. Truman**: With my kids, it's the support to what we're doing out there, rather than the preparation for what we're doing out there. I flip it. Now for someone like Renee, she may use it as an instructional tool prior to going because as you move up into normal intelligence you can make that leap.

Alignment of the Goals of the Project Shop Materials

According to Mrs. Truman, her instructional goal related to shopping skills was that her students be adequately prepared to go into the grocery store by themselves to buy one or two items, perhaps while a parent waited outside in the parking lot. Her students

were at an age where she did not consider it important for them to be able to plan and execute an entire shopping trip by themselves-- she was not aware of any individual of middle school age who should be prepared for going on a shopping trip by themselves. Instead, she could make better use of software to prepare her students to enter a store, find one or two items, and pay for them at the checkout. The majority of the Project Shop materials were designed to teach these skills. According to Mrs. Truman, the computer-based materials met her instructional goal. This is supported by the fact that she used the materials for instruction in her classroom almost daily. At the conclusion of the data collection phase of this study, I asked Mrs. Truman for her opinion on how well the materials meshed with her curriculum.

> **Investigator**: How well aligned are the training materials to classroom practice?
>
> **Mrs. Truman:** Depends on what that teacher is focused on, but in terms of best practices, you've aligned it. In the broader sense, this is assistive, this is an instructional tool.
>
> **Investigator:** How much have you been using the program lately?
>
> **Mrs. Truman:** Pretty much daily.

In contrast, Mrs. West's instructional goals for her students were different. Her students were high school age. Most of her students had already mastered the shopping skills that were taught in the Project Shop materials. What she intended for her students was that they would be able to seek employment upon graduation at several different types of locations, one of which was a grocery store. There were only two pages of content in the Project Shop storyline that addressed vocational issues matching her instructional goals — bagging groceries and stocking shelves. In addition, because her students were able to spend three days a week in the community practicing their vocational skills, she believed that it was not necessary for them to use the materials. Therefore, while a small subset of the instructional goals of the program matched her

instructional goals for her students, she did not actively use the materials to any extent. A more detailed account of Mrs. West's non-integration is presented later.

Also important were content features of the program that were intended primarily for instruction but saw the bulk of their use as recreation and leisure. Students viewed the storyline and video exemplars when they were allowed to interact freely with the program during recreation and leisure time. While these features were not a part of the instruction as defined by Mrs. Truman, they demonstrated many best practices for incidental learning on trips to the grocery store while also providing an enjoyable experience for the students.

There were many aspects of the content of the computer-based materials which allowed them to be integrated into Mrs. Truman's existing instructional practice. Many of the program's internal and data tracking features were either designed to be part of the original design or were added as a result of many design iterations stemming from collaborative design conversations between Mrs. Truman and me.

Due to their content, the activities that were used most frequently by Mrs. Truman and her students were the Dollar Plus and Match to Sample activities.

> **Investigator:** The part of the program that they're using, what's the majority of what they're doing?
>
> **Mrs. Truman:** We've focused on the pay to the next dollar (Dollar Plus) and in looking for items (Match to Sample).

Dollar Plus was used almost daily in Mrs. Truman's class since this computer-based activity was directly related to a previous activity in her class where the students worked with a teacher, paraprofessional, or student assistant to practice the same skill with actual currency. (For the rest of this chapter, the individual who worked with the student--the teacher, paraprofessional or student assistant--will be referred to as the facilitator, except in cases where the distinction between them is important.) This non-technology-based activity consisted of a fictional price for items written on a hand-held dry erase board. Working with the facilitator, the student put down the proper amount of simulated dollar bills. The advantage of using the computer-based activity was that the

students could hear a variety of expressions to present a price without seeing the value in a more photo-realistic setting.

No classroom activities were similar to the Match to Sample activity. However, the discrimination methods that took place on the computer were very similar to those techniques that were used when the students traveled out into the community. These techniques included using a flipbook to match a picture of an item to the actual item on the shelf.

The software's other activities were used by the students for recreation. Evidence from these episodes suggests that students gained incidental learning from working with the materials during their leisure time, occasionally transferring this learning to a community setting. For example, Mrs. Truman reported that Lindy was able to generalize what she learned in a community setting merely by interacting with the Picking a Line activity. In fact, she pointed out to Mrs. Truman what she had learned. Without any direct instruction using this activity, Lindy was able to apply the learning to the community. It's important to note that Lindy *chose* to work on this activity when she had free time.

Design of the Project Shop Materials

This section describes the features of the program that facilitated the presentation of content, including directions and feedback. Also, it discusses several supportive and unobtrusive software features, such as record keeping and the Teacher Options Screen, that were designed to allow more customized instruction with the computer-based materials.

It is important to note that other examples of computing in the special education classroom use similar innovations to those discussed in this study. For example, Fuchs and Allinder (1993) describe how these types of computing components could be applied in classrooms of students with mild intellectual disabilities. However, a unique aspect of the research reported here is that it primarily involves students with more severe intellectual disabilities than those in the studies reviewed by Fuchs & Allinder. This

distinction is important because in the literature detailing the use of computer-based instruction to teach community-based skills to individuals with moderate to severe disabilities, these features of computer software are rarely, if ever mentioned.

Directions. The Project Shop software contained detailed directions, mostly audio, but some via both text and audio. Audio was used primarily instead of text because of the projection that the majority of the students using the program would not be able to read. With the students' disabilities in mind, the directions were designed to be as clear as possible, with each activity including a modeling behavior where the desired skill was demonstrated before students attempted it. All of the directions proved to be valuable to the students. Unexpectedly, the directions were also very valuable to the facilitator working with the student seated at the computer because the facilitator was often unfamiliar with each activity's specific guidelines. Thus, the software's model aided both students and facilitators.

> **Mrs. Truman:** The modeling depends on the level of the student. Lindy could deal with the modeling better than Pamela. Having it in there is not a bad thing but it also provides…when I was first doing it, I didn't know how to do the activities and Shopper Bob showed me what I was supposed to be doing, so it was also an orientation.

Because the majority of the directions were audio-based, the teacher was able to hear what was occurring at the computer from other areas of the classroom. If the student was not using the program effectively--either alone or even with a facilitator--Mrs. Truman would intervene.

Feedback. Similar to the directions, feedback to questions or assessments in the computer program were an important consideration when the software was originally designed. Feedback was designed with two purposes: First, the feedback informed the student as to whether a given response was correct or not. Second, when the student was not correct, the feedback included a model of the correct answer or behavior. In this way, the software attempted to mimic instructional prompts used in traditional teaching methods promoted by special educators. According to Westling and Fox (2004), the goal

of instruction is to gradually eliminate the use of prompts so that the learner can respond with the correct behavior to the natural stimuli in the actual environment, an idea similar to scaffolding in problem-solving environments (Collins, Brown, & Newman, 1989) ; Choi & Hannafin, 1995). An example of this type of feedback delivered in computer-based instruction is the work of Ayres and Langone (2003), who studied the use of a purchasing simulation in which an animated cashier provided feedback to students about whether or not they had paid the correct amount.

Several issues arose with the model of incorrect feedback used in the Project Shop materials that required serious consideration. In the Dollar Plus activity, the feedback actually became a hindrance to the learner due to the length of time that it took the computer to model the correct answer, particularly at high dollar values. In these instances, the user was forced to watch a video which showed a hand paying the total dollar amount. This issue led to a modification that became part of the Teacher Options Screen that allowed the teacher to determine the type of feedback beforehand. (This adaptation is addressed later in the chapter.) In addition, it became apparent early in the study that a facilitator was needed to work with a student because Project Shop's feedback was limited in the ways it could prompt the user to identify the correct answer.

Record Keeping

In another study using computer-based instruction with video to teach shopping skills, Wissick et al. (1992) suggested that the power of the computer was not being fully utilized in maintaining data collection and record keeping of the progress of the students using the program. Drawing upon these findings and using the capabilities of the Project Shop development team, the Project Shop software was programmed with the capability to store user records. Record keeping is a common feature of computer-managed instruction (Heinich et al., 2002; Roblyer, 2003) but discussion of its application to a special education audience is limited (Fuchs & Allinder, 1993; Lindsey, 2001).

Login. In order for the data tracking to function correctly, a means of uniquely identifying each student using the program was needed. However, the login screen had to be designed in such a way so that individuals with special needs could successfully interact with it. Assuming that students who were functionally illiterate could still identify their own names, one modification included extra large text. This allowed for easier viewing and made it simpler for a user to click on his or her name using either a mouse or a touch sensitive screen.

As was discussed in Chapter 4, many students logged in under multiple similar names or did not log in with their own names. In other cases, the facilitator logged in using his or her name instead of that of the student. These actions caused problems because the program was designed to store the last level of difficulty achieved by specific users, and logging in under the correct name was essential in order for users to resume at their previous level of difficulty. Simply put, it was important for students to log in with their own names.

Records. Mrs. Truman rarely viewed the data of her students' interactions that were automatically recorded by the computer. However, she stated that maintaining records of students' progress as they interacted with the activities was extremely important. This feature allows teachers to determine when and how often students worked with the activities. When analyzed over time, the files could also reveal flaws in particular stimuli presented in the program. In theory, if there is a trend in which all students respond incorrectly to a certain price in Dollar Plus, or if there is a certain cereal item that students repeatedly are not able to match correctly in Match to Sample, then the teacher would know that the student needs more help or practice in that activity. Similarly, from the point of view of multimedia design, such data would point to areas of the program that need to be revised or refined in future editions of the program.

Teacher Options

It became important during the study to provide the teacher with a way to control many of the features in the program. Features were included to allow the teacher to modify various aspects of the Dollar Plus activity, including maximum trials, time delay, difficulty (price range), and type of feedback (modeling, no modeling, or no feedback). These features were added to the program after many collaborative iterations and meetings with Mrs. Truman. They allowed her to control specific areas of the Dollar Plus activity to suit the individual needs of her students. The Teacher Options Screen was only accessible to Mrs. Truman or another facilitator through a hidden, unobtrusive command (i.e. pressing CTRL-F12 on the keyboard).

Summary

Many of the software features that were designed and explored in this study were not unique. Indeed, these features would be included in any well designed computer-based training where monitoring individual user completion and mastery is important. A learner audience consisting of individuals with moderate to severe intellectual disabilities required a much higher different level of design challenge and complexity, however. Specifically, these features needed to be designed and programmed to guide and inform not only the student, but also the individual responsible for working with the student.

Technology Integration

This section will discuss how the teachers' views of technology and technology integration were associated with the existing technology integration literature. It also addresses how those views could have played a role in their integration of the materials. The technology integration practices and beliefs of both teachers who participated in this study will be compared to trends and patterns of technology integration in the literature.

Why was Mrs. West a Participant?

Given Mrs. West's lack of interest in using the Project Shop materials, it is fair to question why she was chosen to be a participant in the first place. Mrs. Truman's class

provided an ideal environment for this experiment. She had trouble finding opportunities to take her students out into the community. In addition she was very willing to integrate the Project Shop materials into her curriculum.

In contrast, Mrs. West's class had few if any barriers to community access. Nevertheless, in the beginning of the study, Mrs. West was very receptive to using the Project Shop materials in her classroom. She was already aware of their instructional goals and had been briefly exposed to them in their development stage as a student teacher in a classroom where a usability study was conducted on an earlier version of the materials.

As part of the research in Phase 2 of the study, she sat down with me and went through the program. After she was introduced to the activities, she acknowledged that some of the activities would be easy to master for her higher ability students, but she still felt there were students in her class who could benefit from using the materials. The study continued in her classroom for another week until her classroom methods and a trip to the community focusing on shopping skills were observed. In the two instances where the Project Shop materials were used during this time, I served as the facilitator for the students, and Mrs. West did not participate in any of the interactions. There was no use of the Project Shop materials when I was not present. In fact, as mentioned in chapter 4, Mrs. West rarely made use of the computer at all in her classroom for any type of instruction.

> **Mrs. West**: We don't use the computer much because we're always (as you've seen) only in the classroom for like an hour in the morning before we go into the community four days a week, and then the one day that we're needing the classroom, we're needing to address our cooking skills and things that take a long time. So we utilize our classroom materials more than we do the computer. I would like to use the computer more.

In Phase 2 of the study, at my suggestion, one of the students, Garth, sat down at the computer accompanied by me to work with the Dollar Plus activity and the Match to Sample Activity. He was successful in navigating the two less difficult activities in Match

to Sample (Cereal and Frozen Pizza) but had some trouble with Soups, the most difficult category in Match to Sample. In the lower levels of Dollar Plus, he showed some success, but had less success when the dollar value was high. In fact, the teacher option to limit overpayment was added primarily because of his difficulty in coming up with the correct dollar amount.

I reported these observations to Mrs. West—she had always acknowledged that Garth would be the best candidate for the use of the Project Shop materials–and left Mrs. West left with a copy of the CD to use at her convenience. However, during our final meeting to discuss the project, she reported that she had not used the materials. Mrs. West's lack of integration of the materials was not entirely understood. It is clear she had a student who could practice with two of the activities and she herself recognized the potential benefit to this student. There was also content covered in the materials that other students could benefit from, such as vocational skills, which were a primary focus of her instruction. However, she clearly did not intend to use either the Project Shop videos or software.

As discussed in the previous chapter, the two cooperating teachers had different experiences in integrating the Project Shop materials into their classroom curriculum. Mrs. Truman used the videotape sparingly, but made the CD-ROM materials part of her daily routine for both instructional and recreational purposes. On the other hand, Mrs. West's schedule was fixed and rigid, with few changes from week to week. The most probable reason why she was not compelled to use the Project Shop materials was that she had as much access to the community for her class as she wished.

> **Investigator:** Do you think your kids' age had anything to do with why this software wasn't used?
>
> **Mrs. West:** Probably, because they've been getting this kind of instruction for years; that's why I've cut back on shopping skills instruction and have shifted the focus to the vocational aspect of our community experiences because they've demonstrated to me that they can find items in the store. They know how to choose the correct line; they may need some assistant in presenting the money

more quickly, and those are things that we work on that one day a week, but I feel that they've had so much experience in that they are much more successful--they're all pretty successful.

Investigator: Not really age appropriate?

Mrs. West: I would say maybe it would be more appropriate in a middle school or a high school that doesn't have as much access to the community or doesn't have as much experience with the skills. There may be some high school students that haven't worked on this very much.

In contrast, the following statement by Mrs. West supports the idea that the dominant reason she did not use the materials was that she and her students had nearly unlimited access to the community:

Investigator: You guys go into the community four days a week; what if you were not going into the community four days a week?

Mrs. West: Then we'd probably do more simulation-type stuff.

Mrs. West did not view the videotapes with her class or use the CD-ROM materials with her students when I was not present. Through observation of her class and through interviews, the findings suggest five reasons she did not use the materials:

1. According to Mrs. West, the computer in her classroom was rarely if ever used for instructional purposes by the students.
2. In general, videotapes in her classroom were almost never viewed by her students. When used, it was for entertainment only.
3. Mrs. West believed that the instructional goals of the materials did not fit with her classroom curriculum. Many of the skills taught on the CD-ROM had already been mastered by her higher-functioning students. In addition, her instructional focus was on vocational skills which made up only a small portion of the Project Shop materials.
4. The third segment of the videotape dealt with vocational skills, which was well suited to what she was teaching; however, she said she was not initially aware of this segment.

5. Because she was able to take her class into the community four days a week, simulating community-based skills on the computer did not appear to be necessary.

Liu et al. (1998) suggest that effective strategies for technology integration should emphasize how computers are needed to achieve an explicit instructional goal. Also, Clark (2000) found that teachers often based their technology integration behaviors on whether or not they believed the available software would be beneficial to their students' success. In Mrs. West's case, she believed that the software was not necessary for her students to improve their functional community skills. She had virtually unlimited access to the community and as a result came to believe that the use of the Project Shop software was not necessary. An ideal setting for teaching community-based skills is in the community (Hughes & Agran, 1993) and integrating the Project Shop materials may actually have interfered with time that she could have spent in the community. Other than a few exceptions, such as the example related to Garth, Mrs. West's classroom possibly provided an example of a classroom situation where technology integration using a specific innovation (i.e. Project Shop) is not necessary. However, it should not be overlooked that opportunities provided by the Project Shop materials could benefit even classes that have a high level of access to the community. For example, in a real store, a teacher could not manage or implement the progressive discrimination skill technique (a skill taught in the Match to Sample activity) as easily or effectively as the computer's shopping simulation given the logistical and time hurdles.

It is important to identify the level of technology integration or adoption by both teachers in this study using accepted models or levels of adoption addressed in the literature. Hooper and Rieber (1995) offer a five-step model of technology adoption in the classroom. These five steps are: Familiarization, Reorientation, Integration, Utilization and Evolution. In this hierarchy of adoption, familiarization refers to when a teacher is first exposed to a technological innovation in a workshop, training session etc.

At the other end of the model is evolution, where the teacher does not consider technological innovations and the classroom to be separate entities, but rather considers the classroom to be a constantly changing environment where methods, teachers and students synergistically intertwine to meet new innovations of learning.

Both of the teachers in this study fell in between these two levels of adoption. Mrs. West is a prime example of technology adoption at the Utilization level. In this level of the model the teacher is willing to try out an innovation in the classroom soon after becoming familiar with it or trained in its use. Hooper and Rieber suggest that teachers at this phase are not committed to the innovation and will discard it if any problems arise. They also suggest that if the technology were taken away one day, its absence would not cause a problem the next. Mrs. West gave the technology a try, and chose not to use it. In fact, when I removed the technology from her classroom, there was no effect and she did not request a copy of it after the study had concluded.

Mrs. Truman fit into the adoption level of integration. This level is exemplified by what happens if the technological innovation is removed from the classroom. When this occurs, the teacher is required to modify his or her teaching plan. By the end of this study, if the Project Shop materials were removed, Mrs. Truman would have had to readjust her teaching plan to replace the role that they filled in her class.

Project Shop Integration and its Relation to Existing Literature

This section of this chapter specifically addresses research question 3: How do those patterns of use of the materials by the special education teachers relate to existing research on technology integration?

A great deal of research exists on the integration of computer-based technology into traditional classrooms. However, little literature deals specifically with technology integration into the special education classroom and the characteristics and attitudes of the teachers who are in charge of this technology integration. A discussion of how the special education teachers integrated technology into their classrooms and how their

practices relate to research on integration into the traditional classroom is important in finding any common themes between the two different classroom environments. The idea that research on technology integration into traditional classrooms can be applied to the special education classroom is valuable, if only due to the amount of existing literature that already exists in that area.

This study provided evidence to suggest that the literature on technology integration can be applied to the special education environment, specifically in the area of moderate to severe intellectual disabilities. Concepts in the technology integration literature that apply to both the traditional and special education environments include availability of technology, teaching style and beliefs, teaching experience, and technology skills. This section will deal with integration of the computer-based Project Shop materials in special education classrooms, beginning with the videotaped portion.

Availability and Support

Mrs. Truman did use the videotape for classroom instruction. However, this occurred only once. According to Mrs. Truman, the lack of a monitor and videotape player in her classroom were directly related to her not showing the tape more frequently. This equipment was available to her, but not easily accessible. Whether or not Mrs. Truman considered the content on the videotapes to be valuable to her students was not well addressed in this study, most probably because I found myself more focused on the integration of the CD-ROM software.

Both teachers had computers in their classrooms. Many studies have shown (Jaber & Moore, 1994; Mathews & Guarino, 2000; Van Braak 2001) that readily available technology plays a role in whether or not teachers will integrate it into their curriculum. Because there was a computer available in Mrs. Truman's class, it provided her an opportunity to use the computer-based training materials frequently. Given the nature of her classroom and the special supervisory requirements of her students, it would have been difficult for them to have used the computer more if they had to relocate to another

room. Clearly, having the computer in her classroom played a large role in how Mrs. Truman decided to use the materials. Mrs. West had both a computer and the capability to show the videos in her classroom. Even though the Project Shop materials were rarely used by Mrs. West, it is likely they never would have been used if there had not been a computer in her classroom.

Teacher Style and Beliefs about Technology

Research has shown that when it comes to using computers in the classroom, it is the teacher who decides what is used, how it is used, and how often it is used (Bowman, 2001; Niederhauser and Stoddart, 2001). This was certainly true in this study. Both teachers initially agreed to use the materials that were provided, yet only one, Mrs. Truman, chose to do so. There were many reasons for this. First, the community was not easily accessible to her students due to classroom and community scheduling conflicts. Consequently, she was not able to frequently practice the shopping and literacy skills in the community. She was eager to take advantage of an opportunity for her students to practice shopping skills in a visually realistic computer-based environment. Second, her teaching style was (in her own words) flexible, and she was easily able to adopt the software training materials into her classroom curriculum and make them part of her daily instructional routine for her students. This fact is consistent to the evidence reported by Richardson et al. (1991): The computer is integrated more effectively when it becomes a part of the regular classroom routine and is not considered to be a separate entity outside of the normal curriculum. Third, another important technology integration principle, noted by Lowther et al. (1998), was evident in Mrs. Truman's class: her instructional goals matched those of the Project Shop materials. As a result, Mrs. Truman did not need to adapt her teaching style according to the design of the materials, nor did she need to unnecessarily force the materials to fit into her classroom practice.

Even though Mrs. West was enthusiastic about the Project Shop materials, her classroom methods were not as flexible as those of Mrs. Truman. When Mrs. West's

students were in the classroom, clear steps and procedures were mapped out in advance for them and posted on the wall. The findings here do not provide any evidence that Mrs. West's teaching style was unreasonably inflexible. As stated above, several logical reasons can explain why Mrs. West chose not to use the computer-based materials, and those reasons must be weighed against any discussion about her teaching style. Studies suggest (Clark, 2001; Liu, 1998) that some teachers simply do not feel that a given technology is necessary or effective.

Teaching Experience

Mathews and Guarino (2000) suggest that teachers with more years of actual teaching experience are more likely to use technology in their classrooms. Becker (1994) also supports this point. Mrs. Truman has been teaching students with intellectual disabilities for over twenty-five years and has a reputation for being receptive to new instructional methods to meet her students' learning goals. Mrs. West provided various significant reasons as to why she did not need or want to use the training materials, but it should be noted that she is a new teacher without much experience, only in her second year of teaching students with intellectual disabilities.

Technology Experience

Mrs. Truman had considerable knowledge of computers and was comfortable with using them. Becker (1994) defines an exemplary technology-using teacher as one who is comfortable with technology and has considerable teaching experience. Mrs. Truman was very willing to use computers in the classroom and did not have to treat them as something outside of her curriculum. Pierson (2001) suggests that teachers with greater computer ability can more easily integrate them into their classroom practice. Many studies affirm that teachers' abilities with computers affect how they integrate technology into their classrooms. Evidence from this study supports this—Mrs. Truman's technology ability was certainly a factor in her ability and willingness to integrate technology. In fact,

both teachers reported that they were competent in using technology, in part due to their experiences with assistive technology.

Technology integration is an important area of future research in the special education classroom. Technology integration research that has been conducted in the traditional classroom generalizes well to the special education classroom.

Integrating Instructional Computing in the Special Education Classroom

Research question four asked this: Can those patterns of use that emerge form principles or guidelines for technology use in community-based instruction? When considering the role of video instruction, this study provided no meaningful evidence of any new principles or guidelines. However, it does suggest several interesting possibilities about the computer-based instruction in the special education classroom. Among these are relationships between the computer-based instruction and the existing classroom learning activities. Also of note is how the teacher, students, and the computer all interacted with each other. The findings here suggest that certain principles can address the future use of computer-based activities specifically designed to teach community-based skills to students with moderate to severe intellectual disabilities. The remainder of this section presents an initial theory to help understand how students and facilitators should work together to make learning with the computer effective and enjoyable.

The Community, the Classroom, and the Computer

Mrs. Truman's style of instruction in her classroom resulted in much data on how to use computer-based instruction to teach community-based skills effectively. In this study, Mrs. Truman used a combination of community and classroom instruction--including computer-based materials--to teach her students community functioning skills. Findings in literature also suggest that these methods are effective in teaching community-based skills (Mechling, Gast, & Langone, 2002; Wissick et al., 1992). In a study that compared simulated community instruction, community-only instruction, and a

combination of simulated and community instruction on consecutive school days, Cihak, Albertoa, Kesslera, & Taberb (2004) found that the combined instruction method allowed for better generalization than either individual technique.

The findings of this study suggest that prior to any instruction using computer-based materials; the teacher should be familiar with both the content and features of the computer-based instruction. After familiarizing herself with the program, the teacher should then familiarize the students with the community setting related to the content presented in the computer-based instruction for the greatest chance of success. Mrs. Truman felt that it was important for students to understand clearly that the actual community setting was the foundation of the instruction. For this reason, she explicitly made sure that the students understood that the actual community was the point of reference as they used the computer-based materials.

> **Mrs. Truman:** I use the community as my primary foil…in other years…I've been in jobs where I was in the community total; that was my primary location of my instruction and we spent some of the time in the classroom, so I really see community as the primary focus of this type of instruction, and then you come in the classroom and practice what you experienced out there and because you went out there what you did in the classroom makes sense because you can relate it back. I think for a child with moderate intellectual disability if you don't…if you have not actually experienced it in a real setting, then coming back with play money and white marker boards and that sort of thing has no meaning other than an activity with play money and white marker boards. You have to make the connection to the real activity and they have to have an opportunity to take it and do it in that real activity, but I have learned that if you can do it out there than you can support it back here. That makes sense to me.

To summarize, the computer materials become the primary focus of the teacher or facilitator only after the teacher is adequately familiar with the materials and students have had sufficient experience going into the community setting to practice the shopping and literacy skills. The model that was inspired by the interactions that took place in Mrs. Truman's classroom is shown in Figure 5.

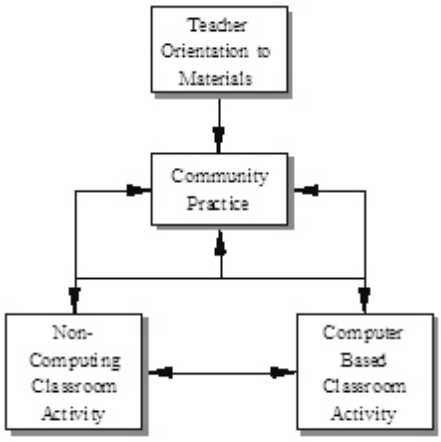

Figure 5. Model of the classroom and the computer interaction: After their introduction to the materials, teachers familiarize their students with the community before using the computer-based and classroom activities.

Mrs. Truman's approach is in keeping with the type of training described in the literature. Haring et al. (1987) describe the effectiveness of using the community with videotaped instruction of community skills. The procedure followed by Kyhl et al. (1999) when researching the effectiveness of videotapes also placed the students in the grocery store before the videotape instruction was used. Wissick, Lloyd, and Kinzie (1992) researched the effectiveness of a computer-based instructional package to teach shopping skills to individuals with moderate disabilities. Their findings suggested that if had they begun their training in both the community and classroom setting at the same time, less time would have been needed by students to generalize skills learned in the classroom to the community. The reason for this, they believed, was that the students would have been

better able to associate what was learned in the classroom to the actual community setting.

The importance of the specific interaction between students, teacher/facilitators, and the computer can not be underestimated. Obviously, even a perfect computer program would fail if not properly accessed, communicated, or understood. Therefore, it is important to understand the balance between the computer and the facilitator in guiding the instruction.

In the case of the Dollar Plus activity, the computer instruction was used in conjunction with the classroom activity mentioned above, using the dry-erase board and simulated currency. These activities were alternated in the classroom practice. By handling simulated currency at a table, a learner was able to physically practice the motions required to pay for an item. However, by working at the computer, the student was able to practice paying for items while hearing a variety of different voices and prices presented in different formats. For example, "That will be one dollar and sixty-seven cents" as opposed to "That's a buck-fifty two." Additionally, by modifying the program via the Teacher Options Screen, students could practice paying for items when they could see the price, when they couldn't see the price, or at gradually increasing dollar values.

Facilitating Student Interaction with Instructional Software

In their research with the Wazzou Widgets, Miller, Brown & Robinson (2002) detail the use of Internet-based learning objects in a classroom of students with mild intellectual disabilities. They argue that the effectiveness of their instructional materials was maximized when teachers mediated the interaction of the student and the computer. This truth was also evident in the ways in which the Project Shop software was used by Mrs. Truman. Many studies reported in the literature, (e.g. Langone, Shade, Clees, & Day, 1999; Mechling & Gast, 2002; Mechling, Gast, & Langone, 2002; Mechling & Langone, 2000; Norman, Collins, & Schuster, 2001; Wissick, Lloyd, & Kinzie, 1992), discuss in depth the effectiveness of using instructional software to teach students

community-based skills. However, there has been no strong emphasis in their research on how facilitators should work with individual students at the computer. In addressing this theme, Wissick, et al. (1999) offer the following:

> "within the classroom, the teacher may choose to work with students individually on the simulation or have peer tutors work with students. The use of multimedia simulations can provide an environment for interaction with peers in an age-appropriate setting. Instead of replacing human contact, technology applications should provide age-appropriate instruction and increased interaction with peers and community members." (p. 244).

They address the need for future research on discovering successful combinations of these factors with the ultimate goal of creating learning environments that would include peers and teachers.

In this study, the interaction that took place in the classroom when students were working on the computer-based training with facilitators played an important role in how the Project Shop materials were integrated into the community. The model is depicted in Figure 6.

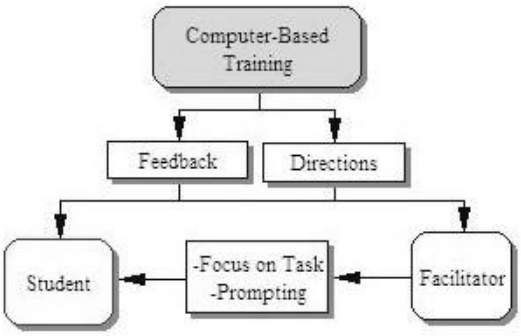

Figure 6. The role of the facilitator. The facilitator and the student are guided by the computer-based training. The facilitator also prompts the student and keeps him or her focused on the task.

This model is based on interactions from the classrooms in this study when a student was learning about a community-based skill from computer-based instruction. In this situation, they were accompanied by a "knowledgeable other" whose role was not only to keep the student focused on the task, but also to assist the student in learning the various skills required to successfully complete activities in the training through instructional prompting (Westling & Fox, 2004). This knowledgeable other (facilitator) was typically one of three individuals: the teacher, a paraprofessional who works in the classroom, or a student who has more ability with the computer and the subject matter being presented. In this study, the paraprofessional who worked with the student was Mrs. McDonald, and the student who served as the knowledgeable other was Sandy, a middle school student who chose to work with Mrs. Truman and her students as an elective requirement.

Keeping in mind the special education setting, this model of interaction functions under the assumption that a student is not typically able to work effectively with a computer without the guidance of another individual:

> **Mrs. Truman**: If you put the student by themselves it becomes recreation instead of instruction. One thing you might want to point out is you can use something like this with someone who doesn't have a lot of training. Sandy can sit down; he was comfortable enough with the computer that he could load it in, I could show him what I was looking for, teach him a little about how to deal with error correction and how to know when you've had enough, and how to stop an activity. When you as the teacher person bring a close to the activity rather than the student jumping up…you maintain control of the activity, so something like this--the structure in it--you don't have to have a lot specialized skill, whereas if you were sitting down and doing paying to the next dollar, you couldn't do that unless you teach them, which I did. But this is one where it basically makes sure the child uses the computer program.

The facilitator has to have at least a little bit of knowledge about how to guide (prompt) the learning of students with special needs, but does not need to have expertise in teaching students with intellectual disabilities.

Facilitator

The facilitator is responsible for listening to and observing the guidance presented by the computer-presented directions and computer-generated feedback to ensure that the student uses the program in a way that promotes effective learning. In addition, he or she is charged with keeping the student focused on the learning task. According to Choi and Hannafin, (1995) facilitation in student-centered learning can include modeling, guiding, and scaffolding. These activities are equally important in the special education classroom, particularly guiding.

Focusing on the Task. As evidenced in an earlier quote from Mrs. Truman, a primary goal of the facilitator is to make sure the student stays seated at the computer and stays focused on the task at hand. In her classroom, this was necessary for both computer-based instruction and other classroom-based activities. The students appeared to be accustomed to this type of supervision when engaging in any learning activity, computer-based or otherwise.

Prompting the Student. Ensuring that the student is learning effectively from the computer-based training was important in this study. Facilitators needed to work with the student and the computer-based training to ensure that the student was actually learning from the interactions, not merely going through the motions directed by the computer.

Mrs. Truman placed a lot of value on her student assistants as described in the exchange below:

> **Mrs. Truman:** And that's the one where I want someone sitting with them when they do that so that they don't practice it wrong, where if it's wrong, they can step in and say, "That's wrong," and give that cue to them, "that's wrong," because the computers going to pop-up another one and maybe give them the same one over again, but they didn't get the thing, "no, you didn't count it right," so having a peer tutor, whether it's another staff member or whether it's a student.
>
> **Investigator:** Do you think that this is going to be the case that every class that this is used in like yours is going to be side-by-side with a teacher or a parapro? Is that always going to be the case that the first time that they use it, there's going to be somebody with them, and then sort of eventually wean them off?

> **Mrs. Truman:** I think so. Oh yeah. I think the value of this to me is independent, as you've probably noticed for me to instruct it's one-on-one, two-on-one, you know, that kind of thing. If you have a class of six, the first thing I teach students is how to take a break. So if something like this comes up, some sort of emergency, "take a break," and they go do whatever they want to do, and they know the things they can get into and they know how to act, very valuable skill--take a break. And also, I teach independent work, they know how to do things independently.

Levels of Facilitation in this Study

Evidence from this study suggests three levels of facilitation are necessary when assisting an individual in using computer-based materials. First, facilitators need to act as a guide for students as they learn the basic program features, such as logging in to the program and navigating within it. Second, they need to facilitate the student in mastering more specific program controls or methods required for interacting with specific learning activities. Third, once the student has mastered all of the computer features from basic to activity-specific, the facilitator needs to help the student learn the activities' specific skills, encouraging the student to stay on-task while providing learning prompts.

For students to effectively use computer-based training, they must first become comfortable with the program itself. In other words, the student needs to be able not only to understand the visual layout of the program, but also to understand the program's navigational functions. These can include interacting with menus, navigating from page to page, and logging in and out of the program. After this level of familiarity is achieved, the facilitator then needs to help the student understand program features unique to a specific learning activity.

The level of interaction with any particular activity is more complex than general navigation. In the case of Project Shop materials, the activities all present different type of interactions, such as dragging and dropping, clicking on specific items, clicking on buttons unique to each activity, and following multi-step procedures.

Once the student can successfully navigate the program and follow procedures to complete tasks required in each activity, the role of the facilitator changes to that of a

teacher. Here the goal is not only to help the student work with the program, but also to facilitate the student's learning of the materials presented in the program.

Throughout all of these levels of program interaction, the facilitator is responsible for providing instructional prompts that enable the learner to master the material. The level of the facilitator's guidance of the student using the computer-based training materials must be weighed against the computer's ability to provide similar levels of facilitation. Much research has been conducted on the type of prompting needed to help students with intellectual disabilities.

Two techniques that have been used to guide students at the computer are constant time delay (CTD) and the system of least prompts. CTD is a method for teaching skills to individuals with moderate to severe disabilities. According to Westling and Fox (2004), constant time delay is a four step process: 1) Provide an *attentional cue* (e.g. "Are you ready?"); 2) Present a *task direction* (e.g. "select an item"); 3) After the direction, there is a *delay period* of a few seconds which is then followed by; 4) A *controlling stimulus* that should result in completion of the behavior by the student. This controlling stimulus can be a verbal cue, a gesture, or a physical prompt, anything that directs the learner to complete a task presented in the directions. Initially, when the student is new to a task, the controlling stimulus can be applied immediately without delay. However, over time, if the learner can not complete the task direction, a time delay is given, and when that time expires, the facilitator provides the controlling stimulus.

System of least prompts (also known as least to most prompting) is based on the premise of constant time delay with the additional procedure of providing an increasing level of prompts, going from the minimum influence to maximum influence. This maximum influence is the same as the controlling stimulus in constant time delay (Westling & Fox, 2004) and is used for teaching skills that involve a variety of steps, as opposed a singular task or skill.

The facilitator in the study by Mechling and Langone (2000) used the system of least prompts with the participants as they worked with a program which used digital and embedded videos to teach functional communication skills to students with severe intellectual disabilities. The prompting progression in this study was verbal prompts, verbal prompts and pointing, and then verbal prompts with physical gesturing. In a similar study where the participant was using computer-based training, Mechling and Gast (2002) used constant time delay to facilitate the student, applying an instructional intervention designed to teach individuals how to locate items in a grocery store by reading words on aisle signs.

Computer as Facilitator

Another important issue in this discussion is the role that computer-based training can play in facilitating the learning of an individual with special needs using the methods described above. After all, a computer-based training program, such as the Project Shop materials, can easily be configured by the teacher to control the delays for constant time delay, presenting feedback in a way that can model the correct behavior for the student. It can even be configured to allow a teacher or facilitator to exert complete control over the exact length of the delay or if that delay is used at all. (See Appendix F for an example of a Teacher Options Screen.)

The computer has the capability —as seen in the Project Shop materials used in this study — to provide learning skills training and appropriate sustained guidance with directions and feedback. For Project Shop, the initial purpose of the directions and feedback programmed into the training was to guide for the students. However, when the program was used extensively in Mrs. Truman's class by her students and facilitators, it became apparent that these directions were serving both the learner and the "helper." It also became apparent that there was much more to the role of the facilitator than just keeping the students on-task.

It is difficult to program computer-based training materials to follow methods such as the system of least prompts. The capabilities of a computer program to provide context-sensitive, on-time guidance can only be realized with a great deal of time invested in programming and the use of more advance technologies such as expert systems or artificial intelligence. In the case of the Project Shop materials, the responsibility for on-time prompting rested primarily on the facilitator working with the student as the student interacted with the software.

Directions. The directions were presented in both text and audio. However, the program was designed and programmed with the assumption that the students who would be using it were unable to read. To help facilitate understanding, most of the directions were designed to be accompanied by audio.

Feedback. Typically, studies use a human facilitator to provide feedback. Wissick, Lloyd and Kinzie (1992) used a strategy where the facilitator modeled the task and provided verbal prompts about the actions when a student did not use the program correctly. For Project Shop, the feedback, as discussed earlier, was designed first to inform the user if he had responded correctly or incorrectly to one of the skill activities. The second feature of the feedback in the Project Shop materials was to model the skill when the student gave an incorrect response. Interestingly, these models served as instruction to both the student and the facilitator.

A Theory of Facilitation for Computer-based Instruction

The ultimate goal of design-based research is to produce small-scale theories based on the cycles of integration which begin to explain the impact of the instructional innovations being investigated (Cobb et al., 2003). Design experiments are conducted to determine not only "what works" but also to develop "humble theories" of their use.

In order for computer-based instruction to be effective for students with moderate to severe intellectual disabilities, a "more knowledgeable other" is required to work with the student. This concept is supported by the literature addressing the teaching of

exceptional learners and from what was observed throughout the course of this study. The findings on Mrs. Truman's teaching methods and beliefs about facilitating students using the computer suggest that more discussion is needed to describe exactly how facilitation should take place. According to Mrs. Truman, placing her students at the computer without a facilitator or teacher results in recreation and leisure outcomes. Although some incidental learning might be possible, such learning is not expected. This finding suggests that there needs to be a facilitator present when the student is using the computer explicitly for instruction.

This theory is similar to Vygotsky's (1978) Zone of Proximal Development (ZPD). Vygotsky used two terms when referring to a child's learning. First, the actual development level was the ability of a child to perform certain tasks without assistance. The level of potential development referred to those tasks that a child could not perform on his or her own, but would be able to do with the assistance or facilitation of a more knowledgeable other. According to Vygotsky, the Zone of Proximal Development is "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (p.86).

This concept of the "more knowledgeable other" is important to the theory presented in this section. Vygotsky's theory is built upon with the idea that the computer can serve as a more knowledgeable other in addition to or in place of a capable peer.

The first component of the theory presented below is based on the idea that instructional software should deliver directions and feedback in either an audio or text-based format to facilitate the student's use of the computer-based instruction. The second premise of the theory requires that a facilitator work with the student alongside the computer, providing feedback or prompting over and above the level that the computer is able to do. This is referred to as cumulative level of prompting provided by both the computer and the facilitator. This theory is depicted in Figure 7.

In this graph, the *horizontal axis* represents the student's ability at a given skill. The *vertical axis* represents the level of prompting required in order for a student to learn that particular skill. The *diagonal line* in the field of the graph represents the optimal level of prompting required at any one instance for a student to learn the skill being taught. This is not a distinct value for this optimal level; it is subjective to the student and the skill that is being learned.

For a specific student in a given learning situation at the computer, the *vertical dotted line* shows his or her ability at the skill being taught in that situation. The point where the vertical dotted line intersects the diagonal line shows the amount of prompting or facilitation that is required for that student at that ability level to master that skill at that time.

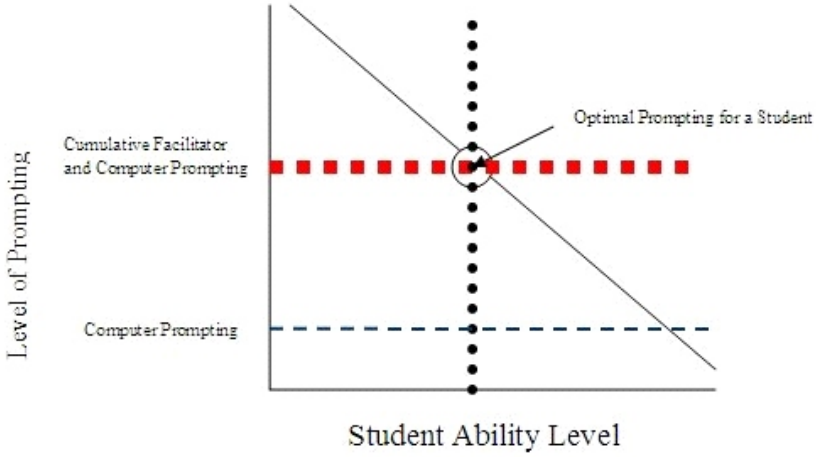

Figure 7. Facilitation equilibrium. When the level of prompting intersects with the student ability level on the diagonal line, there is an optimal level of guidance being provided to the student.

Prompting, as represented in this model, is first provided by the computer through directions — either delivered through text or audio — and feedback. Feedback can be presented as positive feedback or corrective feedback (a correct model of the skill behavior(s) is displayed). Prompting by the computer is supported and augmented by a human facilitator, who can prompt the learner using techniques that the software is not programmed to present. The *dashed line* shows the level or amount of prompting delivered by the computer.

This level of computer-prompting remains fixed based on what the software itself is programmed to provide. Factors that could increase or decrease this level of prompting could include increasing the level of feedback or removing feedback altogether. Increasing the level of feedback, directions, or prompting that the computer delivers could require the human facilitator to provide less prompting for students to achieve their instructional goals. In contrast, reducing those same computer features would require the human facilitator to provide a greater level of prompting.

The square dotted line shows the total level of prompting the student is receiving. This total level of prompting is what the human facilitator provides in addition to the level of prompting provided by the computer.

An optimal level of prompting is achieved when the dotted line representing student ability, the square dotted line, and the diagonal line all intersect at the same point. This is when the computer and the human facilitator are providing just enough prompting to allow the learner to master a skill. This intersection is referred to as the *Facilitation Equilibrium*.

This theory should be applied to the three steps listed below when facilitating students using computer-based instruction: learning the interface, interacting with the activity, and learning the content represented in the activity.

Figure 8 depicts a situation where the total level of prompting for the learner intersects with the student's ability level to the left of the optimal prompting line,

implying that the human facilitator is not providing enough prompting for the student to learn the skill effectively. This skill could be related to learning how to use the computer program, or to learning a skill to be generalized to the community. This situation could result in the student repeatedly making the same mistakes in both use of the program and in achievement of the learning goals for the content represented.

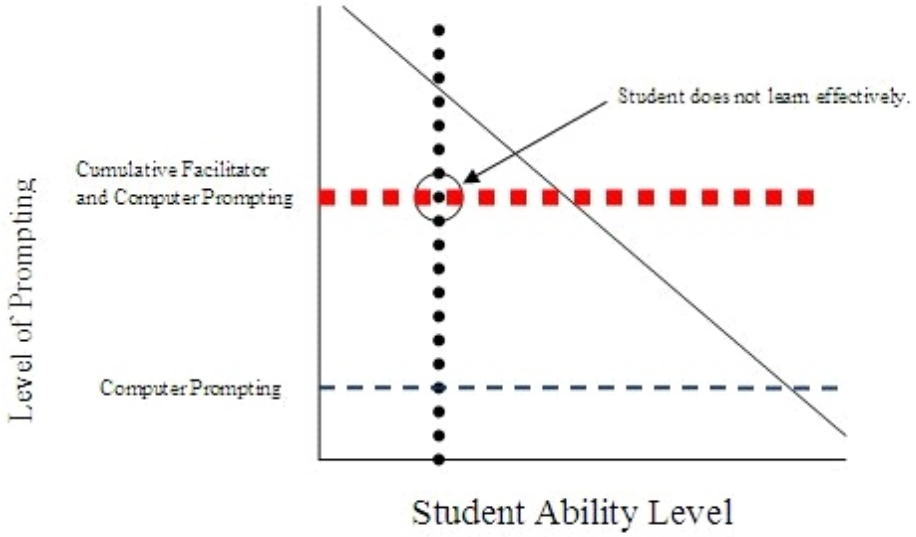

Figure 8. Underprompting. When the intersection of prompting and ability is below the optimal learning level, the student will not learn effectively.

A situation where the facilitator is providing too much assistance to a learner is depicted in Figure 9. When the student has the ability to master the skill without the level of prompting being provided by the facilitator, the student may either become disengaged from the activity or learn to generalize the skill only when required to do so with an

external prompt. This situation above was described in the example of Ace, who was receiving too much help from a facilitator. He was able to master the dollar plus skill on the computer. However, when it came time to practice the purchasing skill in the community, Ace needed some human assistance in the same style as was provided in the classroom in order to perform the skill correctly--in his case looking at the facilitator when he believed he had the correct amount of money.

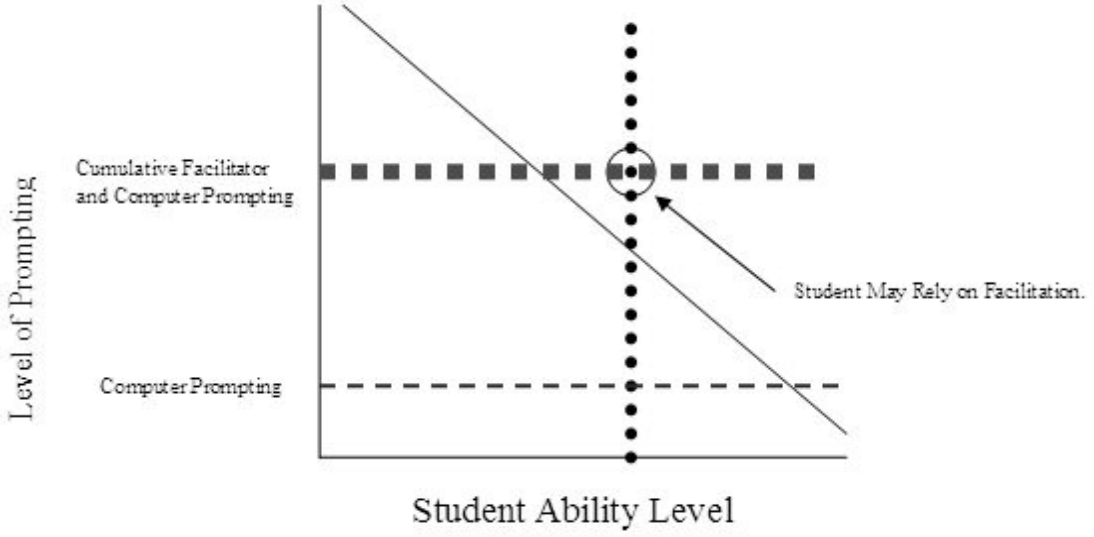

Figure 9. Overprompting. When the intersection of prompting and ability is above the optimal learning level, the student will learn the material, but may require the facilitator to perform it effectively in the community.

Note that this theory assumes that the computer software is not adequate on its own to provide enough appropriate prompting for a student to learn a particular skill

being presented on the computer. Furthermore, this theory does not explicitly address the duty of the facilitator to keep a student focused on the learning task. Figure 10 depicts a situation where the computer is able to address all of the facilitation without a human facilitator and the student is able to master all of the skills presented in the instruction without someone to help him stay on task. However, according to this study, this situation is not common when teaching students with moderate to severe intellectual disabilities.

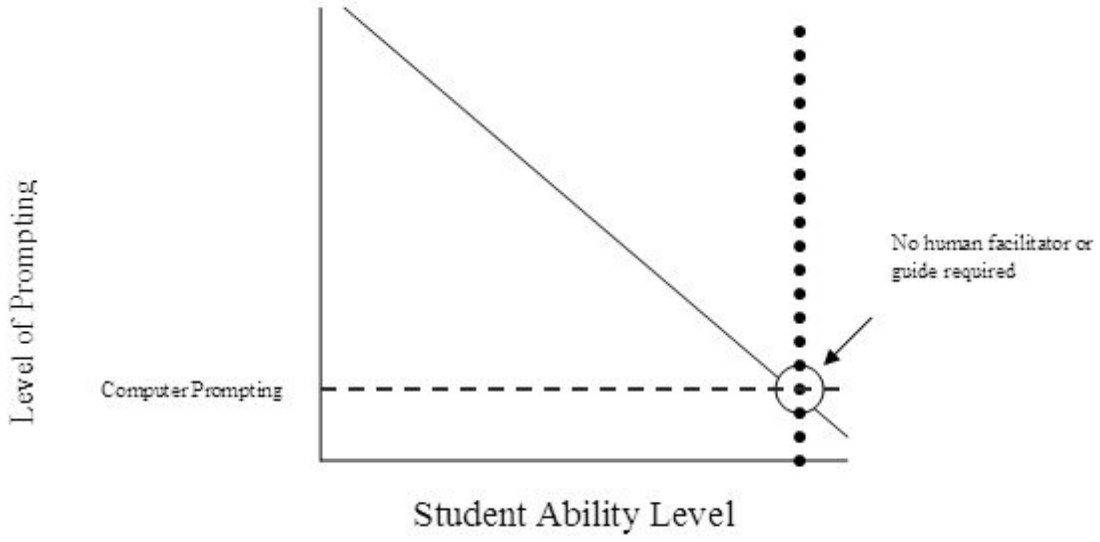

Figure 10. No facilitator prompting required. In a situation where the computer can provide enough prompting for the student's ability level, a facilitator may not be required.

Of course, this theory is in its preliminary stages and requires further research and refinement. However, it can possibly provide a basis for discussion and practice when working with innovations such as Project Shop. It is especially intended to promote more discussion on how a facilitator can guide a student's learning when using computer-based materials in the classroom. In the figures shown, the level of prompting afforded by the computer remained at a relatively low level according to the scale provided. Future research on how software could be designed to provide more facilitation than what is currently available would allow for an expansion of the theory. Future innovations in technology, such as artificial intelligence and virtual reality, would provide a new foundation for research in this area. Despite these possible areas for future discussion, the ability of a computer to play a stronger role in keeping a student on-task, further decreasing the role or need for a facilitator, is an area of research for which this theory is not able to account.

The Influence of Project Shop on the Teachers

The final research question was concerned with whether the Project Shop materials changed the ways that the teachers taught. According to the findings, the materials had little effect on the way that Mrs. West taught. In contrast, the Project Shop computer-based materials were used almost daily in Mrs. Truman's class for both instruction and recreation/leisure. It can be argued that the presence of the materials in her classroom and the fact that they were used to teach topics that were never taught on the computer before represented a change in the methods that Mrs. Truman used to teach. Also, the fact that they were used for recreation and leisure and that this use seemed to produce an incidental learning benefit was important. Prior to the introduction of the materials to the classroom, most recreation and leisure time at the computer involved playing games that had little or no educational value.

Mrs. Truman offered some intriguing ideas as to how the Project Shop materials affected the way that she taught:

> **Investigator:** Do these materials (everything) change the way that special education teachers teach?
>
> **Mrs. Truman:** Generically? I think probably so…It provides a greater dimension. But I don't expect the Shopper Bobs in my life to teach the pay to the next dollar, but I do see that this can provide me another way to give the child a variety in practicing it. Eventually you can set this up to work independently for high-functioning moderate students, and they do it right. I'm listening to the computer tell him if it's right or wrong, and if I hear a lot of "No, let me show you," than I can go in and see what's going on. I don't think this is initial teaching, this is support teaching, support activities.
>
> **Mrs. Truman:** I think it's just I have seen as I teach and I watch other people teach, sometimes you have to be refocused, you get comfortable and you are not as precise and as organized as you need to be for this level to be the most efficient for this level as you need to be. More focused, these are issues that keep you reminded of things you already knew. When this came up, it was kind of neat because let's search this way, (left to right top to bottom, she was gesturing) you're showing some good techniques for kids who need more, you remind people of instruction technique with that.

Mrs. Truman modified her classroom techniques and introduced new methods of instruction into her classroom. The integration of the Project Shop materials into her classroom represented a distinct change to the methods of instruction that were used in her class.

Implications

This study has many implications for the future use of computer-based instruction in the special education classroom. First, the design and features of the Project Shop materials should be considered when more instruction of this type is developed for this audience. This study offers guidelines for the following features: directions, feedback, recordkeeping, and teacher controls of the materials. Second, the patterns of use that were documented in this study provide a model for how computer-based instruction could be combined with community-based instruction already used by special education teachers. Third, the facilitation theory generated from this study's findings presents a foundation for future facilitation of learners with special needs who are using computer-based instruction in the classroom for a variety of skills. In addition, a theory of optimal

facilitation provides a tool for considering the use of instructional prompts over and above what computer software is able to achieve.

Finally, the notion of applying the literature of technology integration into the special education environment opens up a large arena for discussion and application. It is hoped that a great deal more of this will take place in the future.

Suggestions

The research literature abounds with reasons why teachers do or do not choose to integrate technology into their classroom. There are many factors that affect technology integration (see Chapter 2). However, the question remains of how can the instructional technology community can promote further technology integration into the classroom.

An additional goal of these findings and this study is to offer suggestions to software developers on how to increase the likelihood that teachers will actually use the software when it is made available. Many factors already discussed in this chapter have provided instances or situations where an individual teacher is more likely to make use of the available software to teach community-based skills to individuals with intellectual disabilities. However, in the future, what else can be done in order to facilitate the greater use of these types of materials? One area that deserves additional recognition is that of a community-based model of teacher education where pre-service teachers go out into the schools to help teachers use technology effectively (see Brill & Reeves, in press). However, improving teacher education will not measurably improve the likelihood of in-service teachers implementing technological innovations in their classroom.

An interesting connection between this study and the ideas of Brill and Reeves (in press) is how some exemplary teacher education programs use and teach Action Research to prepare pre-service teachers. The methodology used for this study, a design experiment (a form of Action Research), allowed for Mrs. Truman to not only play a role in refining the Project Shop materials, but provided her the opportunity to actually take ownership of some of the features of the program. Changes that were made at her suggestion not only

provided her with a sense that she was a part of the design team, but also made the program more usable in her classroom.

If this study could offer any suggestion to improve the likelihood that an individual would use an effective technological innovation in the classroom, it would be to allow the teacher's input to become part of the innovation itself to both ensure that the teacher has a stake in the innovation as well as maximizing the effectiveness that any materials would have in that specific classroom.

Future Research

The results of this study suggest many areas for future research. More research is needed on the patterns of use modeled by the facilitation theory. In addition, research is needed to validate the patterns of use found in this study. The research should involve teachers who are using computer-based instruction with their students to teach community skills. The theory of facilitating students with moderate to severe special needs when they are using the computer-based training materials in the classroom requires a great deal of additional research. Conducting research in settings that are using computer-based instruction and human facilitation to teach a community functioning skill could provide helpful findings in an area of research literature that is very limited.

Another primary area of future research lies in evaluating the ability of the Project Shop materials to teach students how to generalize the skills taught in the software into the community. Two limited studies have been completed or are in progress, one making use of the Match to Sample activity and one using the Dollar Plus activity.

Additional research is needed to investigate the software's user interface design. For example, can standardized navigational features that serve a common purpose, such as a forward arrow, be applied to all computer-based training designed for students with moderate to severe intellectual disabilities? A more uniform approach to navigation, such as the development of a standard set of navigational principles relevant to exceptional learners, seems warranted. Such standardization would eliminate the excessive time

required to make students comfortable with the computer interface before moving on to the actual learning of skills modeled in the software.

One additional direction for future research would be conducting another design experiment where the software and curriculum were modified specifically to better aid the facilitator. The role of the facilitator in this study was always anticipated, but not to the degree that occurred in Mrs. Truman's classroom. The theory presented above built on Vygotsky's premise of the more knowledgeable other by pointing out how the technology can assist both the student and the facilitator in bridging the gap between what is known and what can be potentially learned. Future considerations in this area should include interface elements that would not be obvious or otherwise legible to the learner, but obvious to the facilitator. Examples might include an onscreen progress indicator for an activity that could keep track of how many specific interactions students answered incorrectly and the types of mistakes students make. An example of this would be in the Dollar Plus Activity where if the student continually responded incorrectly in the same pattern, such as always answering one dollar too little, the computer could prompt the facilitator onscreen that the student was consistently answering in this way and to recommend that the facilitator make an adjustment.

In its current state, the Project Shop materials were designed to store these trends to be analyzed afterwards. What this future step would require is for the additional logic within the program to allow for instant analysis during the instruction, not following it.

Overall, research on the interactions that take place between teacher, student, and computer in the area of students with moderate to severe disabilities is ripe for growth. Little research of this type exists in the literature. Future research in this area, particularly with the models formulated above, would provide a needed contribution to the literature.

Weaknesses

There were only two classrooms that participated in this study, one of which did not demonstrate successful integration of the technology. It would have been better had

two classrooms been chosen that faced similar barriers to community access. Such a comparison would have been a more robust validation of the findings generated from Mrs. Truman's classroom. Furthermore, there was no evaluation of how well the videotape could have been used effectively in either classroom, as both teachers chose not to make it a part of their classroom routine. As part of the Project Shop materials, the videotape and how it could be used has yet to be properly studied.

An additional weakness of this study was that it did not explicitly measure learning achievement as a result of the implementation of the Project Shop materials. The overall goal was to determine if the type of instruction that was presented by the Project Shop materials could be effectively integrated into a classroom of students with moderate to severe intellectual disabilities. Regardless of how successful this type of study was in terms of integration, it results in a "cup half-full, cup half-empty" situation because in the larger picture, the study has not shown if this type of training can facilitate student learning. So far, it has only begun to uncover how a teacher might choose to implement this type of learning using the methods and guidelines previously discussed. However, the study can lead to future research dealing with how well students are able to generalize skills after using the Project Shop materials.

Conclusion

Design experiments are conducted to develop theories, not merely identify "what works." The theories that arise from a design experiment can be relatively minor in that they address learning in very specific areas. This study was able to develop a theory that focused on using the computer and a human guide to facilitate learners with special needs as they approach computer-based instruction.

With the barriers in place that prevent students from accessing the community increasing, alternative means of instruction to teach community-functioning skills grows more necessary. One of these instructional methods is computer-based instruction, and the amount of research on using computer-based instruction to teach community-based

skills continues to grow. The theory that was developed as a result of this study should contribute to future use of computers in teaching community-functioning skills.

This study and the Project Shop materials were a very specific instance of technology integration into two special education classrooms containing students with moderate to severe intellectual disabilities. Nevertheless, the program features discussed above should still be considered when developing computer-based instruction for this category of learners, whether it is for training in community-based skills or other areas of learning.

In closing, this study provided compelling reasons to continue integrating computer-based multimedia into special education classrooms. When teachers and students are not able to adequately access the community, providing simulations of the community on a computer shows promise as a solution.

For teachers to effectively monitor their students' learning, many of the features of traditional computer-based instruction prove worthwhile/show validity/show success in the special education classroom as well. In addition, providing special education teachers with access to the "inner workings" of a computer to more specifically address the unique learning needs of their students, such as offering them the Teacher Options Screen, is extremely important when dealing with such diverse learning styles.

The design collaboration that unfolded between Mrs. Truman and me yielded many significant improvements to the program, while also documenting this teacher's experience with the program. Her following statement summarized the great potential for successful computer integration in the field of special education, and the great need for research and development to continue:

> **Mrs. Truman:** I wish we had more of this sort of thing. I'm hoping you make this a career and I get on your mailing list of catalogs. This type of program, that's real practical, very basic, moves slowly, has multiple levels of difficulty, and is really geared more to the child with more severe intellectual disabilities. They typically are geared to the very mild and they just go too fast, they're not usable, too hard, too quick, not enough practice.

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APPENDIX A

INTERVIEW PROTOCOL

Interview Protocol

- Describe your current methods for teaching your students grocery shopping skills.
- What kind of instructional treatment/strategies do you use in the classroom?
- What kind of instructional treatment/strategies do you use in the community?
- What kinds of materials have you used to teach your students grocery shopping skills?
- How have you used technology to teach your students grocery shopping skills?
- Based on your experience with the Project Shop materials, how do you feel they could be used to support your current community-based instruction curriculum?
- What portions of the instructional program have you used?
- Are there any sections that you are aware of that you have not used? Why?
- What problems or difficulties have you encountered with the Project Shop materials?
- How, if at all, have you addressed any of those problems or difficulties?
- How has the investigator addressed any of those problems or disagreements?
- What problems or difficulties have you not been able to address successfully?
- Is there anything else you want me to know, or other questions I should have asked you?

APPENDIX B

RESEARCH SCHEDULE

Research Schedule

Date	Mrs. Truman	Mrs. West	Researcher/Team
7/30/2003	Interview		
8/5/2003	Observation		
8/7/2003	Interview		
8/8/2003			Design Meeting
			Program
8/9/2003			Modification
8/13/2003	Observation		
8/14/2003	Observation		
8/19/2003			Design Meeting
8/20/2003	Interview		
	Community		
8/21/2003	Observation		
8/25/2003			Design Meeting
			Program
8/25/2003			Modification
8/26/2003	Observation		
8/26/2003			Research Reflection
	Community		
8/28/2003	Observation		
9/3/2003		Interview	
9/9/2003	Observation		
			Program
9/11/2003			Modification
		Community	
9/12/2003		Observation	
9/16/2003	Observation		
9/17/2003		Observation	
9/23/2003		Observation	
9/24/2003	Observation		
10/1/2003			
10/2/2003	Interview	Observation	
			Program
10/15/2003			Modification
	Interview / Follow		
11/7/2003	Up	Interview	
11/12/2003		Interview	
	Interview / Follow	Interview / Follow	
1/7/2004	Up	Up	

APPENDIX C

TEACHER'S GUIDE

TEACHERS GUIDE

Project Shop consists of two deliverables: A videotape and a CD-ROM

VIDEOTAPE

The videotape is broken down into three 10-minute segments. In each segment the characters demonstrate appropriate and inappropriate behavior for a shopping trip or for working in a grocery store. They are guided on their adventure by a "wizard in training" Shopper Bob, who narrates the videos.

Segment One

In this tape, the fictional characters, Robbie and Brad prepare for a shopping trip and proceed to the grocery store. The following skills are demonstrated:

Planning a Meal
Parking Lot Safety
Dealing with a Malfunctioning Door
Getting a Shopping Cart
Navigating a Grocery Store Safely
Shopping for Items
Social Skills in a Grocery Store

Segment Two

Robbie and Brad are joined on their shopping trip by two more characters, Rachel and Liz. In this segment, all four characters continue their shopping trip and pay for their groceries. The following skills are demonstrated:

Navigating Safely
Asking an employee for assistance
Proceeding to a checkout line
Paying for Groceries

Segment Three—Vocational Skills

All four characters also work at the grocery store where they do their shopping. In this segment, they work at the store performing their job duties. The following skills are demonstrated:

Proper appearance
Appropriate behavior
Assisting customers
Bagging Groceries
Stocking Shelves
Occupational Safety

CD-ROM PROGRAM

The CD-ROM contains a multimedia computer-based training program designed for students to learn about and practice the skills revolving around a shopping trip and working in a grocery store. There are three major content components of the CD-ROM: The storyline, video thumbnails of best practices, and interactive practice activities.

Program Content

Storyline

The storyline portion of the CBT revisits a character from the videotape, Robbie and a new character who is his roommate, Kevin. Over twelve narrated pages, the user follows the story of the two characters as they go on a shopping trip and work at a grocery store. The user navigates through the pages using of a forward and backward arrow. The narrated words appear on the screen, and the user is able to click on any word to hear it narrated individually. There is also a still photo on each page depicting the event in the story.

Video Thumbnails

On each page of the storyline, there are icons on the left side of the screen that the user can click on at any time to see video demonstrations of the skill being addressed on that page. Five different fictional characters are depicted in this video demonstrating the specific skills. They are: Robbie, Anthony, Maya, Diego and Lauren.

Activities

There are six detailed activities in the program. These activities are designed to allow the users the opportunity to practice the skills that are demonstrated on that page. The user can access the activities from either the page where the skill is demonstrated or from a list of activities that is part of the Main Menu (see below). These activities are: Preparing a Shopping List, Cart Smart, Match to Sample, Picking a Checkout Line, Paying for Your Groceries and Bagging Groceries.

Preparing a Shopping List. This activity is based on the strategy of a shopper using a flip book with pictures of grocery items that they are shopping for. In this activity, the users sit in their simulated kitchen, and place items on the table into their flipbook. There are six categories of items: Breakfast, Lunch, Dinner, Snacks, Cleaning and Self-Care. Users can select which category of these items they want to place in their list using a submenu which is embedded in the activity.

Cart Smart. Learners practice shopping cart safety, grocery store navigation and asking employees for help in this edutainment activity. In this activity, the users view a top-down depiction of a grocery store and use four arrows, UP, DOWN, LEFT, and RIGHT to move their fictional shopper and shopping cart around the store on a mission to find six grocery items. If they collide with other shoppers, they are presented with a video of that shopper's reaction and are prompted with the appropriate etiquette response for the situation. By navigating to an employee, they can also receive assistance in finding a particular item.

Match to Sample. By presenting a mock-up of grocery store shelves and freezer shelves, users can practice matching items from their simulated flipbook to the same item depicted on the shelf. There are three different categories of items they can shop for: Cereals, Frozen Pizza and Canned Soup. The user can pick which category they would

like to shop for using a menu built into the activity. This activity has increasing levels of difficulty. Each level of difficulty presents more items on the shelf that have to be scanned in order to find the correct one. If the user selects three correct items in a sequence, or four correct out of five, they can proceed to the next level. If they select two items in a sequence incorrectly, they go down a level. The user gets two attempts for each item. On the first incorrect attempt, the narrator models the correct response and then prompts the user to try again. If the user clicks the incorrect item a second time, they are given a new item to match. *This activity also has an external tracking feature and a probe trial setting. Each of these will be discussed separately below.*

Picking a Line. This activity directs learners to drag their shopping cart to the fastest of three grocery store lines. Factoring into their choice are amount of people in a line, whether a cashier is present and if a light is on showing that the line is open.

Paying for your Groceries. (Dollar Plus) In this media-rich activity, students practice the skill of pay to the next dollar or dollar plus. A video of a cashier is shown stating the total price for their grocery items. The user then clicks on the video showing a hand placing individual dollar bills down in front of the cashier, simulating the real-life motions of paying. The user clicks the video for each dollar they want to pay. When they have placed enough money down, they click on the wallet button to finish the transaction. Feedback for incorrect answers informs the user that they have paid either too much or too little for the item. This activity has varying levels of difficulty that pertain to two different areas. The first type of difficulty is based on the way the dollar value is spoken to the user. For example, the cashier will begin by stating a price as clearly as possible, "That will be two dollars and fifty-seven cents." As users progress through levels, the cashier may say, "That's a buck-fifty two," providing a variety of ways that the price can be said aloud. Depending on how the teacher chooses to present the activity, the learner can have the option of having the price depicted on the screen, or the student will have to respond using only the cashier audio of the price. *This activity has a Teacher Option Screen which enables the teacher to control many aspects involved. These options and the use of them will be discussed below. In addition, like the Match to Sample activity there is an available external tracking feature and a probe trial setting. Each of these will be discussed separately below.*

Bagging Groceries. Users are able to practice their vocational skills by bagging simulated groceries at a checkout line in this activity. Items of varying weights are shown on the screen and the user has to place them in the grocery bag in the proper order. Once there are enough items in the bag, the user can then drag it to a grocery cart shown on the screen.

Program Features

This section will describe the many features of the program that are not related to content but user navigation, tracking, probe trials etc.

Autorun

Placing the CD-ROM in the CD-Drive of the computer will automatically launch program *shopper_bob.exe* which will display the program's title page. The two other

executables on the CD-ROM, *probe.exe* and *video_menu.exe* will be discussed in later sections.

Login Screen

After the splash screen, the users are directed to a login screen. If it is the first time that a user has encountered the program, they will be directed to type in their name. If the user has already entered their name, they will be able to select it from a list shown on the screen. The name that they enter is used to generate a file folder of the same name that is stored in the windows/a5w_data/projectshop/directory. This folder contains simple program tracking information, the user's last completed level in the Match to Sample and Dollar Plus activities and any records that were kept from user trials in those two activities.

Main Menu

The main menu for this program has three choices, Shopping, Activities and Exit. Each choice will provide audio describing the choice when the mouse is passed over it. By clicking Shopping, the program will launch the storyline portion of the program mentioned above. If the user clicks Activities, they will be directed to an additional menu that lets them launch a particular activity directly without having to select it from a page on the storyline. Clicking Exit will launch a dialog box that prompts the user as to whether they wish the leave the program or not. Choosing "Yes" quits the program, choosing "No" returns the user to the Main Menu.

Storyline Navigation

Each storyline page has icons that can be clicked to activate different features of the program. Each page in the storyline automatically begins to narrate the text on the screen. If a user clicks on any word in the text, the narration will cease, and the word will be said aloud. After the word is said aloud, the narration starts over. On the left side of the screen there are thumbnail icons of videos that demonstrate the skill being discussed on that page. There may be one video or as many as five on each screen. Clicking on the video thumbnail icon during the narration will stop the narration audio and the graphic on the screen will be replaced with the video. Once the video is playing, controls will appear on the frame around the video that allows the user to pause and resume the video or skip backward and forward in the video. The user may click another video thumbnail icon at any time while the narration or another video is playing.

Also on the each storyline page is a navigation bar on the bottom of the screen. The bar contains four buttons. There is a backward and forward arrow that allows the user to navigate between different storyline pages. The backward arrow is not active on the first page of the storyline and the forward arrow is not active on the final page. Also on each screen there is a button to return to the Main Menu. This button is always active. Finally, if there is an activity that is related to the specific storyline page the user is viewing, the Practice button will be active. Clicking the Practice button launches that particular activity. (A list of the activities and their related storyline pages is presented below) When the user leaves that activity, they will return to that same storyline page. Note: if the user launches an activity directly from the activities list of the Main Menu, exiting the activity will return the user to that list.

Record Keeping

For the two activities, Match to Sample and Dollar Plus, the program automatically records a detailed description of the users' interactions.

Match to Sample. In Match to Sample, user data is kept in separate files for each category: Cereal, Frozen Pizza and Soup. Each Match to Sample record file contains data in three different sections: The header, specific interaction data, and summary data.

The header contains the following information: Student Name, Task (Match to Sample or Dollar Plus), phase (Instruction or Probe Trial), Date, Start Time, Stop Time and Total Time in the activity.

The specific interaction data contains information for each discrimination attempt the user makes. These are Level of Difficulty (1 to 6), Type of Item (Cereal, Frozen Pizza or Soup), Trial (records the number of the item they are currently attempting to match), Stimulus (the actual brand that they are matching, e.g. Corn Flakes), Response Before Prompt (whether they were correct, incorrect or no response on their first attempt), Response after Prompt (correct, incorrect, or no response on their second attempt) and Time in Seconds for that particular item to either be matched correctly or have two responses judged as incorrect.

Summary Data contains the user's actual score using the following possible criteria: Correct Before Prompt, Incorrect Before Prompt, Correct After Prompt, Incorrect After Prompt, and No Response After Prompt. How many times each user's answer fit into each category is listed along what percentage they matched each specific category out of their total matches.

File Names for each Match to Sample record are kept as:
"MS[Soup, Cer or FP]_Month_Day_Hour_Minute.xls"

Dollar Plus.

All interactions in Dollar Plus are stored in record files. There is only one type of file created for Dollar Plus. Header information and summary data in the Dollar Plus record files are identical in format to the information stored in the Match to Sample record files.

The specific interaction data for Dollar Plus is somewhat different in format than that in Match to Sample. The criteria stored in this section are: Level (of difficulty), Trial (the number of the different dollar values being attempted), Actual Price (e.g. $2.57), Response Before Prompt (whether they were correct, incorrect or no response on their first attempt), Response after Prompt (correct, incorrect, or no response on their second attempt) and Time in Seconds for that particular dollar value and Movie File (the path and name of the cashier Quicktime file).

File Names for each Dollar Plus record are kept as:
"DP_Month_Day_Hour_Minute.xls"

Record files are stored in the user's unique file folder. They are written in tab delimited format and given an .xls extension so that they can be viewed in Microsoft Excel.

Probe Trials

A Probe Trial refers to using an activity without any feedback or guidance to evaluate a learners baseline ability. Running the executable: probe.exe, launches the login screen. After completing the login, the user is taken to a menu that asks if the user would like to do a probe trial of either Dollar Plus or Match to Sample. After making a selection, one of those activities is launched. The user then proceeds through both activities at the maximum level of difficulty without the benefit of directions or feedback.
Record files are slightly different for probe trials, as Probe Trials are not programmed to allow a second attempt on any specific item or dollar value in both activities.

Dollar Plus Teacher Options

A unique feature to the Dollar Plus activity is the Teacher Options Screen (see below). This screen can be accessed by pressing CTRL-F12 during the Dollar Plus activity. This screen allows for much more control of specific features for teachers to modify when their students are using the Dollar Plus activity.

Maximum Trials refers to how many times the user can do the activity for each dollar value. The default is 1,000. Clicking on this number on the screen, opens a dialog box where the teacher can enter maximum number of trials they with to allow their user.

Latency (Time Delay), default of 10 seconds, is how long the user has before they click either the Dollar Video or Wallet button. If the user does not click on either of those buttons, the program records a No Response and the answer is judged as incorrect. After any user click, the number resets. The default value is 10 seconds. Clicking on this option opens a dialog box where the teacher can enter any time delay value that they choose.

Overpayment refers to how many dollars the student will be allowed to go over the correct answer before the program stops the trials and records an incorrect response. The default value is 2 dollars over. Clicking on this option opens a dialog box where the teacher can enter any value that they choose.

Maximum Price Range allows the teacher to set a Maximum value on the cost of the groceries in the activity. Clicking on this option launches a screen where the Teacher can select from four different maximum values: $3, $10, $14 or $20. The default value is $10.00.

Display Price is a simple toggle option. It is turned either on or off. If display price is on, the user will both hear the stated price and see it written numerically on the screen. When it is turned off, the user will only hear the price as it is spoken by the cashier. The default value is Display Price is On.

Feedback allows the teacher to select the type of feedback that the student receives after entering a dollar value. Clicking this option launches a screen that presents the teacher with three choices: No Feedback, Simple Feedback or Complex Feedback. Simple feedback consists of the Narrator, Shopper Bob informing the user that they were either correct, and they paid too much, paid too little, or didn't interact with the buttons quickly enough. Complex Feedback combines the simple feedback with the addition of corrective feedback, if the user clicks incorrectly.

There is a note on the bottom of the screen that informs the teacher if Dollar Plus is running in Probe Trial mode or Instructional Mode. In Probe Trial mode, the Feedback option on the Teacher Options screen will be disabled. There is no feedback in a Probe Trial.

Video Menu

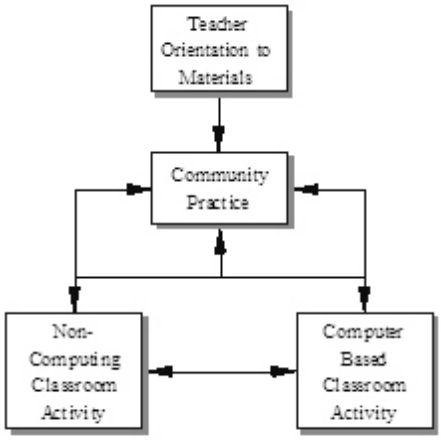
The third program on the CD-Rom is the Video Menu, named video_menu.exe. This program is a single screen interface that allows the user to play all of the videos from the storyline on one screen. The videos are broken down by category and the name of the actor on the tape who is performing the skill. This file is intended to be used by the teacher when they would prefer to only use the videos from the program for instruction without involving the storyline or activities.

System Requirements

CD-ROM drive
Quicktime
Windows 95 or higher
Sound Card

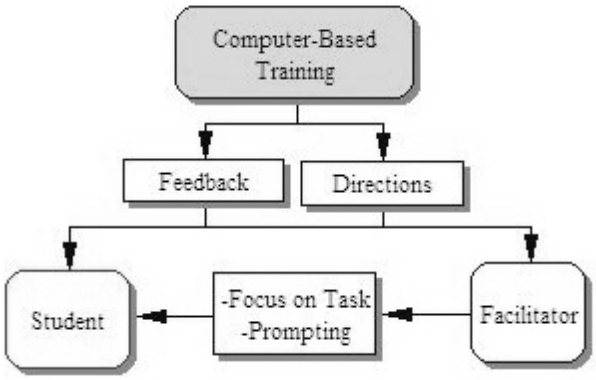
Suggested Methods of Program Use

Preliminary testing of the Project Shop materials has provided a model for their effective use. This is depicted below:



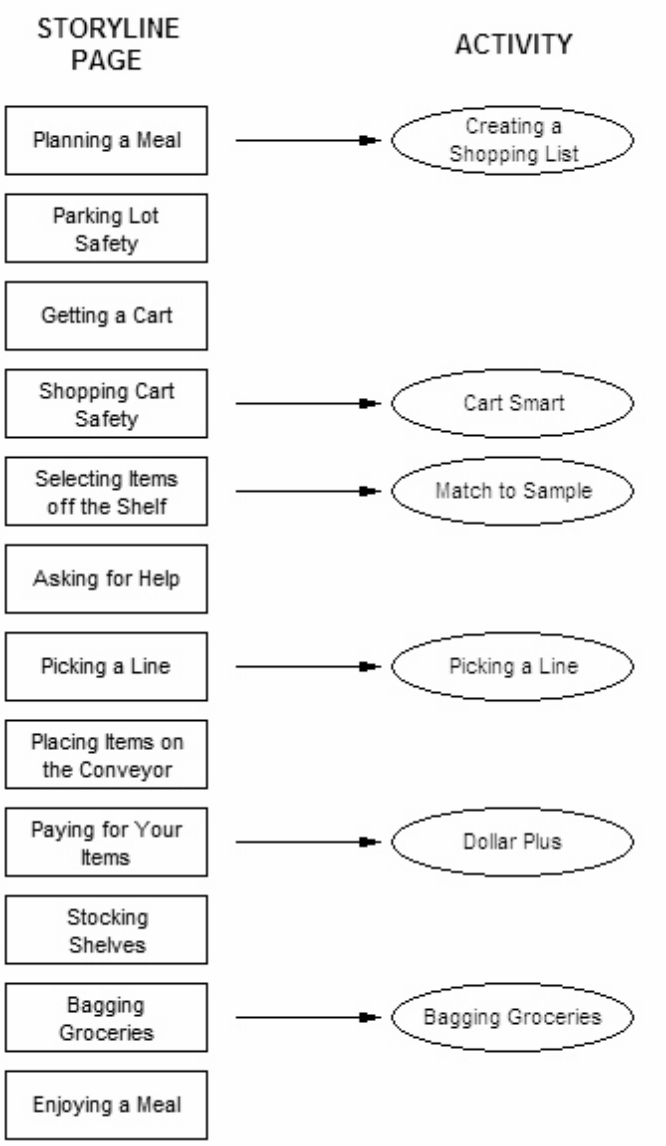
Before using the Project Shop materials with a student, the teacher or supervisor should become oriented with the video and the program. After this orientation, it is best to familiarize the students or learners with the subject matter that is being taught by taking the students or learners to the community for real-life interaction in those areas that are simulated in the Project Shop materials. After returning to the classroom, the students are prepared to work with the computer-based training materials.
Preliminary studies with the Project Shop materials have shown that they are effective combined with hand-on classroom simulations of the same skills. For example, allowing a student to interact with the Dollar Plus activity and then working with the student at a table in the classroom using simulated or real currency.

Facilitating Student Use of the Computer-Based Materials



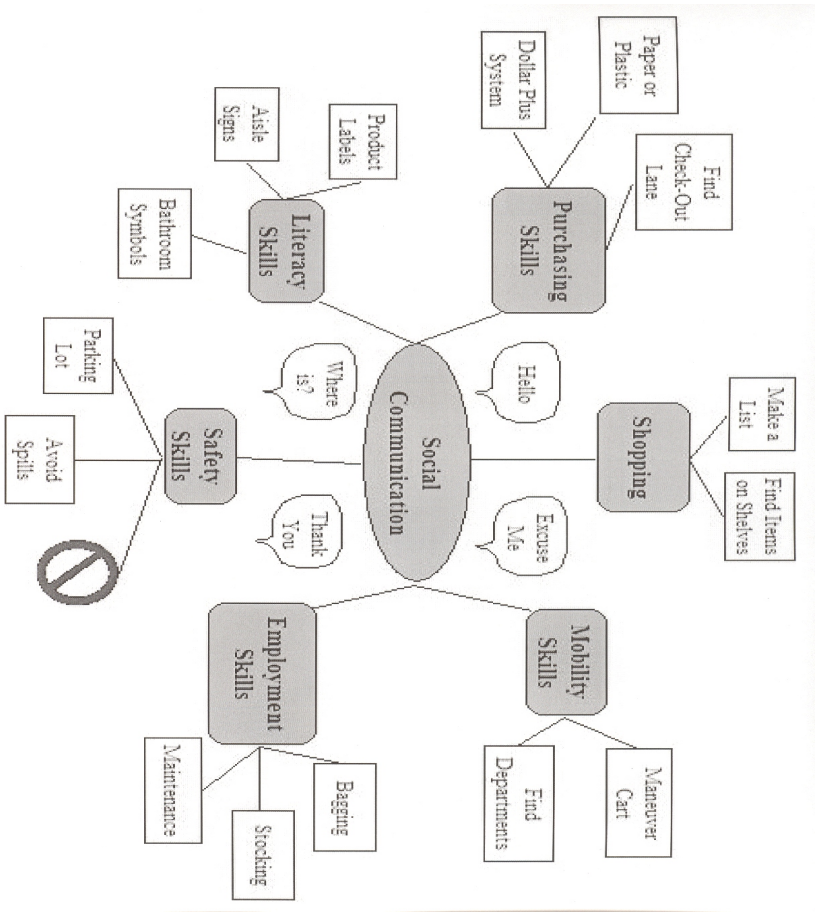
When using the Project Shop materials with students with moderate to severe intellectual disabilities, the role of the facilitator is very important. The facilitator is responsible for guiding the student as they learn how the use the computer interface as well as the actual content. In addition, the facilitator is responsible for keeping the student engaged in the task.

Storyline and Activity Breakdown



APPENDIX D

PROJECT SHOP CONTENT MODEL


Social Communication
Purchasing Skills
Paper or Plastic
Dollar Plus System
Find Check-Out Lane
Literacy Skills
Aisle Signs
Product Labels
Bathroom Symbols
Shopping
Make a List
Find Items on Shelves
Safety Skills
Parking Lot
Avoid Spills
Employment Skills
Maintenance
Bagging
Stocking
Mobility Skills
Find Departments
Maneuver Cart
Hello
Excuse Me
Where is?
Thank You

APPENDIX E

SAMPLE DATA TRACKING FILE

Student	billy_beruch
Task	match_to_sample.A5R
Phase	Instruction
Date	12/14/2003
Start Time	7:58 PM
Stop Time	8:00 PM
Total Time	0:01

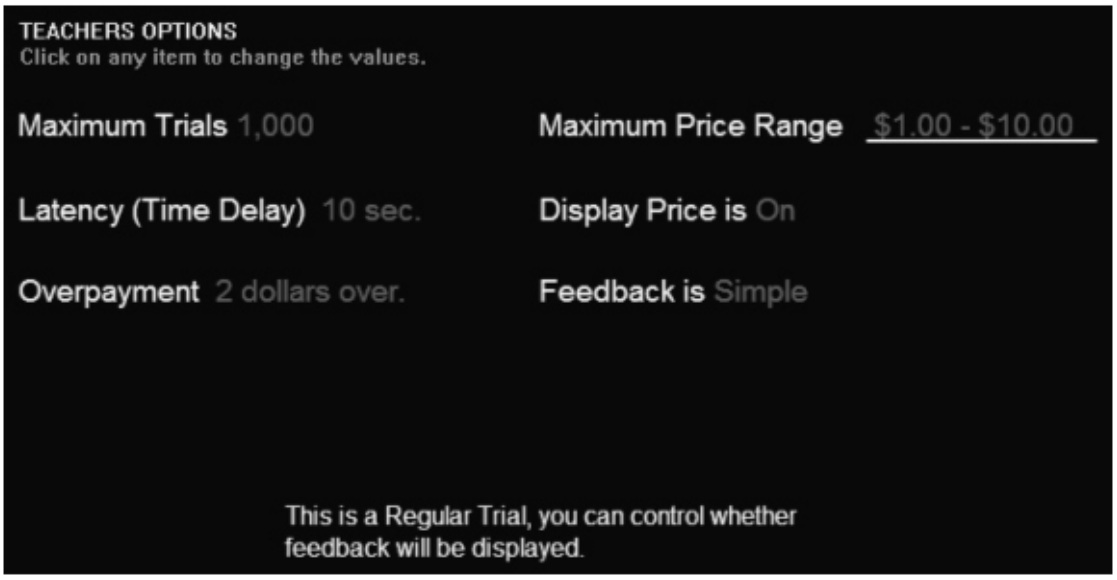
Level	Type of Item	Trial	Stimulus (B	Response	Response	Time in Seconds
	1 soup		1 \progresso.	+		2
	1 soup		2 \progresso.	+		1
	1 soup		3 \campbell_	+		1
	2 soup		4 \progresso.	+		1
	2 soup		5 \progresso.	+		1
	2 soup		6 \campbell_	+		1
	3 soup		7 \progresso.	+		4
	3 soup		8 \progresso.	+		2
	3 soup		9 \chunky_cl:	+		7
	4 soup		10 \chunky_be	+		2
	4 soup		11 \campbell_	+		7
	4 soup		12 \campbell_	+		2

SummaryData

Score		Percent
Correct Be	12	100%
Incorrect B	0	0%
Correct Aft	0	0%
Incorrect A	0	0%
No Response	0	0%

APPENDIX F

TEACHER OPTIONS SCREEN


TEACHERS OPTIONS
Click on any item to change the values.
Maximum Trials 1,000
Maximum Price Range $1.00 - $10.00
Latency (Time Delay) 10 sec.
Display Price is On
Overpayment 2 dollars over.
Feedback is Simple
This is a Regular Trial, you can control whether feedback will be displayed.