CHAPTER 19
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REDESIGN AND PROCESS IMPROVEMENT PROJECTS FOR A VOCATIONAL CLASSROOM

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The following description contains details about four student design projects completed at a school in the 1999-2000 academic year. The projects described are a redesign of a vocational classroom and three process improvement projects. Two address a recycling process and one revises the process involved in creating cement stepping stones. The process improvement projects also include design of devices related to these processes.

INTRODUCTION

This project is a multi-semester effort to improve the educational effectiveness of activities conducted in an old shop classroom converted for use as a special education classroom at. Improvements will enable students to function more independently, make the room safer and more accessible, and allow staff to engage in less non-value-added activity.

Activities within the multi-purpose vocational classroom include pre-vocational training, recycling, arts and crafts, and the making of items ranging from dog collars to garden stepping stones. Due to the variety of activities and the range of abilities of the students, it is imperative that the facility be not only safe and accessible, but also adaptable to the current needs of the students and future students and activities. The project involves the planning and actual redesign of the vocational classroom and improvements to the processes involved in the vocational activities of recycling, including a can crushing operation, making stepping stones, and overall classroom organization and utilization procedures.

SUMMARY OF IMPACT

The redesign of the previously existing layout of the classroom makes it both accessible and more efficient. By increasing width of aisles, replacing old tables with adjustable height tables and moving the location of various activity stations, the designers made the classroom adaptable to the needs of all students, including those who use wheelchairs. This adaptation gives each student the opportunity to participate fully in daily activities, thereby enhancing their educational experiences. The effective use of space and strategic placement of activity workstations increases efficiency and eliminates safety hazards caused by unnecessary traffic and congestion of materials and devices.

Establishing a more controlled flow of students and materials not only addresses safety issues, but also reduces unnecessary student traffic and the associated opportunities to engage in disruptive classroom behavior. Such workplace organization is a critical component in maintaining a consistent, supportive, predictable, non-disruptive classroom environment so necessary when dealing with students who have learning disabilities, emotional impairments or other cognitive disabilities. The creation of standardized work procedures for the various activities being conducted in the room also facilitates the creation of the desired environment.

All of the devices designed as part of the overall project are based upon an analysis of the activities and needs of the center's students and enhance the independence and participation of the students in vocational activities. In addition, changes in the work processes, in many cases, eliminate the need for teacher approval or intervention and thus allow the teacher to more efficiently work with the students. These changes impact the education of the students and assist the students in gaining practical skills, increasing their ability to fully participate.

As a result of increasing student independence and creating an environment that supports competent, safe participation by the students, staff time and energy can be redirected. Instead of dealing with disciplinary issues, or constantly answering questions and providing instructions, or moving and positioning supplies and materials for the students, staff members can spend more time on the education and training of universal work skills such as communication, social and behavioral skills.

TECHNICAL DESCRIPTIONS:
Redesign of Kennedy Center Vocational Classroom
Designers: Erica Hudson-Biggens, Elizabeth Flis, Vince Fayvusovich
Supervising Professors: Dr. Robert Erlandson, Dr. Leslie Monplasir

An analysis of room use and the creation of three alternative redesign plans were the first steps in this project. Teachers formed a redesign committee that worked closely with the students. Following the Kaizen "5 Ss," strategy the first major activity was to initiate a room clean up. The redesign team red-tagged everything that was to be removed and other staff had the opportunity to visit the room, claim, and move to another location anything they wanted to save. Concurrently, the students worked with the redesign team to develop a projected use questionnaire which was distributed to all staff that would be using the room. The intent was to determine who would be using the room and for what activities.

After the specific room activities were specified, the redesign team prioritized the order of events for the redesign activity. The student team, in collaboration with the teacher redesign team, conducted detailed process analyses of the activities to be housed in the redesigned classroom. The students observed and recorded on a Process Analysis Form the elements of each job. From these data the students could identify non-value-added activities, such as excessive lifting or moving of materials, student traffic to obtain tools or supplies, teacher interventions, and steps in the process that generated errors and the type of errors. Based on the process analysis results the students recommended two to three alternative designs for the job or activity that could be incorporated into the new classroom.

The students also conducted a detailed facilities layout analysis and created a detailed AutoCAD diagram of the room that showed the location of all power outlets, lights, sinks, water drains, fixed equipment (fans, blowers, etc.), doors, windows, and storage areas. The AutoCAD diagram was layered so that the redesign committee and students could conduct "what if" scenarios to discuss and evaluate alternative redesign plans.

As all of this information converged and the AutoCAD diagrams were in place, students and staff explored a wide variety of alternative redesigns for the room. They were able to analyze room utilization with different combinations of classes, students and activities. Based on these analyses, a room scheduling strategy emerged and staff identified combinations to be avoided. Staff members also developed an activities layout plan. They specified the location of the students' job board, areas for recycling, stepping stones, and pre-vocational and arts and crafts activities. Storage areas for each activity were specified.

This activity took place when a final budget had not been allocated for the overall redesign project. The students, therefore, prepared three redesign alternatives: modest, medium and expensive.

Figure 19.1. Vocational Classroom Before Redesign.

Staff members continued the cleaning process. A new wheelchair accessible sink was delivered and the room was painted. Additionally, staff established a workplace organization strategy based on the redesign proposals. Each job was color coded: purple for recycling, yellow for stepping stones, and red for pre-vocational. A student job assignment board was created and implemented. Where feasible, icons were incorporated into the job or activity process to identify tools, materials and supplies. Figure 19.1 is an image of the vocational classroom before the redesign. Figure 19.2 shows the redesign of the classroom with the wheelchair accessible sink in the foreground.

Figure 19.2. Redesigned Vocational Classroom.

Figure 19.3. Recycling Cart and Removable Bins.

Improvement of Recycling Process and Design of Related Devices
Designers: Osman Akyalcin, Rebecca Angott, Charlotte Pringle
Supervising Professors: Dr. Robert Erlandson, Dr. Gary Wasserman

Staff members selected the recycling job as the first activity to be integrated into the new classroom. As part of the recycling job, students gather paper, glass, plastic and metal cans from the school's classrooms. Previously, the material was collected in a large cart and then separated and processed. The glass material and paper products were placed into special, separate containers for disposal. The paper products were shredded if feasible and then placed into a special paper receptacle for disposal while the metal cans were manually crushed. The four collection containers were then taken outside to a pick-up area on scheduled pick-up days.

A process flow analysis of the recycling job was conducted to verify the process flow analysis conducted for the facilities planning phase. Based on this analysis the process was modified. A Creform pick-up cart containing four removable bins, each bin for a specific product (glass, plastic, paper or cans) was designed and fabricated. Creform is a pipe and joint technology for constructing agile devices. Students now pick up and sort the material at the same time. This is safer and requires less handling of glass, plastic and metal materials.

The glass and plastic materials can be placed directly into the collection container in the storage area. The paper material bin on the Creform cart is removed and taken to the paper processing area. The bin containing the cans is taken to the can crushing area. Since cans must be washed before crushing, a recycling work area is now designated near the new, wheelchair-accessible sink.

The material must be stored until trash pick-up days and then moved outside to the pick-up area; therefore old shelving units were removed and new flexible storage units provided. In addition, a paper shredding work area was designed and functional specifications for a switch-operated can crushing system developed. The can crushing system is an additional student design project described below.

The recycling work area is color-coded purple. Figure 19.2 shows the room redesign with the recycling bins are in the top right corner. Figure 19.3 depicts the Creform recycling cart and removable recycling bins.

Recycling Process Improvement Device: Can Crusher Design and Fabrication Designers: Brandon Cooksey, Allison Lardie, Darren Van Houzen, Jarret Zablocki Supervising Professors: Dr. Robert Erlandson, Dr. Evgeny Rivin

The process analysis of the recycling job highlighted problems with the current manual method of can crushing. The purpose of this project was to design and build a self-contained, one-button-controlled can crusher for use in the cleaning, crushing and recycling of aluminum cans that are waste products of the on-site art rooms and commercial kitchen. The students currently crush cans by stepping on them after removing the tops and bottoms and cleaning the inside (see Figure 19.4). The automated can crusher is designed to eliminate danger to the students and to allow for fuller participation in the activity by students who are physically or cognitively unable to crush cans using their feet. The goal was to design, fabricate and test a mechanism that is user-friendly, safe and able to crush cans of sizes ranging from small, fruit-snack size to large 7" and 9" diameter cans. The crusher must be reliable and able to crush approximately 10 cans each day. This limitation reflects the current manual process and if productivity could increase there is the possibility of providing can crushing services for other schools in the school district.

The designers analyzed various can crusher concepts, including those of patented can crushers. The designers tested cans to determine the necessary crush load and the options for crushing the cans. The final design of the can crusher uses a pneumatic-driven system with a cylinder capable of providing the necessary 1300 pounds of compressive force and the required stroke of at least seven inches. The school provided an air compressor to drive the can crusher.

The can crusher is mounted on a mobile Creform cart also designed by the design team. A lid covers the opening to the crushing chamber. This lid must be opened to insert a can into the crushing chamber. After the can is inserted the lid can be closed. The student then presses a switch and the crushing

Figure 19.4. Student Crushing Can with Foot.

cylinder advances to crush the can. When the can is crushed the cylinder retreats and the lid can be opened and the crushed can removed. The position of the lid, user switch and device placement on the Creform cart allows ergonomically sound human operating procedures, which are also accessible to students in wheelchairs.

Safety is a major concern. The device has a number of built-in safety features. The first feature prevents the lid from being physically opened when the crushing cylinder is advancing. The second safety feature is a pneumatic/electronic control system designed to force the crushing cylinder into an open position if there is a valve or power failure. The third safety feature prevents the crushing cylinder from advancing when the lid is open for insertion of cans, as the open lid is constructed to physically block the cylinder. Finally, when the lid closes it activates a door closure sensor. This door closure

sensor must be activated before the student-operated switch can start the crushing process. Furthermore, the lid must be fully closed or it will physically prevent the crushing cylinder from advancing. Figure 19.5 is an image of the can crusher on the cart.

In keeping with the overall facility plan, the can crushing system is mounted on a mobile Creform cart. The air compressor is also mounted on wheels. This allows both units to be moved to a secure storage area for safe out-of-the-way storage. The cart also has space for storage of the tools necessary for the can crushing operations. This follows through with the "kitting" strategy employed throughout the classroom.

The final cost of the can crusher system is $1,303.74. This includes the crushing device, the Creform Cart and the air compressor.

Improvement of Stepping Stones Creation Process and Design of Related Devices
Designers: Rubab Hans, Taissa Meredith, Jaime Rutt
Supervising Professors: Dr. Robert Erlandson, Dr. Olugbenga Mejabi

The students make cement stepping stones with inlayed glass designs. The previous process for constructing the stepping stones is difficult, inefficient and requires a great deal of strength, a limitation that particularly reduced independence of students with physical disabilities and required teachers and staff to perform many of the process steps. A major goal of this project was to create a process environment that supports and increases student independence. To accomplish this goal, the assembly process and ergonomic demands of the job were modified.

In the older process, students were required to seek approval from the teacher twice before the completion of the stepping stone—once after laying precut glass onto a design paper and again before applying contact paper to the glass design, which will later be placed in the cement of the stepping stone. The new process eliminates the need to first lay the glass pieces upon the design paper and to seek teacher approval. Instead, the glass pieces are placed directly on the contact paper, which is now imprinted with the design pattern. Students need only seek teacher approval after laying the glass on the contact paper and then again after laying the glass into the wet cement mold.

Changes in the stepping stones process include the addition of two devices. The portable workstation was constructed using Creform, a pipe and joint technology system comprised of sturdy plastic coated metal piping and metal and plastic joints. The workstation can accommodate up to six students simultaneously and is wheelchair accessible and therefore allows for fuller participation by students with varying abilities and limitations. The Creform frame is covered with a yellow Formica top as part of the color-coded classroom. The portability of the workstation increases the speed of the process and minimizes danger of injury by decreasing the distance that cement must be carried. The workstation, shown in Figure 19.6, also has storage space for related tools.

Figure 19.5. Can Crushing Device and Cart.

In addition to the introduction of the portable workstation into the stepping stones creation process, a Creform material handling cart replaces the wheelbarrow previously used to transport cement. The material handling cart is half a foot lower in height than the wheelbarrow, reducing the amount of stress on the backs of students who stir or mix cement in the bowl of the material handling cart. Because the cart rests on four wheels and is equipped with a handle, the cart can be easily pushed by applying force only in a horizontal direction, unlike the wheelbarrow, which requires force in the horizontal and vertical planes for transport. Due to portability, the pouring of cement can now be done under a hood in the classroom, thereby reducing cement dust in the air. See Figure 19.7.

Figure 19.6. Portable Workstation for Stepping Stones Creation Process.

In addition, the portable workstation provides a stable yet movable surface, facilitating emptying of the cart into the stepping stones molds on the workstation table. Both the workstation and the material handling/wheelbarrow cart have locking wheels to increase stability.

Figure 19.7. Material Handling Cart.

RADIO FREQUENCY TECHNOLOGY FOR MANIPULATIVE PLAY

Designers: Jeffrey L. Morin and Vamsi Ramakrishna Penmecha
Client Coordinator: Dr. Robert Erlandson
The Enabling Technologies Laboratory
Supervisor: Dr. Robert Erlandson
Department of Electrical and Computer Engineering
Wayne State University, Detroit, MI 48202

INTRODUCTION

One of the challenges in introducing new technology into educational environments is that teachers, therapists, and other support staff are usually unfamiliar with and reluctant to try the new technology. A previous project created a prototype manipulative play system based on Radio Frequency (RF) hardware with a Visual Basic interface. Teachers and therapists who have played with this system had fun and more importantly, observed how this technology can be expanded and utilized to help all children develop mathematical skills through manipulative play. The children who used the prototype system were immediately engaged. Younger children were caught up in the dialogue and process while older children wanted to know how it worked.

Testing of the prototype demonstrated the potential of using RF technology with manipulative play to teach students, including those with physical and cognitive disabilities, the concepts of relative size, color differentiation, and other skills. Laws such as IDEA 97 mandate more integration of general education and special education students and require that we develop educational materials and resources that enable diverse student populations to naturally participate in classroom activities. The RF Technology Manipulative Play System addresses this growing need.

Feedback from prototype testing indicated that the implemented activities were too simple to sustain interest. The technology allowed the selection of only one item at a time. Teachers indicated that the development of pattern recognition skills and sequencing skills requires more selections. The original RF tag technology would not support such patterned and sequenced activity. Furthermore, the RF tag manufacturer stopped making the RF tag product line. Fortunately, Microchip recently introduced an inexpensive anti-collision RF tag system. Version 2.0 of the RF Technology Manipulative Play System utilizes this new anti-collision technology to create a system that supports simple selection games as well as a host of pattern recognition and sequencing games.

SUMMARY OF IMPACT

Special education teachers and staff who saw a practical application of RF technology are now more comfortable with it and are encouraged to brainstorm over uses for the technology. In the case of the sample application, they suggested several applications for using RF technology to aid their students with disabilities. Version 2.0 of the RF Technology Manipulative Play System is the result of previous field testing.

TECHNICAL DESCRIPTION

Version 2.0 of the Manipulative Play System uses Microchip 13.56MHz RF anti-collision tags and the associated reader/scanner. The reader/scanner is connected to a PC via a RS 2323 serial line. Visual Basic 5.0 is used for the control and user I/O software. To encourage manipulative play, the interface is designed as a game with several options. The Version 2.0 prototype uses a collection of wooden blocks, cubes, rectangles, triangles, and circles. The blocks are a variety of colors. An anti-collision tag is embedded in each block and each tag has a unique code that is programmed by the manufacturer. A game requires a player to respond to a verbal or visual instruction from the computer by selecting a specified block and placing the block on a stand. Figure 19.8 shows some of the blocks and stand. Figure 19.9 shows a block and an RF tag. The stand contains an antenna which is connected to the scanner/reader. Figure 19.10 shows the bottom of the stand where the antenna and reader/scanner are mounted.

There is a variety of single selection game options. For example, the user is prompted to choose a specific color, choose a specific shape, choose the largest, smallest or middle sized cube, and choose the largest, smallest or middle sized rectangle. Pattern game options include picking specific combinations of cube or rectangle sizes or colors. For example, select all the circles or select the largest cube and the smallest rectangle. Sequencing game options require an ordered selection process. For example, the user must pick the largest cube, the smallest rectangle, the purple circle, the red triangle, and the green cube. The pattern and sequencing game options can be made more or less difficult, depending on the number of selections required of the user.

The RF tag's anti-collision feature allows monitoring of multiple selections for the pattern and sequencing tasks. The Visual Basic program can monitor which blocks have been selected and in which order. The user can then receive verbal feedback to support correct responses and notify the user of an error and the need to make a correction.

The cost of the microchip development kit and RF tags is $1,079.00. The development system has been used for three student design projects. The RF tags cost about $1.50 each and a reader/scanner can be purchased for about $300.00.
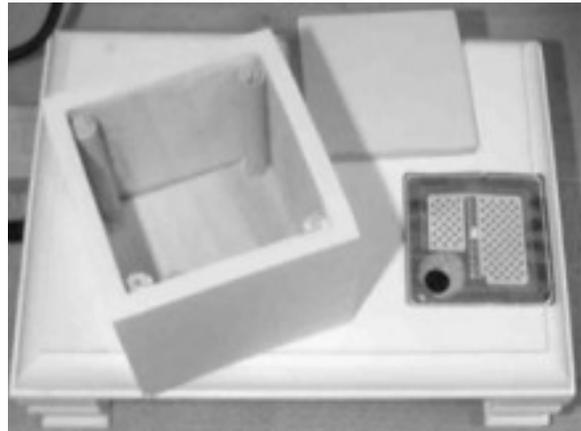

Figure 19.8.   Colored Blocks and Stand.

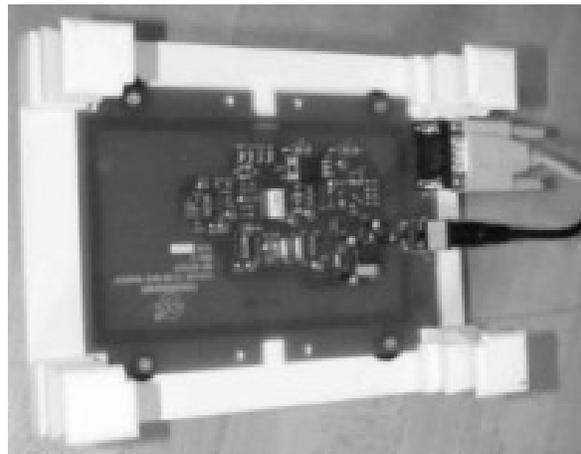Figure 19.9. RF Tag and Opened Block.

Figure 19.10. Antenna and Scanner Mounted on Bottom of Stand.

FITTS' LAW GAME SYSTEM FOR TEACHING ACCESSIBLE DESIGN

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INTRODUCTION

Fitts' Law is one of many scientific laws that influences accessible design strategies. Current federal legislation mandates the use of accessible design in a variety of services and products, yet a large number of university faculty and students are generally not aware of these legal mandates. The Fitts' Law Game System is designed to raise student and faculty awareness of accessible design principles in general and Fitts' Law in particular.

SUMMARY OF IMPACT

In addition to raising awareness of accessible design issues, the system serves two other purposes in illustrating Fitts' Law as well. First, teachers and therapists use a variety of augmentative communication devices for their special education students and clients. These devices typically use a series of overlays that the users touch to produce a message or computer action if the device is used as an alternative keyboard. The overlay design is a specific example of the application of Fitts' Law, and hence overlay designers need also to be aware of the implications of Fitts' Law on the design of their overlay products. Second, the mathematical expression of Fitts' Law was developed using the general population as experimental subjects. The Fitts' Law Game System will allow data collection for a variety of users. This will enable data to be gathered for individuals with disabilities in order to test the validity of Fitts' Law for diverse user populations.

TECHNICAL DESCRIPTION

Fitts' Law basically states that the bigger the target, the easier it is to hit. The law can be described by an equation that specifies the relationship between movement time (MT), movement distance (D), target size (A) and various characteristics of the person, method and task modeled by two parameters, K1

$$MT = K_1 + K_2 \log(2D/A)$$

Target Size = A   Target Size = A
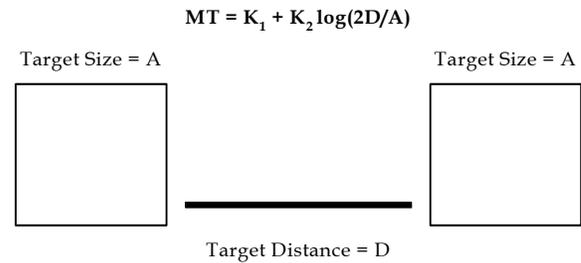
Target Distance = D

Figure 19.11. Components of Fitt's Law.

and K2. It has the following basic form shown in Figure 19.11.

There have been many refinements and applications of this basic equation. Part of the appeal of the equation is that it is intuitive for those who understand the mathematics. The further one moves (D), the longer it takes. The bigger the target, the shorter the target acquisition time (MT). The non-linear, logarithmic equation is typical of models describing human performance.

Examples of Fitts' Law can be found in pushbutton TV and VCR remote controllers where the size and placement of the pushbuttons make operation more or less difficult. Other examples include the controls on car radios and light switches. Processes such as placing groceries into a shopping bag, inserting an ATM card into the receiving slot, and pulling a car into the garage all exhibit principles of Fitts' Law.

A universal example of Fitts' Law is a computer's cursor control via a mouse or other input device. Because this is such a fundamental task the Fitts' Law Game System is built around cursor control on a computer monitor. The player can select one of six levels of difficulty. The lower the difficulty, the larger the target area. The higher the level of

difficulty, the smaller the target's area. The system always brings the cursor to a home position in the lower right corner of the screen. A given target is then randomly presented on the screen. The player must move the cursor into the target area and click the mouse, or perform an equivalent operation that signifies a mouse click if using an alternative input device.

There are six different target areas and 10 different distances. For a given target, one of the distances (a direct line from the home position to the target) is randomly generated. A given distance falls along an arc with the home position as the center of the arc. The system generates a random position along the arc. This scheme prohibits placement patterns yet provides data for fixed target areas and specified distances.

A player can specify the number of targets that will be presented and can play the game six times per setting, one game for each target size or level of difficulty. The following data is automatically collected: target area, distance moved, and movement time (time from the appearance of the target until the user clicks the mouse within the target area). When the player is done, the system provides an option to see a plot of the results which can be displayed in one of the following ways: movement time versus target area (with distance as a parameter) or movement time versus distance (with target area as a parameter), as illustrated in Figures 19.12 and 19.13.

The system is designed as a game, but can be configured to formally gather performance data. In the experimental (data collection) mode the
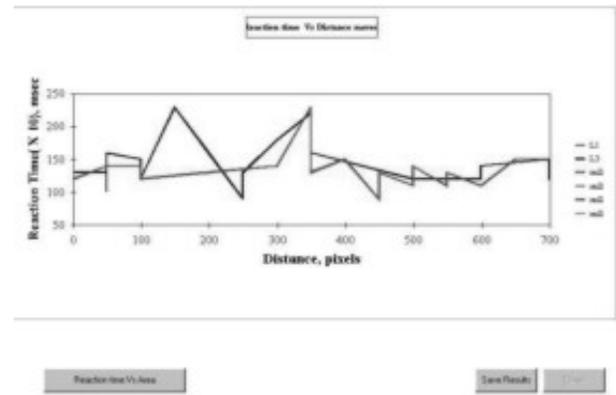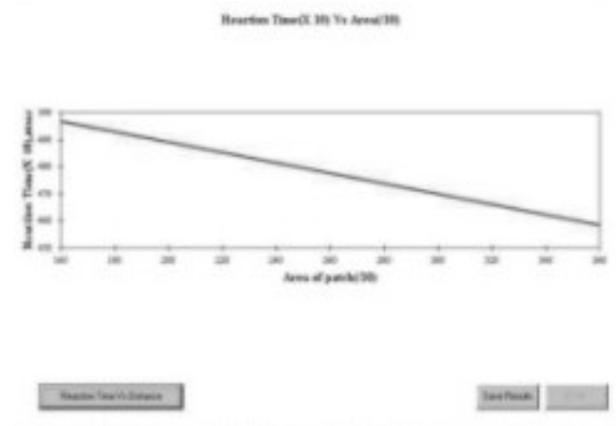

Figure 19.12. Reaction Time Versus Target Area.

Figure 19.13. Movement Time Versus Distance.

experimenter identifies the subject via a code. The experimenter selects the difficulty level and number of targets to be presented. Data are automatically collected and saved into a subject data file.

MULTIMEDIA ASSESSMENT TOOL FOR CHILDREN WITH DISABILITIES

Designers: Muralikumar Krishnamurthi and Kalpana Muralikumar
Client Coordinators: Patricia Nizio, Detroit Institute for Children
Supervisor: Dr. Robert Erlandson
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INTRODUCTION

A client agency provides specialized medical, dental, and rehabilitative care high-tech adaptive equipment for children. Therapists and teachers there have difficulty assessing the language and mathematics competencies of children with multiple disabilities because standardized assessment tests typically require generalizing of skills beyond the scope of the assessment tests, generalizing from concrete examples to abstracted drawings, verbalizing answers, and pointing to respond. Such requirements are beyond the physical and motor capacities of many. Therefore, this multi-purpose, multimedia-based computer system for early language and mathematics knowledge and skills has been designed to allow staff to evaluate such skills in this population.

Field testing of an earlier version of this program established the efficacy of the concept, but highlighted several areas for improvement and prompted the staff to request additional functions. Inclusion of the new functions resulted in a complete redesign of the original program. The program looks and feels like the original but includes the requested performance enhancements and functional additions.

SUMMARY OF IMPACT

The children using the Multimedia Assessment Tool (MAT) are primarily between the ages of five and 15 years and have severely limited physical capabilities, most due to cerebral palsy. Most of these students cannot sit independently, walk, or use their hands to communicate. They can, however, use MAT to demonstrate what they know of a particular vocabulary group, such as "animals" or "objects," by simply activating a switch to select pictures scanned across a screen. A second task has been added to this version of the program. It involves short term memory and an understanding of logical connectives such as "AND." For example, a child might be asked to select a cow and a horse and a bird. These activities allow staff to determine each child's level of receptive language development and provide the children with the opportunity to demonstrate their capabilities given the appropriate forms of assistive technology. MAT also allows the children to practice the motor skills associated with listening, watching, and maintaining attention, all of which are necessary for operating computers and improving communication skills.

The original field testing was so successful that the agency will be adding these activities to their collection of assessments and a record of client performance will be included in the client's treatment files. Based on field testing, a new report generating system was designed and developed. This activity was completed as a second project for the same design group.

TECHNICAL DESCRIPTION

MAT offers two types of task activities, each addressing different language and cognitive processing skills. In one case the child is simply asked to pick an object or an animal from the pictures presented on the monitor. In the second group of tasks the child is asked to make selections based on increasing memory demands and logical connections. The task implemented in the current version of the program uses an "AND" connective. For example, the system asks the child to pick the square and the circle, or perhaps the cow and the bird and the lion. The program supports up to six pictures on the screen and five connectives. The new design allows the simple addition of additional tasks. In addition to "AND," therapists want to use the "OR" connective and combinations of connectives.

MAT can be run in two different modes: learning mode and assessment mode. In the learning mode,

the student's learning process is reinforced by repeated voice prompts and the display of the correct picture in the case of a wrong selection by a student. In the assessment mode, software does not correct the student in the case of an incorrect selection. Rather, the system records all details of the selections made, the time taken to make each selection, and which picture was selected. Data collected during the assessment mode can then be tabulated and displayed in graphical rm by MAT's multi-functional report generator.

The example depicted in Figure 19.14 may be used for two different activities. In both cases the program displays four different animals from which the child will be required to make a selection. In one activity the child receives a verbal prompt to select one particular animal from the set. For the second activity the child is asked to select two or more specific animals. For example, select the horse and elephant, or select the cat and the horse and the elephant.

Since many of the children cannot use a mouse, the program supports a visual scanning mechanism for switch users. The child makes a selection with a single switch or a mouse when a choice is highlighted. In the learning mode, if a selection is correct, the program will move to the next exercise. If the choice is incorrect, the same exercise will be repeated. In the assessment mode, the program simply moves on to the next exercise and records the child's responses. In all activities, verbal prompting is provided to maintain the child's attention and to guide the child through each exercise.

The number of pictures displayed in the program depends on the level of difficulty specified by the staff. As the level difficulty decreases, the student is required to choose among a reduced number of pictures. The system also allows staff to create user-defined session settings to meet the needs of individual students (see Figure 19.15). These settings include the color of the highlight scan, width of the highlight scan, image scan time, image delay time, and the number of scans over each image before session termination.

In addition to the report generator, MAT maintains a database of student and staff information. This offers controlled access to student information, which is available via password only to staff members assigned to that student. While preparing
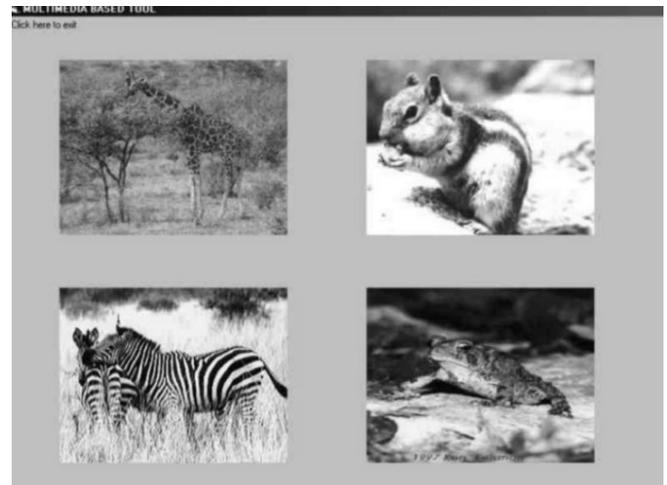

Figure 19.14. MAT 3.0 Selection Screen.

Figure 19.15. Session Settings Screen for Setup of Individual Student Settings.

MAT sessions for their assigned students, staff may record new audio prompts, play or overwrite existing audio prompts, or preview the images associated with each audio file before starting a session.

MAT is implemented in Visual Basic 5.0. To function optimally, MAT requires a Pentium-grade CPU with Windows 95, 98, 2000 or NT, a color monitor, a single-switch (if a mouse will not be used), and computer speakers. If staff wish to add or replace photos in the system, a digital camera or scanning device is necessary.