Using Problem Solving to Teach the Disabled

"The use of problem-solving techniques can be incorporated into the instruction of teachers of students with disabilities."

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As technology continually evolves in response to human endeavors, a unique aspect of emerging technologies is the application of new solutions to problems faced by persons with disabilities. Technology education can (and should) play a role in the development of ideas through problem solving to assist teachers of students with disabilities.

Although the incorporation of problem solving in technology education teacher preparation programs is common in the field (Johnson, 1988), the use of problem-solving techniques can be incorporated into the instruction of teachers of students with disabilities. This article will present a discussion and practical applications of how problem solving in The Ohio State University technology education teacher preparation program assists teachers. Further, a discussion of how technology education teachers can adapt these applications to be a part of their teaching is included.

A Teacher Training Model

One of the goals of The Ohio State University's (OSU) Technology Education program is to help train prospective teachers and other professionals working in special education and technology education fields to develop problem-solving skills. Teachers of students with disabilities bring a knowledge base of the concerns of people with disabilities while technology education students bring their knowledge of technology and problem solving to the group.

Although some people with disabilities have trouble with mobility, dexterity, coordination, or sensory problems (i.e., hearing, sight, etc.), all of them need assistance to perform even the simplest tasks. It is the goal of the students in these fields to assist disabled populations to become more independent.

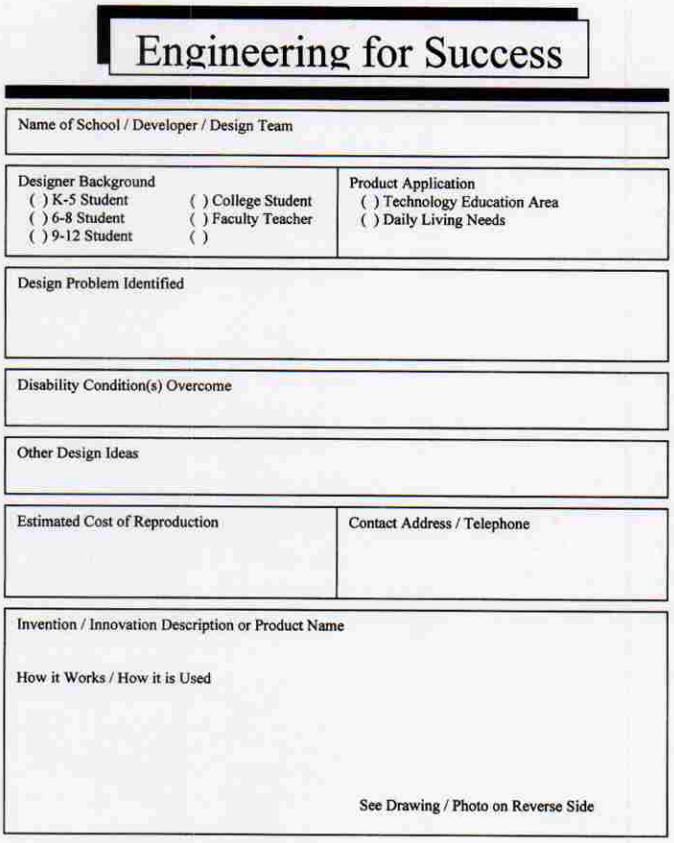
One of the courses in the OSU technology education program that helps teachers of students with disabilities to learn problem-solving skills is a graduate level course for people working with disabled populations. The primary part of the course's curriculum is the problem-solving approach, "Engineering for Success" [adapted from Gugerty, Roshal, Tradewell, & Anthony (1981), designed by Scott (1985)] (see figure 1).

The steps of the Engineering for Success (EFS) problem-solving design include 1) identify the design problem, 2) identify the disabled condition to overcome, 3) list all possible solutions, 4) select the best solution, 5) develop a prototype, 6) test the prototype, 7) make modifications and retest, and 8) determine the degree of success.

The students in the graduate level course, from a technology education or special education teaching background, are encouraged to work in teams of three or four, on projects that help permanently disabled populations. It would appear that the products produced by the teams having both technology education students and teachers of students with disabilities clearly focus on a disability problem, and are developed from sound problem-solving principles, resulting in high quality products.

One example of the EFS design in action is a product developed by a group of technology education students and teachers of students with disabilities. This team noticed that many disabled people who used a computerized communication board effectively in their lap while sitting had difficulty holding the device for communication while standing, shaking hands, going through lunch lines, or while doing other things with their arms and hands.

After the design team made a list of possible solutions, they decided to use a wooden tray to support the device, and leather straps to hold the communication device while standing. After developing a prototype and then testing, modifying, and retesting the device, the team found the



Engineering for Success

Name of School / Developer / Design Team

Designer Background
( ) K-5 Student ( ) College Student
( ) 6-8 Student ( ) Faculty Teacher
( ) 9-12 Student ( )

Product Application
( ) Technology Education Area
( ) Daily Living Needs

Design Problem Identified

Disability Condition(s) Overcome

Other Design Ideas

Estimated Cost of Reproduction

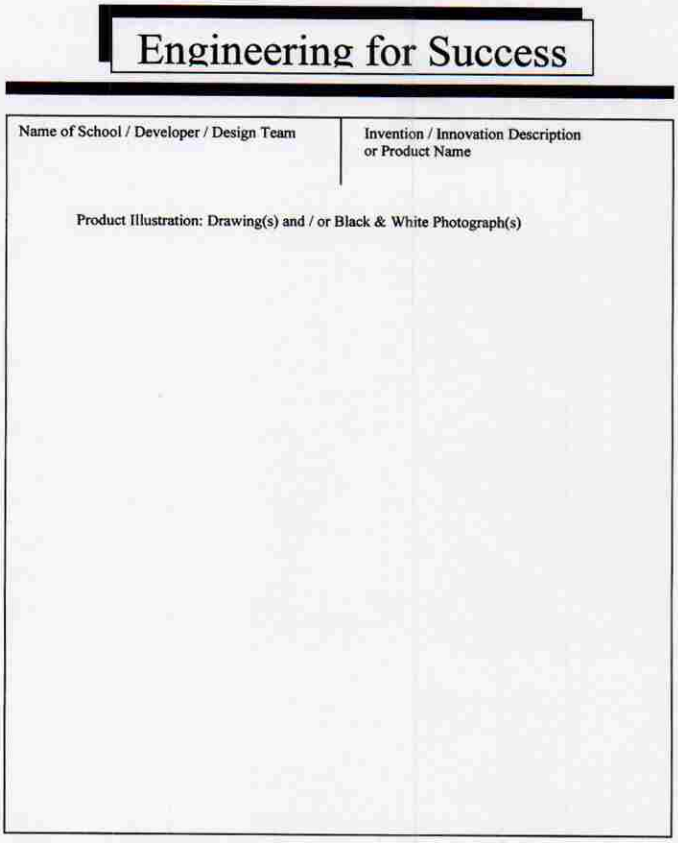
Contact Address / Telephone

Invention / Innovation Description or Product Name

How it Works / How it is Used

See Drawing / Photo on Reverse Side

Figure 1 Part 1. Engineering for Success.



Engineering for Success

Name of School / Developer / Design Team

Invention / Innovation Description or Product Name

Product Illustration: Drawing(s) and / or Black & White Photograph(s)

Figure 1 Part 2. Engineering for Success.

final product to allow a person to communicate easily in any situation (see figure 2).

Another example of the EFS design in action is a safety device that was developed to help elementary students with developmental disabilities safely use a paper trimmer to cut paper for making note pads. A design team consisting of technology education students and teachers of students with disabilities developed this product. For the paper trimmer to be safe, both hands needed to be in use. This allowed a special needs student to operate the device so that there would be little chance that a hand or finger could be under the blade arm.

The design team made a list of possible solutions that included using a bicycle brake handle and cable to release a locking mechanism. After making a prototype and testing, modifying, and retesting the device, the team agreed the final product would keep both hands busy and help prevent injury (see figure 3). The device locks the blade arm up when a pin enters a slot behind the back of the blade arm. The student must pull a lever (using his or her left hand) to release the pin, enabling the blade arm to be operated with the right arm. This design prevents the student from cutting a hand or finger while operating the paper trimmer.

Figure 2. Communicator and harness.

The above designs are solutions to problems associated with permanent physical disabilities. These solutions help provide persons with disabilities with technological devices that make particular activities easier to perform. The problems that persons with permanent disabilities face are usually associated with daily or special tasks. These tasks can be made easier through the development of technological devices.

Adoption of EFS for Technology Education Teachers

Just as the EFS model has been used in our teacher training program, we are also pleased that technology education teachers have adopted the model to use in elementary and secondary schools. In some cases, local technology education student associations (TSA) have used the EFS model as a project for their yearly activities. In other cases, technology education teachers have utilized the EFS model to be an integral part of teaching problem solving.

One example of a TSA using the EFS model is a walker-chair developed for a child with low muscle tone. The TSA assisted their technology education teacher in problem solving and developing the chair. It had to fit the four-year-old child and be adjustable to allow for the child's growth. In addition, the chair needed to be stable and easy to maneuver while allowing the child to develop muscle tone in her legs.

The TSA developed a chair from wood, a car seat cushion, and leather straps. After testing and modifying the chair, they found the final product to allow the child to maneuver easily and safely, and obtain the necessary exercise recommended by the doctor.

Conclusion

The incorporation of problem solving in technology education not only helps students in technology education teacher preparation courses, but also teachers working with students with disabilities. One problem-solving design that has been successful in The Ohio State University technology education program is the EFS design.

This design tries to group technology education students with teachers of students with disabili-

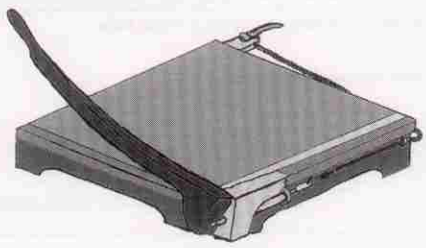


Figure 3. Paper cutter with safety cable.

Figure 4. Child walker.

ties. Within a group, they are taught how to develop quality products through the incorporation of the knowledge from their respective fields and the EFS design. As faculty and teaching associates at The Ohio State University, we have found this design to be successful.

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