

## Undergraduate Design Project: Star Tracer

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*Supervising Professor: Steven F. Barrett*

*Client Coordinator: Kay Cowie, Special Education, College of Education*

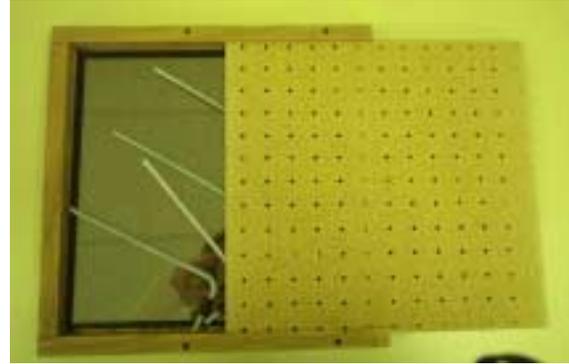
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**Figure 1. Completed Star Tracer**



**Figure 2. Disassembled Compacted Star Tracer**

### Introduction

In the spring of 2002, the University of Wyoming received funding from the National Science Foundation Division of Bioengineering and Environmental Systems in order to complete undergraduate design projects. The funding enables these design projects to be completed by undergraduate students from the College of Engineering. The purpose of the design projects is to directly aid individuals with disabilities from around the state of Wyoming. Dr. Steven F. Barrett of the Department of Electrical and Computer Engineering at the University of Wyoming has located individuals with specific needs from around the state in order to compile exact design projects to be completed. In order to most effectively assign projects based on need Dr. Barrett has partnered with some other organizations and departments, including the University of Wyoming's Department of Special Education.

Amongst the many individuals working in the Department of Special Education, Dr. Steve Barrett has worked specifically with Kay Cowie, one of the Assistant Lecturers. After meeting with Dr. Barrett, Kay specifically requested one design project for two students from the College of Engineering to complete. Kay requested this design project in order to continue educating people from around the state about different learning disabilities. This is extremely important since fourteen percent of all school age children are diagnosed with some type of physical disability. Half of those fourteen percent have a type of learning disability and five to eight percent of those children have a learning disability that can be associated with dyslexia or portray them the way that dyslexia does[1].

Kay Cowie is currently one of the lecturers and educators for the Department of Special Education at the University of Wyoming. Twenty-three years ago, Kay was a special education teacher at Glenrock Junior/Senior High School in Glenrock, Wyoming. While teaching in Glenrock, with the permission of the principal, Kay wrote her own program titled, "Hands On Learning" to be incorporated into the curriculum of the school in order to educate students on disabilities. Today Kay continues to incorporate her curriculum into activities throughout the University of Wyoming, in order to educate future teachers and leaders. It is because of this program that so many lives have been changed and touched in the entire state of Wyoming.

One of the most important reasons that Kay has accomplished her goals of being able to teach people about different disabilities is through the use of visual aids. Without some type of hands on teaching method it is too hard to suggest to someone the effects of disabilities that cannot be outwardly recognized. One of these types of disabilities is dyslexia and other disabilities similar to dyslexia. A person who possesses dyslexia gives off no outward signs of containing the disability and therefore can become target to criticism and teasing when they try to accomplish normal everyday tasks. In order to simulate to someone without dyslexia how certain activities can be challenging for someone who does possess dyslexia, Kay used an aid called a Mirror Board. The Mirror Board is Kay's favorite and most effective aid. The mirror board was made out of a wood board base, a 12x12 inch square piece of mirror,

Styrofoam, and two bent pieces of coat hangers. The device worked by placing the mirror in a notched out section of the wood board so that it would stand up with a slight tilt. Then the coat hanger pieces were bent and placed into two holes drilled into the base and then the Styrofoam was rested on the hangers as a raised divider in the middle of the mirror. Finally a piece of paper with the image of a star outlined by a bigger star was placed onto the wood board.

Once set up, a student attempts to trace in between the two stars by looking into the mirror. Anyone who tries this finds out that it is difficult to complete the task. When attempting to trace the star, the mind is confused by looking into the mirror and cannot relay to the hands which direction to move the pencil in order to turn the edges of the star. This is what it is like for someone who has dyslexia to be able to complete certain everyday tasks. Through experience, the Mirror Board has proven to be the most effective aid to educate not only students, but all people about what many different learning disabilities are like. Unfortunately, these Mirror Boards were not made from very durable material and after twelve years of use Kay was in need of new Mirror Boards.

### **Summary of Impact**

In June of 2002, Dr. Barrett and Kay Cowie met to discuss Kay's need for new Mirror Boards. The five remaining Mirror Boards that Kay currently had in use were not only falling apart, but they were very bulky, heavy, and took a long time for assembly. Kay desired new Mirror Boards that would be durable, lightweight, contained in one piece, and could be quickly and easily transported and assembled. After discussing the new desires for Mirror Boards, Stephanie Popp and Jennifer Barnes were hired as two undergraduate engineering students to design new and more efficient Mirror Boards. The remainder of the project was spent designing and constructing thirty new Mirror Boards. After completion, these new and improved Mirror Boards were renamed "Star Tracers." The Star Tracers have provided many benefits to Kay and many other groups that they have been used with. Since receiving the new star tracers, Kay has used them in Elementary Schools in Laramie, with church groups, civic groups, and even the Wyoming Game and Fish Department has requested an in-service with the star tracers in order to educate workers on the needs for understanding certain disabilities. In addition, many classes in the Department of Education at the University of Wyoming have used the star tracers in order to educate future teachers. The star tracers have been requested for use by students from around the university to be used in presentations for classes in other colleges. Student teachers have also used the star tracers in the classes that they are student teaching for. This design project has helped to touch many lives throughout the state of Wyoming. It has allowed educators such as Kay, to be able to quickly and more effectively teach people all over the state about different types of disabilities that exist. This has allowed people to recognize the difficulties that many people may face in their daily lives.

### **Technical Description**

The first week of the project was spent designing plans that would make the Mirror Boards lighter, safer, more durable, and easier to transport. A plan was agreed on that would make each Mirror Board into its own carrying case. This was accomplished by making the base of the Mirror Board the actual case and the divider that would replace the piece of Styrofoam would be the lid to the case. Sides were added onto the base and then notched a section was cut into these sides so that the divider could be slid into the grooves and therefore act as a lid to the casing. The cheapest material to be used for supporting the divider was then discussed. Kay had been using the coat hanger pieces for this purpose. Prices on different hinges available were researched. If a hinge was to be used, the price to build the Mirror Boards was going to increase dramatically. Instead of using an expensive, fancier hinge it was decided that aluminum rods could be used instead. Four pieces of aluminum rod would be used and four holes would be drilled into the base in order to hold the pieces of aluminum. The aluminum rod would be bent at the top and Velcro would be wrapped around the top bent portion in order to hold the divider onto the aluminum rods. The other side of the Velcro would therefore be placed on the divider board. The divider board needed to be durable yet lightweight and inexpensive. We decided on particleboard to be used as the divider and lid of the casing. Finally, the mirror needed to be chosen. The problems associated with mirror were that the mirror was heavy, breakable, and contained sharp and jagged edges that could possibly cut someone. As an alternative, mirrored plexi-glass was used instead. After all of the products were decided upon, and a prototype was built, the construction of thirty mirror boards began. All of the wood that would be used for the Star Tracers was cut in the Carpenter shop at the University Wyoming. Therefore all thirty Star Tracers could be assembled at one time. After they were assembled, the wood was varnished and polished to seal in the quality of the wood. It was decided that small luggage carts would be purchased from a local store to transport the Star Tracers. The pieces of each Star Tracer were placed into the base casing and the divider lids were slid into place. Ten of the Star Tracers were placed onto each cart and they were quickly and easily transported to Kay.