

CNC Technology Brings Out Hidden Talents in Physically Disabled Children

By Jeff Lintz

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In my career teaching production technology to middle school special education students, I have had many students who clearly had talent in graphics and design that went unrealized because of their physical disabilities. I have seen students with an enormous amount of creativity get frustrated and withdraw because they could not physically build what their mind could conceive.

This situation has taken a major turn for the better as our school has equipped itself with inexpensive, accurate computerized numerical control (CNC) equipment. This equipment makes it possible for students to define their ideas on the computer, using special interface equipment and then watch their designs being built before their eyes.

The fact that they can use the machine's capabilities to build beautiful and functional objects without help from another person enhances both their enthusiasm and their self-esteem. In one of the most dramatic examples I've witnessed, a student with cerebral palsy built a CO2-powered car for the Dragster Design Challenge and has gone on to do very well in the graphics program at Miami Lakes Educational Center.

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Proud students, with educators, display their finished projects.

Special Education Program

The special education classes at Hialeah Middle School in Miami-Dade County, FL, include students who are mentally handicapped, deaf, autistic, blind, and physically impaired. In the past, I often felt frustrated working with physically impaired students because many of them, while cognitively normal or above normal, cannot achieve anything close to their true potential in the technology lab due to their physical limitations. Poor muscle control keeps many students from using conventional power tools for safety reasons. Even if they could use the tools, chances are they would end up disappointed because the results would be far below the quality of the designs they can conceive.

I have seen a number of these students become frustrated over their



Students cut their cars using the Techno DaVinci.

inability to consummate their designs - and as a result give up on what in my opinion might have otherwise been a very fruitful career. One student with muscular dystrophy sticks in my mind. He breezed through his assignments and his creativity was immense, but even though I built him a lift that would hold him up to use the scroll saw, he could never complete his projects on his own. The disappointment I saw in him was appreciable - and I wish I had him back now to work with the CNC equipment.

Bringing New Technology Into The Classroom

About three years ago, far-sighted local school officials decided to purchase CNC machinery and bring it into the classroom. CNC machines automate the work of conventional power tools by using computer-generated commands to move the cutting surface with far more precision than could be achieved by even the most experienced craftsman. Our school selected Techno's DaVinci, a unique tabletop machine, suitable for a wide range of applications, including model making, woodworking, plastic fabrication and sign making.

The DaVinci is slightly different from the more common gantry style machine

because it moves the workpiece as well as the cutting spindle. The machine is constructed out of state-of-the-art extruded aluminum profiles. Because of this design, similar to that used in the aircraft industry, the machine is light and portable, yet rigid. In addition, the machine has hardened steel linear ways and ball screws, which means that it provides a high level of performance, speed capacity, and machine longevity at a surprisingly low price.

The servo DaVinci machine comes standard with 3-axis servo control, which can be upgraded to 4-axis to accommodate a rotary table option. Techno machines can also be equipped with T-slotted vacuum tables for easy fixturing of sheet stock-like materials.

Along with the DaVinci machine, we got the IMS CO2 system, which allows students to quickly, easily, and inexpensively design and produce finely machined CO2 metric 500 racing cars

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that meet the specifications for Technology Student Association (TSA) competition. The kit includes specially fitted hardware, interface software, instructional videos, and fabrication templates that simplify the design and manufacture of CO2 cars. The kit allows any student to produce better cars more quickly, without tedious hand carving. But for our physically disabled students, the difference is like night and day. Instead of having to rely on others to produce their designs, they can compete on an equal basis with fellow students, using the CNC machine to substitute for a lack of fine motor control.

One Student's Story

I put the new machine to the test almost as soon as we had it set up. I had a student with cerebral palsy, whose involuntary spastic motions made it unsafe for him to use conventional power tools. But it was clear from the very beginning that he had a sharp mind and a graphical inclination. When he entered class he couldn't use a conventional computer mouse, so I got him a track ball, which proved easier to manipulate.

Almost immediately, this student demonstrated his ability to create interesting designs on the computer. He took a strong interest in the CO2 racer project and created the model of a car with computer-aided design software that had the other kids oohing and aahing.

In the past, his enthusiasm probably would have been lessened by my assisting him with hand-over-hand tooling of the project. But the CNC equipment gave him a chance to follow the creative process to its

logical conclusion. He used the software provided with the DaVinci to cut his design out of a block of wood.

The pride on his face was truly something to behold. This may have been the first time in his life that he could build something all by himself.

As the other students in the class began treating him like an equal and paying less attention to his physical disabilities, he began to shine. He took a much more active

role, such as participating as an integral member of the team that won the Environmental Challenge contest sponsored by the Florida Technology Student Association. The project involved a drip irrigation system to conserve water in a butterfly garden. The student I refer to designed the display and folder that accompanied the project and did much of the research. After winning the state contest, my students traveled to the nationals and placed ninth out of nearly 50 teams entered.

I maintain contact with this student, who



A student programs a side panel for a lamp.

'The pride on his face was truly something to behold. This may have been the first time in his life that he could build something by himself'

is now enrolled at Miami Lakes Educational Center and Miami-Dade College. He has also participated in a statewide leadership youth program for physically impaired people and has been called back as a leader for the coming year.

The Whole Class Benefits

The value of CNC technology extends far beyond physically disabled students. All of my students participated in a project earlier this year to build nameplates for a meeting of principals from throughout the school district that was held at my school. The students designed and made a nameplate for each principal and also designed and built a plaque for their own use.

For example, one student scanned his favorite cartoon character, converted the resulting raster file to a vector file,

then pasted it into his plaque design and used the DaVinci to engrave it in a block of wood to design a jewelry box lid.

As my colleague Ron Torres-Gatherer, Technology Education Teacher at Hialeah High School, says: "Revitalizing the classroom so that kids are invigorated by learning and enthusiastic about coming to school requires fresh ideas and creative approaches to teaching. The emphasis should be on providing educational tools to motivate, inspire, and focus on teaching skills rather than simply teaching the student how to use the tool itself." CNC technology has the potential to make a difference in the lives of thousands of handicapped kids by allowing them to overcome their disability, energizing them with a passion for learning and a sense of accomplishment.

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