Identifying and Developing Technological Giftedness:

Exploring Another Way to be Gifted in the 21st Century

By Del Siegle

Labels are part of life. They help us communicate and share meaning through agreed upon terms. The label "gifted" is used to describe young people or adults with an outstanding skill in some talent area. While some skills are highly valued, others are not. A skill that is considered important in one society, or at one point in time, may not be valued in another. Giftedness is fluid and changes over time.

> If we were a hunting and gathering society, the gifted individual would be one who could stalk game well and shoot with accuracy. Maybe she would be the one who could locate tasty roots easily. If one had special penchant for meat, one might refer to the hunter as highly gifted and the root gatherer as moderately gifted. (Siegle, 1990, p. 5)

We have advanced considerably from a hunting and gathering society. We are a society embedded in technology within an information age. As has occurred in the past, the definitions of who are gifted need to be modified and expanded to reflect the time in which we live.

> When personal computers first appeared just 30 years ago, few imagined the extent to which they would become part of our daily lives. To most young adults, the future will likely bring an even greater breadth of complex information and communication technologies, including those that are not yet imaged. (Tyler, 2006, p. 1)

Schools not only need to prepare students to be effective users of technology, they also need to begin recognizing students with strengths in technology. This involves recognizing and developing gifts beyond those that have been traditionally identified for gifted and talented programs. In the twenty-first century, the classifications for gifted students should include technologically gifted students. Society requires the skills that technologically gifted students possess; educators have an obligation to identify technologically gifted students and help develop their technological gifts to their fullest. Formal identification of technologically gifted students is necessary because the first step in developing any talent is to recognize it.

Technological giftedness appears to manifest itself in three distinct ways. O'Brien, Friedman-Nimz, Lacey, and Denson (2005) identified two distinct groups of gifted technology students: programmers and interfacers. Friedman-Nimz (personal communication, April 23, 2006) has since suggested that a third group—those who like to work with hardware and fix computers— probably also exists. Students who excel in each of these categories could be considered technologically gifted. In addition to demonstrating expertise, these young people tend to exhibit passion toward one or more technology related activity.

PROGRAMMERS

The talent to write computer code appears to be one type of technological giftedness. I have known gifted students who, as early as first grade, were exploring how to write computer code. While this is unusual, all of the academically gifted students with whom I have worked were able to create simple computer programs by fourth-grade. Some of those students demonstrated a special talent with programming; others did not. Many were able to conceptually breakdown programming tasks and see the relationships among them that involved a special type of analytic processing. For many of these students, programming appeared to be a natural way of thinking and seeing the world. Such a gift needs to be developed.

One way to identify and develop programming talent is to expose young people to programming at an early age. The early Apple computers with Apple BASIC were a wonderful medium to introduce programming. Seymour Papert's (1980) LOGO is

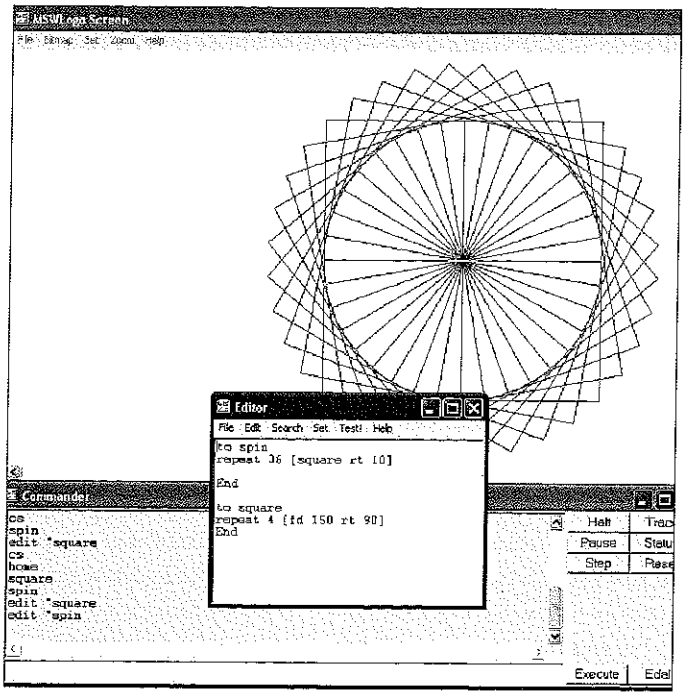

Figure 1. Simple LOGO procedure created with MSW LOGO

still an effective program to introduce very young children to programming. LOGO provides programming for pre-mathematical children and helps develop their reasoning and problem solving skills. Although the program was created for young children, some of the more advanced functions prove challenging for older students as well. Various free versions of the LOGO program are available on the Internet. One popular version is available from **softronix.com/logo.html**. This site not only includes a working version of LOGO that can be downloaded (see Figure 1), it also includes free manuals to assist those who are not familiar with LOGO programming.

A starting place for upper elementary students can be Visual BASIC that can be easily learned. Most educators are not aware that Microsoft has built an abridged, yet still powerful, version of Visual BASIC into the Office products. It can be accessed through Tools —> Macros —> Visual BASIC Editor (see Figure 2) with any of the Microsoft Office products. Once in the program, most of the Visual BASIC commands and tools are available (see Figure 3). Experiencing Visual BASIC can provide a bridge to more advanced programming that technologically gifted programming students will eventually want to pursue.

O'Brien et al. (2005) found that programmers often liked to work alone with computer language and spent hours deciphering code. In addition to their facility with programming languages, these students reported strengths in logic and problem solving. They typically began using the computer as a toy or education tool, advanced to creating simple web pages, and ultimately learned more advanced code. They learned code quickly and were often frustrated by the slow pace of formal computer instruction. Because most programmers quickly outgrow the computer programming options provided in their high schools (or find that high school programming courses progress too slowly), these students may benefit from mentoring opportunities with professional programmers or may be good candidates for early enrollment in university computer courses.

A second area of exposure can be creating web pages. This is a great entry point to programming; however, technologically gifted programmers will quickly become discontented creating pages with simple web editing programs and will need to begin exploring html, Java, and XML. Those students who show an interest and talent for programming can advance to more sophisticated programming such as Visual BASIC, C++, or more advanced Java.

INTERFACERS

A second area of giftedness involves the application of technology. These students excel in using software. They may or may not be able to program computers, but they apply technology in effective and creative ways.

> Because technologically gifted students usually experiment and often teach themselves how to use new technologies, they show remarkable initiative. Not only are they interested in technology, they have the initiative to satisfy and extend their interests. This is evident when they learn new software programs without formal training. While many use the "guess and check" problem solving strategy and simply experiment with what a piece of technology or software program can do, others teach themselves by devouring the instruction manual. (Siegle, 2004, p. 31)

Their interest and skills are not necessarily limited to computers. They often focus their interest on audio and video technology as well. These students are adept at using the technology to

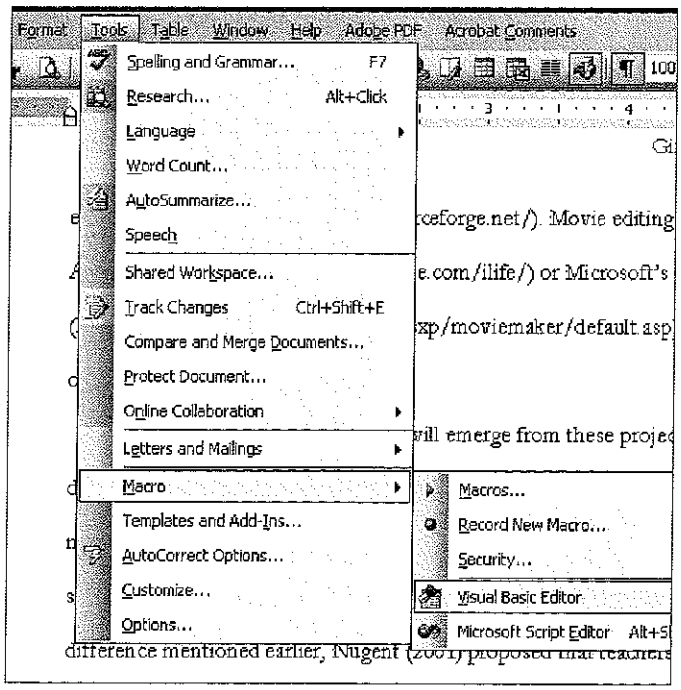

Figure 2. Exploring Visual BASIC programming via macros built into Microsoft Office.

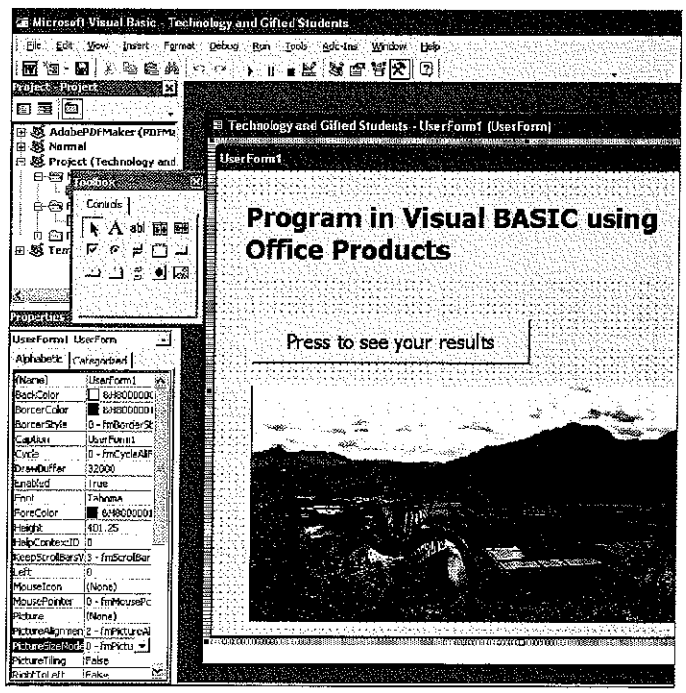

Figure 3. Sample program written in Visual BASIC within PowerPoint™

produce products. O'Brien et al. (2005) found that interfacers were less interested in exploring the computer hardware and more into the social interactions that result from helping others use technology.

Technologically gifted interfacers may exhibit the following behaviors:

- They demonstrate a wide-range of technology skills. They are attracted to a variety of different types of technology.
- They often learn new software without formal training. This is often because they are able to apply what they learned with one type of software to another type.
- They spend their free time developing their technological skills. There is nothing they enjoy more than "playing with technology."
- They often assist others with technological problems. Because of this trait, students can easily identify who among them has this type of technological giftedness.
- They are able to incorporate a variety of technologies into the products they produce. For example, at an early age, their PowerPoint™ presentations may include unique graphic images or custom sounds that they have created or edited.
- They eagerly pursue opportunities to use technology. When a new piece of technology appears, they cannot wait to experience it.
- Finally, they demonstrate more advanced technology skills than others their age. This reveals itself in the sophistication of the products they produce (Siegle, 2005).

Since technologically gifted interfacers can often be identified by the products they create, the ways they assist others with technology, and the technology-related questions they ask, one possible way to identify them is through a rating scale. The Scales for Rating the Behavioral Characteristics of Superior Students (SRBCSS; Renzulli et al., 2004) includes a seven-item technology rating scale (see Figure 4).

Preliminary studies with the technology scale indicate that teachers identify more males than females with it. In an unrelated study, Schulz (1999) reported different personality traits predict between 20 and 25% of students' willingness to embrace new technologies. Males who rated themselves as adventurous, refined, and less jealous were more willing to embrace technology. Conversely, females who embrace technology rated themselves as composed, frank, responsible, and less steady. Male students were also much more likely to embrace new technologies. Based on these preliminary findings, males may be more likely than females to show initiative in using new technology and more likely to experiment with unknown technologies which are factors measured by the SRBCSS Technology Scale.

In 2001, Educational Testing Service (ETS) convened a panel of experts from government, education, and the private sector to define what it meant to be information and communication technology (ICT) literate. Based on its work, ETS has developed two ICT literacy assessments: one for students transitioning to college and a more advanced one for rising college juniors (**www.ets.org**). Both assessments are Internet-based and require 75 minutes to complete. The testing fee, which is about $30, is based on the number of students completing the test. O'Brien and Friedman-Nimz (2006) proposed that the ICT literacy assessment developed by ETS might be used at an earlier age to identify technologically gifted students.

Exposing students to the technologies related to their interests can also be an effective way to identify technologically gifted interfacers. A student who is interested in photography will enjoy working with a digital camera and a photo editing program. Students who are interested in music may enjoy composing music on an inexpensive music composition program such as Music Masterworks, **musicmasterworks.com**, or editing sound with

SCALES FOR RATING THE BEHAVIORAL CHARACTERISTICS OF SUPERIOR STUDENTS

TECHNOLOGY CHARACTERISTICS © 2003 Del Siegle

The student...	Never	Very Rarely	Rarely	Occasionally	Frequently	Always
1. demonstrates a wide range of technology skills.	❑	❑	❑	❑	❑	❑
2. learns new software without formal training.	❑	❑	❑	❑	❑	❑
3. spends free time developing technology skills.	❑	❑	❑	❑	❑	❑
4. assists others with technology related problems.	❑	❑	❑	❑	❑	❑
5. incorporates technology in developing creative products/assignments/presentations.	❑	❑	❑	❑	❑	❑
6. eagerly pursues opportunities to use technology.	❑	❑	❑	❑	❑	❑
7. demonstrates more advanced technology skills than other students his or her age.	❑	❑	❑	❑	❑	❑
Add Column Total:	❑	❑	❑	❑	❑	❑
Multiply by Weight:	X1	X2	X3	X4	X5	X6
Add Weighted Column Totals:	❑+	❑+	❑+	❑+	❑+	❑+

Scale Total: _____

Figure 4. Technology characteristics subscale of *Scales for Rating the Behavioral Characteristics of Superior Students* is available in print and online from Creative Learning Press (www.creativelearningpress.com)

the free Audacity sound editing programs, **audacity.sourceforge.net**. Movie editing can be accomplished with Apple's iMovie HD, **apple.com/ilife**, or Microsoft's Window Movie Maker 2, **microsoft.com/windowsxp/moviemaker/default.asp**. All of these programs are free or are available at minimal cost.

Recognition of technologically gifted interfacers will emerge from these projects. Those students who demonstrate special talent in this area will need additional opportunities to apply their skills with more advanced projects. Based on personality characteristics that O'Brien et al. (2005) found, these students may also benefit from opportunities to share their expertise with others. Due to the gender difference mentioned earlier, Nugent (2001) proposed that teachers should provide girls with opportunities for play and open-ended exploration on the computer (e.g., girls' computer clubs, girls-only lunch, and after school periods for computer usage). She suggested that such activities help girls gain confidence and comfort with technology. Additional effort may be needed to find and encourage technologically gifted females.

FIXERS

The third area of technological giftedness involves those who enjoy working with technology equipment. While the first two types involve creating products with technology, these students enjoy maintaining or even creating the technology for others to use. They may enjoy creating a computer from spare parts, fixing a broken calculator, maintaining a classroom server, or fixing a car stereo.

In 2001, nine-year-old Jacob Komar noticed unused, outdated computers in his sister's school. With the aid of his family, he started Computers for Communities (CFC), a 501(c)(3) nonprofit organization. CFC accepts old computers, printers, and other peripherals from individuals, schools, and businesses. The group refurbishes and redistributes the equipment back to the underprivileged in the community. To date, CFC has distributed over 1,500 computers to individuals and organizations.

> First I acquired computers that were being discarded from a local school. Then I refurbished and distributed them to individuals in my community that could not afford to have a computer at home. What a great feeling to see the smiles on those kids' faces. I felt like I was Santa Claus! Since then, I have created a non-profit organization that helps other groups do the same thing: locate discarded computers, refurbish them, and distribute them to those in need. (Komar, n.d., p. 1)

Komar is an example of how a technologically gifted fixer can have a positive impact on the lives of others. By locating technologically gifted fixers and providing them with positive opportunities to apply and develop their special talent, not only do others benefit, but the students develop a sense of prestige and accomplishment while advancing their giftedness. One possible way to develop this talent is to form after-school clubs.

CLOSING THOUGHTS

No one knows what technology lies in the future. Technologies that seemed impossible a few years ago are common place today. The technologically gifted students of today have the potential to be the creators and implementers of the technology in our future. The possibilities are limited only by their imagination. It is time to identify and encourage students with special interest and skills in technology. ■

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