Altered Carbon: How Parents Can Encourage and Support Gifted Children's Interest in STEM with Readily Available Tools and Apps

By Stephen T. Schroth, Janese Daniels, and Kimberly McCormick

As parents, we recognize that most children today are keenly interested in technology, and often prefer working in ways that use a variety of media and other forms of communication that are different than the way many children learned even a decade before. Many young learners look for ways to include technology in all aspects of their learning, ranging from embryonic thinking about a project, to information gathering, communicating ideas with others, giving form to ideas, refining and polishing initial efforts, and sharing a final product with others. When working with gifted children, listening to what they say—and seeing how they express themselves—often provides clues to which children will benefit through increased exposure to technology.

When gifted children demonstrate an attraction to or a love of technology, parents may wish to investigate a series of such tools, apps, or programs that can be used to enhance their child's education, both inside and outside of school settings. In either case, parents want to look for evidence that their child embraces and enjoys coding or other technology enhancements:

- The evidence might be simple, such as the gifted child stating that he or she is really excited by technology and how it works (which is different than enjoying technology for entertainment, games, or social media).
- Teachers, grandparents, babysitters, friends, or, even, friends' parents might be the ones who notice the gifted child's love of technology and help to enlighten the child's parents or caregivers.

- Parents may simply notice their gifted child is engaged for much longer periods of time when a project or activity includes technology.

Regardless of how parents discover this love or passion on the part of their child, recognizing what is happening is an important first step to enhancing the child's learning experiences.

Coding

Coding involves identifying and analyzing a problem, applying problem-solving skills, and using knowledge of programming language to devise solutions that are innovative, effective, and efficient. Gifted children and their parents are often fascinated by coding, as it permits young learners to engage in higher-order thinking skills while simultaneously participating in an activity believed by many to be one path to a lucrative and exciting career. A variety of resources have sprung up that permit parents and teachers to assist gifted children in exploring coding in authentic and meaningful ways.

A popular resource related to coding is the website **Hour of Code (www.hourofcode.com)** which provides authentic coding experiences to gifted children of all ages, from pre-readers through high school students. The site provides a one-hour tutorial, available in over 45 languages, to help gifted children get started and engages learners with an attractive, intuitive, and safe environment in which to work. *Hour of Code* allows users to identify their experience level with coding as being either at the *beginner* or *comfortable* level, and also allows them to identify themselves as being a pre-reader or enrolled in Grades 2–5, 6–8, or 9+. This permits gifted children—or their parents and teachers—to tailor the experience so that only certain options are available, a feature that is especially useful with younger learners who may be easily distracted. Once the choices are made, a variety of resources are available, such as encryption, code devoted to climatology, MATLAB, and many games.

Parents or teachers who are not personally familiar with the coding process will be happy to discover a series of how-to guides, each tailored to a specific audience, including parents, teachers, after-school educators, public officials, or volunteers. Using videos and interactive text, these how-to guides each explain how to run an *Hour of Code* program, select tutorials, promote the experience, plan for technology needs, start the *Hour of Code* process off with an inspiring speaker, code, and celebrate children's success.

Scratch (www.scratch.mit.edu) provides similar resources, but is aimed at a slightly younger audience. Like *Hour of Code*, *Scratch* encourages gifted learners to engage in coding to create stories, games, and animations they can then share with users around the globe. Attractive, free, and available in more than 40 languages, *Scratch* encourages children to learn to code and to code to learn. *Scratch* provides ideas on how it can be used as part of a free-standing investigation or integrated into the teaching of other subjects.

Many school leaders, teachers, homeschooling parents, and others who work with gifted children are interested in providing various learning options to those learners, including online and blended offerings. **Versal (www.versal.com)** provides a suite of tools that can be used to augment the educational program or even provide coding instruction. *Versal* permits educators and parents to create an online environment for gifted children that allows them to work at their own pace, using either a completely online or a blended learning environment. *Versal* also provides the ability to maintain student portfolios, provide professional development opportunities to teachers, and conduct student orientation sessions and career services. *Versal* also empowers gifted children interested in coding through its *Versal Code* option, an open cloud-based integrated development environment (IDE), which allows administrators to instantly create programming courses and inspire students to learn more about coding.

Books to Support Children's Interest in Coding

Coding for Beginners Using SCRATCH
(Usborne)

Explores the basics of SCRATCH programming, and permits children to use code to create animations and games.

HTML for Babies
(Sterling Children's Books)

One of a series of concept books that introduces the youngest children to the shapes and colors that comprise web-based programming.

Grace Hopper: Queen of Computer Code
(Sterling Children's Books)

Biography of Grace Hopper, one of the pioneers of coding and computer science.

Mission Python: Code a Space Adventure Game!
(No Starch Press)

A hands-on introduction to coding using the Python language that encourages children to create games and puzzles.

A Computer Called Katherine: How Katherine Johnson Helped Put America on the Moon
(Little, Brown Books for Young Readers)

Made famous by the film *Hidden Figures,* this book tells how Katherine Johnson overcame racism and sexism to help put a man on the moon.

Other Apps and Resources

Coding is not the only way that technology may be used with gifted children. Children and their parents often welcome apps that can be used with tablets, phones, or other electronic devices that permit gifted learners to engage with rigorous content in a variety of settings and places. Three apps that are especially popular with gifted children and their parents include **Busy Water, Zoombinis,** and **Inventioneers Full Version**. Each of these provides fun and innovative ways for gifted children to interact with science, technology, and engineering content while sharpening their creative and critical thinking skills through tasks that require problem-solving and other higher-order thinking. Find them all in your favorite App Store.

Busy Water uses an attractive, child-friendly interface to introduce problems related to water physics, such as a fish that has been released from its tank by a mischievous cat and finds itself in a system of pipes seeking an escape using gravity. With over 100 puzzles offered at various levels, *Busy Water* permits even very young children to explore endless possible solutions using their creativity and problem-solving skills.

Zoombinis, founded in 1996, provides entertaining activities for elementary and middle school children by emphasizing and encouraging analytical, logical, and mathematical thinking. The game encourages problem-solving by stating the goal of the problem at hand, and then permitting the player to deduce his or her own strategies or to use gameplay strategies for success.

Inventioneers Full Version encourages children to use physics engineering skills to design inventions, test them, and revise their creations until they are successful. Certain tools and helpers assist the participants to help a special character meet particular challenges as they arise. In one task, for example, participants are given a piece of cheese shaped like a ramp and an Inventioneer with the ability to blow objects. Children must arrange these pieces in a way that will assist a cat trapped in a tree safely get to a basket located below on the ground. *Inventioneers Full Version* permits children to fail, analyze why their first attempt was unsuccessful, regroup, and try again. This helps to build persistence and resiliency in gifted learners, two qualities of character that will serve them well in future endeavors.

Parents seeking to support their gifted child's development and to build problem-solving, creative, and critical-thinking skills have a variety of tools at their disposal that will assist with these goals. Readily available technology, which can be obtained at little or no cost, will assist parents in providing these experiences to their gifted children in attractive, accessible, and appropriate ways. The ubiquity of technology, and its appeal to gifted learners, makes these tools something that can be used anywhere, at any time, and in an almost infinite variety of ways.

Resources

Adams, C. M., Cotabish, A., & Ricci, M. C. (2014). *Using the next generation science standards with gifted and advanced learners.* Waco, TX: Prufrock Press.

Kettler, T. (Ed.). (2015). *Modern curriculum for gifted and advanced academic students.* Waco, TX: Prufrock Press.

Renzulli, J. S., Leppien, J. H., & Hays, T. S. (2000). *The multiple menu model: A practical guide for developing differentiated curriculum.* Waco, TX: Prufrock Press.

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