

## Unschooling and STEM Careers

by Judy Arnall



You've probably noticed it. Your daughter loves playing with lego, taking apart appliances, building complicated computer programs, making potato guns and playing video games. She loves logic, order and computation. She is probably headed to a STEM career. STEM careers are built on a solid foundation of mathematics.

"What about Math?" It's the second most common question I get when talking to someone about unschooling, a type of homeschooling with is learner-determined education. (You probably all know the first question and it starts with the dreaded "s" letter.) As the parent of five unschooled children, three of whom were heading in the direction of a STEM (Science, technology, engineering and mathematics) career, I can share our experience of children learning math and science in their own way and time.

In a Calgary Herald article on Feb 6, 2016, *Future of Employment; Women may face job crunch*, it's stated that women make up the bulk of clerical and office

positions which will be greatly reduced in the future with technology while 3d printing and robotics are growing fields that create demand in engineering, technology, architecture, computers, coding and many more STEM fields. If more women don't enter STEM careers, they will be left behind in low paying, unrewarding jobs in the service industry. Clearly, girls need math just as much as boys. So when should she begin formal math studies?

Unschoolers know that math is all around us. Math is simply a tool to solve life's problems. Just like a screwdriver is a tool to help us in many ways, even beyond its original use, (I even use it to open paint cans), math is the same, in that numbers are used in different ways to solve different problems. Children use math as soon as they are toddlers and try out a shape sorter, or put nesting cups inside each other, or slide those wooden beads along those toy abacus wires. Children grow in their math skills as they go about their daily lives playing, building projects, shopping and learning decimals, or cooking and learning fractions. In their heads, they guess at addition, subtraction, multiplication, division, and estimate quantities to solve problems. This is also called mental math or math done in children's brains, rather than on paper. This provides a wonderful experiential math foundation for the first 13 years of life.

By the time a child reaches puberty, their brains develop and allow abstract thinking, so they can understand complex theories, beyond tangible objects in their everyday lives. That is why algebra and the mysterious "x" standing in for a variable, is taught in junior high school. Some children don't understand it until later because all children vary in their development as well as age of reaching puberty. What unschoolers know is that by the time a child's brain allows for theoretical thinking, they can understand and learn the entire math curriculum of grade 1-7 in about six months.

So when is the best time to start formal math on paper? Grade 8. That seems to be the best time to switch from mental math to doing calculations on paper or what we call paper math. In grade 8, children will cover much of the younger years curriculum and get a good foundation of theoretical math to come. It's a bridging year. In grade 8, they will cover (in Alberta) decimals, fractions, integers, perfect squares and square roots, ratio and rate, algebraic expressions and equations, Pythagorean theorem, prisms and cylinders, graphs and probability. All these concepts are useful for further math needed for STEM careers. By waiting until grade 8 to begin formal math, children will not have had time to feel inadequate about learning math.

All my children began their formal, paper math education around grade 8. Some skipped grade 9 math, but all of them did grade 10, 11, and 12 math according to high school outcomes. It was also the first time they learned about exams,

deadlines and expectations and they did fine. If they wanted a STEM career, they were old enough to understand that they needed to learn higher math in high school in order to pursue math and science at a university level.

Science education on paper began in high school grade 10, even though as every parent knows, experiential science begins in babyhood. When a toddler throws his bowl of Cheerios off the high chair tray, he is learning velocity. Later, in grade 10, he learns velocity again with paper calculations. My children began with a common grade 10 science program that had 4 components - a little bit of biology, a little bit of chemistry and a little bit of physics and environmental science. In grade 11, they had to specialize according to their university goals and science preferences. For stem careers, most students were required to have 2 sciences and calculus math.

One of my children reached adulthood without grade 11 or 12 science and math and discovered he needed it for his career direction. When children are motivated to learn, they will succeed. He took fast track courses and finished all his math and science requirements in 1.5 years.

Another of my children loved science and took all three streams just for the fun of it. True learning for the love of learning. It was a good thing, because the university he went to had all first year students take a timed, 2 hour math skills test. Any student that got below 75% was automatically deleted from all their first year math and science courses and the onus was on the student to pick up remedial courses which added another year to their program. It was the universities way to ensure a cross-Canada standard of math education, because some provinces did not have standardized government diploma exams in grade 12.

In summary, although my children began more formal learning in social studies and English language arts in grade 11 and 12, and science in grade 10, they started earlier in grade 8 for math when they knew they were heading to a STEM career. However, I believe that waiting to learn paper math until grade 8 increased their self-perception that they were confident learners and also increased their love of math to solve problems. Both are required for STEM careers.

For more ways to learn math without a workbook, pre-order Judy's new book, *Unschooling to University*, due out Fall 2017.

Visit our blog at [www.unschoolingtouniversity.com](http://www.unschoolingtouniversity.com)

<http://www.professionalparenting.ca/book4.html>