

Computer Science in Early Education

English. History. Math. Science. Those are the four subjects that we all have been taught since early in our lives. What if we have been missing something? What if there were a fifth core subject? There is a subject that is much different from the current core but still teaches an important way of thinking: computer science. Because computer science is so broad, it actually teaches several useful ways of reasoning about problems. Additionally, learning the basics of computer science can allow people to build a myriad of amazing things. It can be a subject that makes schools much more interesting for young students. Also, teaching it early on will allow those who do decide to pursue it to become much better computer scientists than they would have been had they started later in life. Looking at this from a more broad perspective, there is a much larger demand for exceptional computer scientists than there is supply for them right now. Computer science should be taught as a core subject in early education.

One of the first tools that computer science students will learn is programming; programming is the means by which people can build almost anything. For example, just recently I participated in PennApps, Penn's weekend hackathon. I built an Android app that was exactly as I envisioned it. Everyone there made a substantial hack. Many people don't attempt this because they have no idea how to program. If programming were taught in schools, there wouldn't be such a big initial hurdle to get over, so more people would be able to create whatever they like.

Some might argue that computer science is too specialized. They believe it doesn't have enough possibilities for application, making it irrelevant to many people's lives. Thus, not everyone should have to learn the basics. However, this just isn't true.

Usually, this argument is based on the belief that computer science is the same as programming. However, that isn't the case. Programming is simply a tool that computer scientists use to implement whatever they need to implement. In order to help understand that, consider the following analogy: programming is to computer scientists as telescopes are to astronomers. However, this analogy isn't completely accurate because programming is used by many more than just computer scientists. For example, programming is becoming increasingly necessary in the sciences and in business as people are

working with larger and larger data sets. It's also very necessary in developing the user interface of applications that non-computer scientists develop. For those who know that computer science is much more than just programming and still think it's too specialized, there is an equally sufficient explanation.

Computer science teaches a very unique way of thinking that is universally applicable to problem solving. Bill Gates said, "Learning to write programs stretches your mind, and helps you think better, creates a way of thinking about things that I think is helpful in all domains." There are different paradigms of thought even within computer science such as imperative, functional, event-driven, etc. Imperative helps people start simple and think in a fairly linear fashion. For example, imperative thinking would be very useful for writing as writers make some initial piece of writing and then successively write iterations of that writing, adding to it and changing it. Functional thinking is useful in making abstractions. For example, when building a car, the builders usually don't know how every part is put together. In other words, each of those parts is a black box to the car builder. People who make a specific car part are essentially making an abstraction that others will be able to use. Even the parts makers are using abstractions that have been built by someone else or by nature. Without abstraction, society wouldn't be able to grow much, and learning to think functionally can help many people in seeing the big picture. Without even learning specific paradigms such as imperative or functional, in the basics of computer science is logic, and giving everyone a solid foundation of logic would be extremely helpful in making the world better.

An issue for a lot of students right now is being able to pay attention in class. Many students find themselves uninterested in much of what is taught in school. This causes them to tune out and lose focus. However, these same kids have no problem focusing on topics that interest them. Because it is so different from the rest of the core subjects, computer science would provide an interesting change of pace that would help refocus these kids. This is particularly true for me as computer science greatly increased my interest in school. For some, a fun computer science class might even be what they look forward to most in school. Computer science would definitely allow schools to interest a much larger audience of students. Those students could even come from a very young age group.

Many studies have shown that the earlier people start learning something, the better they are at it (Westervelt, 2014). Although this does apply to adults, where it really matters is in the earliest years of life: childhood. For example, a company called Kodable aims to teach five year olds the basics of computer science. That's just the average age they aim to teach. Kids as young as two years of age are participating in Kodable's education. These kids could learn to code before they learn to read. If five year olds can do it, elementary schoolers surely can learn the basics of computer science and programming. Because these kids start so young, they will grow into people with great logical skills and possibly even advanced knowledge of computer science that will make them extremely competitive in the job market.

Despite the huge amount of unemployment that exists now, those who are well- trained in computer science have no problem getting a job. This is because the demand for good computer science graduates far exceeds the corresponding supply (Soper, 2014). Part of why there aren't enough computer science students is because most people aren't exposed to it until much too late in their lives. If computer science were taught in early education, everyone would be exposed to it like everyone is exposed to the other core subjects, and they would be able to decide whether or not they want to pursue computer science. This would help narrow the gap between supply and demand for computer science graduates.

Teaching computer science in early education would surely benefit society. Looking at the perspective of individual students, it would help them be more interested in school, give them the ability to build what they want, and greatly expand and improve the way they think. The sum of all of these changes to individuals would clearly scale to something that greatly impacts society positively. Furthermore, this would help fill the gap in the job market where good computer science graduates are needed, allowing the technical world to blossom even more than it is now. Introducing computer science in early education would have an outstanding impact on the world.

Bibliography:

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Westervelt, E. (2014, February 17). *A Push To Boost Computer Science Learning, Even At An Early Age*. Retrieved from <http://www.npr.org/>