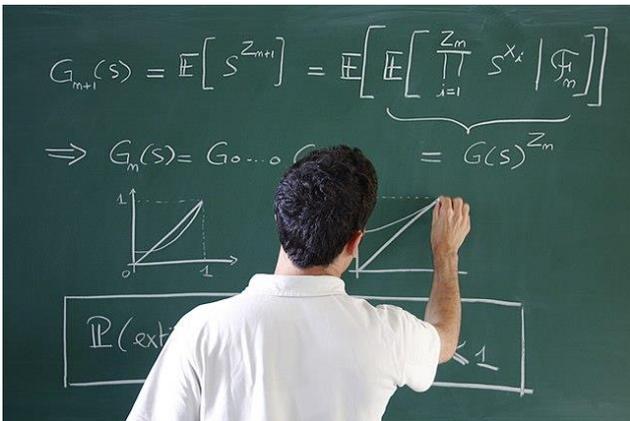


How do differently-abled people learn math?

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Math has far greater significance than we realise. Math is present in every field of study and stage of life. Without math, the world would be incomplete, whether it was collecting change from the cashier or differentiating equations to determine the nutrient consumption of a cancer cell. After all, it is math that has allowed us to progress and develop dynamically. Math is a language that everyone must understand to express themselves and their creative ideas. It would be a shame to miss out on a significant theory or solution simply because the person who developed it could not compute the numbers and crunch the data. As a result, everyone must be fluent in the language of "math." And this research of mine discusses how differently-abled people study math.

I'm sure you're aware of the following basic study techniques:

1. Visual
2. Auditory
3. Reading/Writing
4. Kinesthetic

This idea, also known as the VARK model, has gained traction. They may apply to mathematics, but mathematics is not the same as your other subjects. Math, in my opinion, is more hands-on and has a powerful

linkage to reading and writing. I also believe that math is intuitive and that it is critical to keep your mind engaged in the game; only through practice will your brain muscles become sharper. Numerous certified studies extrapolate on the same point.

People who claim math is not for them are deceiving others and themselves. There is a widespread misconception that strong math students are also quick math students. Also, rote memorization of math facts (like the number of seconds in a day, which is $60*60*24$) is not the best thing ever. Sure, it is significant, but people must understand how it came to be known as it is, in addition to processing the information themselves. According to a Stanford professor of mathematics, the best way to study math and know math facts is to use them regularly and develop an understanding of numerical relationships (Parker, 2015). That said, let's dive into the various categories of disability and learn how differently-abled people deal with the difficulties of learning math:

1. Visually impaired people

To begin with, I'm sure we've all pondered upon how blind people learn what numbers are, what basic arithmetic operations look like, and other general questions. Even so, great mathematicians like Leonard Euler, who had to learn to do math without vision after losing it over a decade before his death, were unaffected. So, how do they manage it? According to a study article, visually impaired people compensate for their vision loss by (ironically) visualising. They use their heightened visual cortex to imagine and draw conclusions. So they begin with basic math, and as it progresses, so does their capacity to understand.

According to the study discussed in the article, visually impaired people showed an increase in their visualising capacity while doing math. Sighted people doing the same problems, visual areas of the brain showed no increase in activity (Hamilton, 2016). And now that we live in a technologically advanced era, measures have been developed so that one can learn anything using a specialised computer. Blind people learn through their auditory senses. As a result, the computer plays the formulas and other concepts clearly and understandably for everyone. This greatly aids them in their mathematics studies (Spinczyk et al., 2019). Tactile graphics also were invented as a result of technological advancements. Tactile graphics deliver information through touch. These graphics have elevated surfaces such that a visually impaired person can feel them. They often accompany

Braille textbooks to convey content in maps, charts, building layouts, schematic diagrams, and images of geometric figures(*What Are Tactile Graphics?* | *DO-IT*, 2022).

2. Dyscalculia

Dyscalculia, dyslexia, and other learning disabilities share many characteristics. Dyscalculia is a math learning disability that impairs a person's ability to learn number-related concepts and perform accurate math calculations, reasoning, and problem-solving. This disability, also known as number dyslexia, is quite common, affecting approximately 3%-6% of the population. It was also discovered that 11% of children with dyscalculia are ADHD. Even though correlation does not imply causation, some links have been discovered between similar learning disabilities and people suffering from ADHD. Some of the symptoms of this issue include, but are not limited to:

- Difficulties with processing numbers and quantities, such as counting backwards.
- Trouble recalling basic math facts.
- The trouble with mental math and problem-solving.
- Difficulty with telling time on an analogue clock.

Dyscalculia, like other learning disabilities, has no cure. The goal is to counsel and assist them in improving and filling knowledge gaps. Many provisions are available in developed countries for people with similar issues. If left unchecked, this may also harm their future. However, our world has become generous enough to help people. And as stated previously, provisions are available even to adults so that they can compete on a level playing field and collaborate with others (Frye, 2022).

3. Loss of hearing



Although hearing loss is common as people get older, it is not a cause for concern in children and young adults. That is not to say that it does not exist among teenagers.

In fact, it starts small but has far-reaching consequences over time. Hearing-impaired children have slower learning processes because they cannot pick up various concepts and vocabulary incidentally like hearing-impaired children. This can jeopardise one's mathematical ambitions significantly.

Delays in learning and language acquisition are also caused by hearing loss, causing academic skills to lag. Auditory-impaired people are frequently mistreated because they are thought to be stupid or incapable of learning, but this is not the case. They simply cannot hear well. Deaf students are also less likely to learn in a general classroom where the teacher addresses the entire class and does not provide one-on-one individual attention to those with special needs. The good news is that there are numerous methods available to assist auditory-impaired students in learning:

1. Medications or operations may partially or completely correct a hearing impairment.
2. Hearing aids and assistive listening devices are available to help the person improve his/her ability to hear with what little or no hearing they or currently has.
3. People can also work with pictures and signs to navigate through the world of mathematics. Visualizing concepts have known to do wonders.
4. Deaf people need to be given special attention and be thought privately in a quiet environment. They tend to learn a lot when they're given individual attention. Provisions also exist to provide support to specially-abled people. There are various other study techniques like speaking slowly to allow them to read lips and make sense of things, or the origami technique where students are taught using paper models and so much more (Stein, n.d.).

4. Locomotor Disability

Another category of disabilities is to do with locomotor disabilities, which include:

1. Leprosy Cured Person
2. Cerebral Palsy
3. Dwarfism
4. Muscular Dystrophy

Locomotor disability is a disability of the bones, joints or muscles leading to substantial restriction of the movement of the limbs or any form of cerebral palsy (*India: Disabilities - Locomotor Disabilities*, n.d.).

Children with Cerebral Palsy (CP) often perform poorly in mathematics. Links have been noticed between locomotor disabilities and dyscalculia. So clearly we know that this does prevent people to study math. The sooner a person is diagnosed, the better because this condition tends to worsen over time. Because there is no definite cure, people with locomotor disabilities may require lifelong assistance. However, there are counselling, rehabilitation, and surgical procedures available. Physical and speech & language therapy may aid in the improvement of conditions as well as the learning of mathematics. All of the previously mentioned research methods are also applicable. The best way for them to learn is if they have somebody who is invested in their education. He or she who is patient and teaches slowly, allowing the disabled to understand and process information, is doing God's work.

5. Visual perceptual and motor deficit

Visual perceptual/visual motor deficits affect a child's ability to understand the information they visually see. This impacts a child's ability to read and affects their ability to draw or copy and often leads to a short attention span (*Visual Perceptual/Visual Motor Deficit*, n.d.).

Some of its symptoms are:

- poor spatial awareness
- sloppy handwriting
- misalignment of letters and numbers
- difficult time staying in the lines when colouring
- difficult time writing words in a vertical column

- incorrect pencil grip
- uneven cutting with scissors
- avoidance of puzzles
- poor coordination
- clumsiness
- difficult time copying from the board
- poor spatial skills
- difficult time keeping words and letters on a horizontal line when writing
- difficulty in sports (*Visual Motor Integration /Dyslexia, ADD/ADHD, Autism, n.d.*).

Solutions? They are identical to those already discussed. There is no cure for this. However, treatments are available if one follows the advice of a therapist. You can avoid this costly treatment by simply practising and improving your motor skills on a regular basis. However, I am no doctor, so consult one and run a thorough diagnostic before deciding how to proceed. Because the visualising factor is at stake here, the learning process suffers greatly. However, as previously discussed, solutions and methods are available.

6. Speech and language disorders

Speech and language disorders are conditions that exist in our society today. A speech disorder is a condition where a person has difficulty producing or forming the necessary speech sounds to communicate with others. As a result, the child's speech may be difficult to understand (Zieve & Conaway, n.d.).

We are all aware of the importance of communication. Consider not being able to express yourself. Imagine having all these ideas and topics to discuss but being bound by the chains of disability. Fortunately, this is easier to deal with than cerebral palsy and can be effectively treated if detected early. People with specific language impairments can study math in a variety of ways, including:

1. Using hands-on material(such as flashcards and calculators)
2. Simplifying questions and word problems and learning step by step.
3. Every other method is discussed in the Dyscalculia section of this paper.



Fig: Girls learning sign language

Conclusion

I'm sure there are a million other disorders and difficulties that specially-abled people face, but their learning methods are similar and overlap with those already mentioned. This paper should serve as a reminder to the reader to look deep within themselves and consider the advantages they have. Millions of people are dealing with issues they never thought would be a problem. We need a level playing field, which is why we must assist those in need. As a man of education and privilege, it is critical that you not only support the cause but also use whatever resources you have to help others. Condemn those who are opposed to this.

That said, I'd like to conclude on a positive note. This world has come a long way, whether through technology or inclusivity. And it warms my heart to know that people are working hard to help others in need and make the world a better place for them. I hope this paper has helped to introduce a new perspective and appreciate methods that specially-abled people use to excel in the world of numbers.

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