



Trinity College Dublin

Coláiste na Tríonóide, Baile Átha Cliath

The University of Dublin

Joining the dots: vision impairment and access to the mathematics curriculum

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Context

Vision impaired students have the same curriculum needs as all students, but due to vision impairment can experience difficulties when traditional method of learning and teaching are used.

(Spungin, & Ferrell 2007).

while blind/vision impaired students “have been included in mainstream education for some time now, the challenge is to change the system to meet their needs.”

(AHEAD, 2008, p. 10).

Vision impaired/blind

- **Vision impaired learners:** make up the majority of vision impaired learners. Many of these learners work with normal print.
- **Learners who are educationally blind:** have insufficient sight to work through the visual medium of print. This does not necessarily mean that they have no useful vision.
- Most people classified as “blind” have some sight.

Making numbers and symbols visible

- The legibility of numbers varies considerably between fonts
- Look at the size and weight of symbols such as for the four operations, greater than, less than, equal to signs, etc.
- Fractions, indices and surds may also need modification to be legible.
- With partial sight it is very easy to misread an addition sign for a division sign

Concept development

- Sighted children's learning is constantly reinforced by what they see around them
- Children with a vision impairment have greatly reduced opportunities for incidental learning and the reinforcement of concepts and knowledge of the world around them
- Solving maths problems often requires and sometimes assumes "general" knowledge.

The mathematics curriculum

The presentation of Mathematics is generally visual, two-dimensional and nonlinear in nature.

- Graphical-spatial mathematical topics, including tables and graphs challenging for those with severe vision impairments
- Braille is not always adequate for mathematics notation
- Speech synthesizers not always effective for mathematics (Cahill et al., 1996).

“tactile media, perhaps in the form of audio-tactile graphics, may be better for more complicated mathematical elements”

(Shute, Graf and Hansen, 2005).

Access to the mathematics curriculum

I did have Braille books but not diagrams, which illustrated parts of the course. As a result my performance suffered very seriously. I did honours Maths for the Leaving Cert and got a D1. My lowest other grade was an A2

I got some extra help with Maths for the Leaving cert. However, what was lacking was a well-structured programme

...my school was badly let down. The teachers were not trained to teach a blind person Maths. No system was put in place that would either have provided someone who was well trained to do this for me or given them information on how to do this (Joe).

Access to the mathematics curriculum

Maths, it's kind of hard, like there's Project Maths and it's really hard for me because I can't see...I'm not good at drawing stuff...I'm slower at picking up maths than everyone else, just because it's slower for me to see everything. So I used most of my resource time for maths (Sandra, 2nd year undergraduate student).

...the Maths I found hard...and even some of the Maths things say...graphs...and for a sighted person to try and explain graphs to you they just don't understand that say...the letter L in print they think it should feel the exact same in Braille (Lisa).

$$\frac{2}{3} + \frac{4}{5} = \frac{22}{15}$$

A Braille representation of the equation $\frac{2}{3} + \frac{4}{5} = \frac{22}{15}$. The numbers 2, 3, 4, 5, 22, and 15 are represented by their respective Braille digits. The fraction bars are represented by the Braille fraction line symbol.

$$\frac{a^{n+m}}{2}$$

A Braille representation of the equation $\frac{a^{n+m}}{2}$. The variable 'a' is represented by the Braille letter 'a'. The exponent 'n+m' is represented by the Braille letter 'n' followed by a plus sign and the letter 'm'. The denominator '2' is represented by the Braille digit '2'. The fraction bar is represented by the Braille fraction line symbol.

$$x = 7 \cdot 3^2 + \frac{2+4}{2}$$

A Braille representation of the equation $x = 7 \cdot 3^2 + \frac{2+4}{2}$. The variable 'x' is represented by the Braille letter 'x'. The number '7' is represented by the Braille digit '7'. The multiplication sign is represented by the Braille multiplication sign symbol. The number '3' is represented by the Braille digit '3', followed by the exponentiation sign and the number '2'. The plus sign is represented by the Braille plus sign symbol. The numerator '2+4' is represented by the Braille digits '2', plus sign, and '4'. The denominator '2' is represented by the Braille digit '2'. The fraction bar is represented by the Braille fraction line symbol.

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Thank You