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Braille technology in early cognitive development

The practice of Braille *and the* cognitive development *of the* blind or partially sighted child.

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Cognitive development

When I was young – last century! - we were taught in a didactic fashion; the teacher delivered the knowledge, and the "good" student acted like a sponge, soaking everything up and returning it when given a good squeeze. We've moved on from there, and children are now a vital part of their own learning process. Why have we moved on? Because we all need to develop cognitively – because without the ability to think in the abstract, this world of ours won't just pass us by – it will roll right over the top of us.

In the time we have today, we can't possibly cover all the ramifications of cognitive development and its meaning for education, but it's worth noting that human beings don't develop cognitively without teaching and interaction. Cognitive development is a social thing; as children interact with the people around them, development is happening, as a response to and as a result of that interaction.

Let's pause for a moment and think about expectations. We really do want children - including those children who just happen to have a visual impairment - to develop all their potentials, to bring all their talents and energies to flower, and to contribute to their community and the world... don't we? Since of course we're answering "yes", then we need to make sure that we're using the same calibre of educational tools – actual, behavioural and virtual – for all these children. And since development will happen as a part of that education, we would like it to be optimal also in encouraging the widest and best development possible.

We define cognitive development as pertaining to higher brain functions: awareness, recognition, perception, reasoning, judgement. In working towards the best way to encourage this development in students, we're guided by some central principles. We want students to move from concrete to abstract thinking; to be able to extrapolate from a situation and decide what to do; to be able to extrapolate from a problem to a solution, and to be able to do these things in concert with their peers and community.

Why Braille?

We still hear occasionally the comment that a student “doesn’t need Braille, because they can use audio”. Let’s lay that to rest. Audio is fine, *after literacy has been achieved*.

We also hear that a student “doesn’t need Braille, because they have some vision”. Let’s lay to rest that Braille isn’t needed by children with visual impairments; it might work to read nursery-level books in 36-point text or more, but once the child needs fluency, large print doesn’t keep up with Braille.

Literacy is about written language! Without strong literacy, for a blind or visually impaired student, further education and employment are almost certain to be impossible. Think about the jobs available to fully sighted people with low literacy levels – there are hardly any, are there? And of the ones you can think of, are any of them suitable or available for a blind or visually impaired person?

Accomplished Braille readers compare well with their sighted peers in reading fluency and accuracy, so their ability to continue their formal education to the tertiary stage is strong.

It's very necessary to state at this point: we are talking about beginning with Braille on paper, not about a refreshable Braille display, whether part of a note-taker or as a separate device. While a refreshable display is a wonderful thing, it comes after paper Braille in the order of things; the student still needs to begin with Braille on paper – even if someone makes a multi-line display that we can all afford!

Part of literacy is learning the context in which the written word appears: a literate person understands all the facets of language, from the abstract concepts of grammar and sentence and paragraph construction, to the concrete concepts such as the difference between a line and a sentence or paragraph, and what constitutes a word. The presentation and production of Braille on paper is a necessary foundation for understanding the concrete concepts, and will also form the basis for understanding the construction of electronic documents.

Available tools

Aside from particular methodologies in the classroom, that a teacher will use to encourage abstract thinking, we have one extremely useful tool for both cognitive development and literacy: computers. In almost every household in Europe today, quite young children will have access to a computer. They’re learning about the world wide web and online games, and finding out about dinosaurs and volcanoes, and making friends with imaginary creatures and real people on sites like Neopets. They’re taking the pre-writing skills they developed on the kitchen table with paper and crayon, and extending them online – learning to recognise words and, while they’re at it, becoming completely at home in the virtual world – and soaking up concepts that they’ll use in their education.

Tools for the VI pre-school child

In almost every household in Europe today, quite young children will have access to a computer – unless they’re going to be learning Braille.

Very young blind and visually impaired children who will be learning Braille are usually given a manual Braille writer. It's a world away from what their peers are using; a fair proportion of young children find it difficult to use because of its weight and the difficulty of pressing the keys. And it doesn't do anything! It just sits there.

An important part of developing literacy is our conviction as learners that this is something we can do – it isn't something only other people can do. When we sit the sighted child at the kitchen table with the paper and the crayon, they can hold it; they can make a mark on the paper, and we can praise them for their success. If we put a visually impaired child together with a manual Braille writer when it's too heavy for them to press the keys, it isn't the fault of the child – but there's no success to let them get the praise!

This is where we would suggest the introduction of the Mountbatten Brailler. When this device is presented to a pre-school-age child – we have children as young as three years old using the Mountbatten – there's no problem with heavy keys. They get immediate feedback, make marks and make the Mountbatten talk, and we can praise them!

In the Mountbatten, the visually impaired child has an analogue of the activities we take for granted for a sighted child. They can scribble, and have access to tactile pictures and shapes they can make themselves; they're able to do pre-writing skills and learn about the alphabet and the beginnings of computing, and they're able to do a great deal of it as play. And most importantly, they can do these things themselves – they will be an active participant, who knows they're active, rather than a passive "sponge".

When the child goes to school, if they're still using the manual Braille writer, it gets worse; every time they have literacy work to do – writing a story or reading – they have to do it separately from the other students. Keeping up with their classmates is a problem, and nobody else in the class can read Braille. They lose many important opportunities for them to join in the class and develop cognitively alongside their peers. The Mountbatten is a device that can be used in peer activities, with Braille and print together, as usable by classmates as by the class teacher to work with the Braille-using student.

Basic print awareness with the Mountbatten Brailler

The Mountbatten is, at its base, a Braille writer. It writes Braille on paper. It does a great many other things, but we'll save those for later.

A Braille writer is still universally recognized as the most appropriate tool to use for beginning Braille instruction. This is based on empirical evidence collected in classrooms over many years, and is also in line with cognitive development practices in literacy, where students need to begin to build their knowledge and understanding using physical objects and activities - writing on a page of paper and reading from a page of paper.

Students using Braille benefit most if they begin writing hard copy Braille on paper, in order to develop page related concepts such as layout and format, the use of columns and lists for ordering and comparing information, the development of good reading skills such as tracking, and the use of those Braille formats that require multiple lines, such as music and mathematics.

Although a Braille-using student might never actually read print themselves, it's also important that they be able to relate their work to a printed page; in due course they will be producing printed work, and they must understand such concepts as spelling, print page layout, and that there are print characters as well as Braille characters. Quite early in the process of learning Braille, they will encounter the fact that a number is made up of a prefix sign and one of the characters they already know as a letter; if they don't already know about print, they will have to be told at this stage!

There are limitations in the manual Braille typewriter that encourage a tendency to place less emphasis on students developing the concepts and skills of print awareness at an early age.

Where the rest of the class may be writing their name or date in the top right hand corner of the page, students using mechanical Braille writers are not required to because of the complexity of doing so; it's quite a complex calculation to make, to make sure there is enough space and yet not too much, and it can be beyond the capacity of a very young student. With the Mountbatten, a simple command will allow the student to do what any computer user can do: right-align just those lines, and then change back to left alignment for the remainder of their work on that page.

The centring of a heading or a column is another good example where formatting is difficult on a manual Braille writer. To centre a heading requires the student to know how many characters fit across the page; to know how many characters are contained in the heading, taking into account contractions, numbers and punctuation; to subtract the number of heading characters from the page characters; to halve the resulting number; to count the spaces across the line to find the position to start the heading – and then to type in the heading, heart in mouth, hoping their answers are right.

On the Mountbatten, again a simple toggle command is entered; once before the heading is typed, to turn it on, and once afterwards, to turn it off.

All sighted children are able to correct their own work using an eraser from quite early in the literacy process. Since the late 1960's, typewriters have included a correction facility. Computers of all varieties have the ability to correct work as it is written. Why should Braille be any different? The Mountbatten has the ability to both correct and delete hard copy Braille, even if the student has moved to another line further down the page.

More complex concepts – Mountbatten as pre-computer

The Mountbatten by its very nature introduces students to basic technology concepts and skills from the moment they start using it.

Unless the teacher decides to turn off speech, every time the young student presses a key or a combination of keys, they receive spoken feedback from the Mountbatten. This can be a letter, such as "a", which goes with a dot pattern being produced; an action such as space, backspace or tab, which goes with the movement of the Braille head to a new position. Aside from the positive feedback speech gives to reinforce Braille learning, the child is beginning a relationship with the Mountbatten where the child has the power to make discoveries and learn through play and experiment; the teacher becomes the facilitator.

There's a fun game for the Mountbatten, called Shark Attack. In this game, the teacher and student sit down together to create a page with Braille on it. At random points around the page, they will type a Braille character for the "shark" to eat. It might just be a letter "a" to begin with, or it might be the first letter of the child's name; just one letter. Then the child takes the role of the shark, using the keyboard to move around the page, finding each of the letters, and using the Mountbatten's erase-and-correct feature to "eat" the letters. The game can develop; by adding more letters, the child not only moves around the page, but must also differentiate between the letters they read.

The concepts used in this game are all going to be part of the skills they'll use when they move to a computer. Almost the most important one is the concept of the cursor – a difficult one to explain! - and they will absorb this concept very easily, because there is an embossing head to follow with their fingers while they work. They will also be absorbing the concepts of movement in all directions using they keyboard, and of being able to correct their work.

The student can also save their work in memory, add to the file they've made and make multiple Braille copies of work they have already done. While they do this, they are becoming familiar with the concepts of electronic memory and file management and retrieval.

The student is also learning to take care of their machine. They can check such status items as the battery level, and how much memory space is remaining. Children like to have control over their environment! Other things such as controlling the Mountbatten's speech output, turning embossing on and off, getting help from the Mountbatten – all these things promote the child's confidence, their view of themselves as capable, and build skills which will be useful life-long.

Any grandparent can tell you that their grandchild is an "expert" at technology, yet we often don't have the same expectations for children who are visually impaired. The Mountbatten is the first step of many that a student will take in using technology; any student who has used the Mountbatten will be able to make the transition to a note-taker with very little instruction. A student who has only used a mechanical Braille writer requires extensive training to move to a note-taker, and because of the time this takes, their training might not be as thorough as we would like.

Peer interaction – literacy as conversation

Literacy is about communication, and Braille is about literacy. Cognitive development is a social thing; development happens in response to and in the context of interaction, with our peers as much as with our teachers.

So it's of prime importance that the Braille-using student should not only gain print-awareness, but that they should be able to do as much of their literacy learning with their peers as possible. The Mountbatten facilitates this with the addition of the Mimic display and a keyboard from the PC, so that the student can pair up with other children in the class for activities; everything typed on the Mountbatten in Braille is shown on the Mimic display, and everything typed on the keyboard is embossed in Braille on the Mountbatten. In the process of this interaction, the Braille-using student becomes more print-aware, and the print-using student becomes more Braille-aware, which is a useful development for both of them.

Cognitive development doesn't stop when we move into adulthood – we just call it "raising awareness". We'd like to see awareness raised in the education community about not just the possibilities of using technology, but about the wider culture surrounding technology; the virtual world is one in which the Braille-using blind or visually impaired child will be able to move freely, so long as they have access to the tools and learning experiences they need.

The fully literate, Braille-using and technologically-capable student will have the world at their feet, and all the tools they need to choose any of the multitude of paths through it. And if they begin this journey in early childhood with a Mountbatten Brailler, we're confident that they will enjoy the journey!

Further reading:

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