

Learning disabilities

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Part I

Learning is so difficult...

- We are used to think that when a student doesn't pass an exam it is his/her fault
- We think that learning is a "normal" activity and when someone doesn't learn in the standard time we call him/her "stupid"
- But there are some disabilities that prevent intelligent persons to learn in the same way as other do
- These disabilities are subtle because they are often associated with a standard intelligence; but they become more and more important as learning goes on and they prevent people from acquiring the instrumental knowledge that allows them to proceed at the standard speed

Dyslexia

- Dyslexia is one of the (many) *learning disabilities* that typically appears in the evolutive age
- This unfortunately doesn't mean that it disappears when the child grows up
- There isn't a single Dyslexia as an illness with a single etiology, eg. due to a specific cause
- They are symptoms (= a child cannot read fluently a text that other children of his/her age and culture read normally) that cannot be explained *with other causes*
- *There isn't Dyslexia, there are dyslexic people*

Dyslexia

- Difficulty to read... but read what?
 - letters, symbols, digits, words, sentences, text ..?
- To read and to understand are different tasks
- Letters have a phonetic representation, symbols have not
- Words can be read without having to spell them letter by letter

Reading/1

- The process of reading is a complex one. Let's imagine a child at his/her first steps:
 1. look at a symbol
 2. recognize it as a symbol
 3. decode it (finding a phonetic representation)
 4. put together the previous and the next symbol to build a word

Reading/2

5. search the meaning of the word in the lexical memory
6. repeat step 1-4, at least at the first step or every time the word is a new one or is composed by "strange" symbols.

Afterwards, a look to the entire word is generally enough to recognize it

7. put together the previous and the next word to build a sentence
8. try to imagine a meaning for the sentence

This is a rough description of a much more complex process in which there are anticipation, hypotheses, steps back, guesses, errors, corrections, ...

Obstacles

- Some **phonetic** representations of letters are **similar** (p/b, d/t) or (in that language) their difference is not meaningful (f/v)
- Some letters are **visually similar**: p/q, b/d, m/n, v/u, e/a
- In some typefaces, some **letters** are very **similar** (1l, 00)
- In some typefaces letters are **too close** and tend to merge
- **Foreground color and background color are too similar**
- Symbols like *=+""\^#@ have **no phonetic representation**
- **Too much space** among letters can make difficult the task of putting them together in a word

Obstacles

The same is true for too

much space

among paragraphs

Or for lines not

starting at the

same point

Reading difficulties

- There are a lot of algorithms proposed to measure the difficulty to read a text:
 - https://en.wikipedia.org/wiki/Flesch-Kincaid_readability_test
 - https://en.wikipedia.org/wiki/Gunning_fog_index
 - https://it.wikipedia.org/wiki/Indice_Gulpease
- Readability depends also on how much the domain is familiar to the reader, or on his previous experience

Reading difficulties

- Studies have recognized that certain **typefaces** are more **difficult** to read than standard ones
- This is why there are "dyslexia friendly" font, like <https://opendyslexic.org/> or <https://www.dyslexiefont.com/en/products/>
- Ebook readers like Kindle features an Open Dyslexic font

Gill Sans	rn m	MW	dpqb	llijj
Verdana	rn m	MW	dpqb	l1IijJ
OpenDyslexic	rn m	MW	dpqb	l1liijJ
Times	rn m	MW	dpqb	llIijJ
Helvetica	rn m	MW	dpqb	l1liijJ

The Cambridge University study

- According to a research at Cambridge University, it doesn't matter in what order the letters in a word are, the only important thing is that the first and last letter be at the right place. The rest can be a total mess and you can still read it without problem. This is because the human mind does not read every letter by itself, but the word as a whole.”
- <https://www.toctocdisturbo.it/anagrammare-le-lettere-e-leggere-lo-stesso/>

Writing

- Writing and reading a word are two faces of the same process
- Some of the reading difficulties have an impact also on writing task
- This depends on the fact that:
 - the conversion between sound and form is "broken" in both directions
 - while writing one has to re-read continuously

What can be done?

- Text recognition and speech synthesis to completely avoid the problem
- Design text books or web sites using dyslexia-friendly fonts
- Pay attention to contrast and colors
- Use customizable editors /word processors / ebook reader
- Propose software for exercising the reading competences

Applications

[Home](#) / [Applications](#)

Dynalist

Dynalist is a outlining and organizing web app. It can be used for notes, Todo lists/GTD, brainstorming, etc. It has a good looking (seriously so), easy to use interface, and includes OpenDyslexic as an option. Get it at <https://dynalist.io/>

Textkraft

ABC Keyboard

This is a change to what you are used to in a keyboard: a keyboard layout that's entirely alphabetical. From the App Store listing:

DyslexiaKey

Where the previous iOS keyboard app was iPad-only, DyslexiaKey works on the iPhone. From the store listing:

Lowercase Keyboard

Apple Distinguished Educator, Matt Thomas, has made a custom keyboard for iOS8, using OpenDyslexic. Below is the

Resources

[Applications](#)

[Books](#)

[Devices](#)

What a teacher can do?

- Don't think that what is plain and simple for you and for the majority of students is evident for all. Ask. Test.
- Give enough time to everyone
- Allow for different learning strategies
- Give different tasks based on different capacities
- Make groups whenever possible and push students to work in groups

"Teach to all"

- These are not recommendations valid only for teachers dealing with children with learning disabilities and dyslexia
- They should become normal teaching habits, to be kept in mind (and repeatedly tested) all the time in every situation
- Like the "design for all" strategy for web sites, there should be a "teach to all" strategy

Part II

Different opinions

- I have very severe Dyslexia along with Dysnomia and Dysgraphia. I have known about it since I was a child. My reading and writing skills are pretty crippled, but I have learned to deal with it.
- However, with today's IDEs, I find it very easy to stay focused and in the zone when I code. But when I write text (like this post) I find it much harder to stay focused.
- I have a severely dyslexic friend who reads quite well when she's reading through a sheet of yellow plastic. Or when she highlights the hell out of each page. For some reason, coloring the text somehow helps her brain grok the glyphs it's seeing.
- So maybe syntax-highlighting and code coloring helps?
- IDE's provide a visual structure that assists the dyslexic to read and code with fewer errors. A single window with sub windows for different tasks prevents the dyslexic coder from becoming lost on the page. It reduces visual stress, like having rails on a bridge does for drivers.
- Similar symbols that appear to be the same to a dyslexic are difficult to find and fix. Automatic syntax highlighting saves a ton of time looking over the error codes.
- Code completion is a workaround for typing in the wrong character, looking up functions is a great help.

Dyslexia and source code

- This is an entirely new field of research
- It is based on the simple statement that source code are texts: programming is reading and writing a lot of times the same text, written by one or many different writers
- Source codes have the advantage of being presented inside an editor, that is a software capable of transforming a plain text in something more easier to read
- But there are many differences among standard texts and source codes

Differences

- Standard texts are written in a natural language which has an enormous vocabulary (100-270.00 words:
<https://wordcounter.io/blog/how-many-words-are-in-the-english-language/>)
- On the contrary, programming languages have much less words (reserved words: from 20 to 200)
- On the syntax side, PL have less constructs and don't accept exceptions (they are rigid)
- On the typographic side, PL use more extensively brackets and other signs like + : \ _ => -> * \$? ^

Languages

- Every editor has the capability to render a source code using a language-aware template
- Constants, variables, reserved words can be shown with different colors and styles (bold, italic, underlined)
- This is a great help when reading code because it allows developers to immediately recognize the syntactic type of a word and to catch errors

```

73 class getID3_cached_dbm extends getID3
74 {
75
76     // public: constructor - see top of this file for cache type and cache_options
77     public function getID3_cached_dbm($cache_type, $dbm_filename, $lock_filename) {
78
79         // Check for dba extension
80         if (!extension_loaded('dba')) {
81             throw new Exception('PHP is not compiled with dba support, required to use DBM style cache.
82         }
83
84         // Check for specific dba driver
85         if (!function_exists('dba_handlers') || !in_array($cache_type, dba_handlers())) {
86             throw new Exception('PHP is not compiled --with '.$cache_type.' support, required to use DBM
87         }
88
89         // Create lock file if needed
90         if (!file_exists($lock_filename)) {
91             if (!touch($lock_filename)) {
92                 throw new Exception('failed to create lock file: '.$lock_filename);
93             }
94         }
95
96         // Open lock file for writing
97         if (!is_writeable($lock_filename)) {
98             throw new Exception('lock file: '.$lock_filename.' is not writable');
99         }
100         $this->lock = fopen($lock_filename, 'w');
101
102         // Acquire exclusive write lock to lock file
103         flock($this->lock, LOCK_EX);
104

```


Colors/Typefaces Themes

- Many editors allows the developer to choose a color and background theme that is easier to read, less tiring, or simply more funny
- "The original **Monokai** colors had been created in 2006 by creative director & developer Wimer Hazenberg. Soon after, the code editor Sublime Text adopted Monokai as its default color scheme. Monokai is internationally used for **syntax highlighting** in almost every editor."

```
10 PRINT CHR$(205.5 + RND(1)); : GOTO 10
```

Personalization

- A dyslexic programmer could define his/her own personalized color/typeface theme and then use an editor that is capable of loading it
- This is unfortunately not always true for environment used in school labs
- The simple idea of letting a student use his/her device for an exercise seems to violate the contract among students and school ("you shall use the same environment for all")

```
1  @import "vars";
2  @import "mixins";
3  @import "components";
4
5  // My Project
6
7  .my-project {
8    color: @text-color;
9    background: @base-background-color;
10
11    &-header {
12      font-size: 1.2em;
13      border-bottom: 1px solid;
14    }
```

styles/main.less* 12,22 UTF-8 LESS master 8

Words and blocks

- What about blocks? Can dyslexic children have some advantage using coding environment like Scratch which don't make use of text but are based upon blocks?
 - Blocks are disposed vertically
 - Blocks are categorized by shape and colour *semantically*
 - Blocks *do have* text on them
 - Limited visual personalization
 - Translation
- What do you think about?

Visual Programming Languages for Programmers with Dyslexia: an Experiment

- "A survey of 351 programmers, including people with dyslexia, has found that programmers with dyslexia are 33.4% more productive if they use a visual programming language. This paper presents important aspects of the profile of programmers with dyslexia, introduces the most commonly used textual programming languages(TPL) by a group of programmers, classifies the 31 most common visual programming languages (VPL) for the study group, and analyzes some technical and facilitation features to support the needs of programmers with dyslexia, in five of these languages that have been considered current and relevant for the purposes of this research. The visual programming language Alice has been selected as the language to be included in a comparison experiment with the Java programming language. Results of the experiment establish preferences and levels of effectiveness of Alice against the other language, according to the performance of a group of programmers who participated in the experiment"
- https://www.academia.edu/74243546/Visual_Programming_Languages_for_Programmers_with_Dyslexia_An_Experiment