**Phase 1 - Secondary Research on Dyslexia and Programming with Dyslexia**

**What is dyslexia?**

Dyslexia is primarily associated with trouble reading or it may be referred as a “reading disorder”. However, people with dyslexia can have trouble with writing, spelling and speaking. (Lapkin, n.d.)

People with dyslexia does not mean they have low intelligence or that they are lazy. It’s also not due to poor vision. It’s common condition that affects the way the brain process written and spoken language. (Lapkin, n.d.)

People with dyslexia can still understand complex ideas. They just need more time to process the information. (Lapkin, n.d.)

People with dyslexia usually have a visual, right-brained global processing style. So, it is important to acknowledge the characteristic and the strength of this style. (Reid, 2010)

Dyslexia cannot be cured, it’s a lifelong condition. However, many people that have this condition can still have a happy and successful both in life and careers. There’s is a lot famous people that has dyslexia such as Tom cruise, Steven Spielberg and many others. (Lapkin, n.d.)

**Signs of Dyslexia:** (Dyslexia Association of Ireland, n.d.)

* Language issues
* Difficulties with numbers
* Difficulties with reading comprehension
* Trouble rhyming words
* Issues with memory
* Poor writing and spelling skills
* Difficulties in expressing ideas in written form (Thomson, 2009)

**Co-occurring Conditions:** (Dyslexia Association of Ireland, n.d.)

Below are conditions which can sometimes co-occur with dyslexia

* **Dyscalculia** - a specific learning disability which causes great difficulty in learning and comprehending mathematics.
* **Dysgraphia** - a specific disability affecting a person’s ability to write.
* **ADD** (Attention Deficit Disorder) and **ADHD** (Attention Deficit Hyperactivity Disorder) – a biologically based condition causing persistent difficulties resulting in one or more of the following behaviours: Inattention, Hyperactivity and Impulsivity.
* **Dyspraxia** or **DCD** (Developmental Co-ordinator Disorder) - a specific difficulty with movement and aspects of learning such as carrying out everyday motor skills
* **Asperger Syndrome** – a pervasive development disorder at the high functioning end of Autistic Spectrum which can cause significant difficulties with social interaction and communication.
* **SLI** (Specific Language Impairment) – a language disorder that affects communication.

**Programming with Dyslexia:** (Alexander, 2004)

It is possible that people with dyslexia may be stronger at:

* Visualization
* Spatial awareness
* Creativity
* Lateral thinking

When considering how the task of software design may be affected by the feature of dyslexia, it is helpful to breakdown on how computer program are written:

* **Recognition of a need** - involves the acknowledgement and definition of what the function of a program will be following evaluation of its necessity.
* **Problem definition** - the program will be evaluated as a method to solve a problem.
* **Synthesis** – conceiving what is require of the whole program, class, method, at different levels of abstraction.
* **Analysis** – what individual classes, methods or code will be required to create the whole functionality, again at different levels of abstraction.
* **Implementation** – coding, testing and correction until the program both compiles and functions in the expected manner.
* **Evaluation** – involves user trailing of the program and may engender further refinements or even a re-conceptualisation of the program.

The general design and problem solving tasks involved in programming require the skills that may be strong in dyslexic programmers. People with dyslexia tend to think holistically. They look at the system as a whole and how the elements interconnect with each other.

However, they may find difficulties in analysis, breaking down the problem or system into its component parts and viewing them in a systematic logical way. Because of short term memory people with dyslexia would have trouble remembering the small details involved in the program, such as the name and function of variables that has been declared, changes to the code implementation and what has yet to be implemented. Also, organisation skill that is required may put people with dyslexia at a disadvantage such as keeping track of the system structure when implementation stage has been reached.

**Tips for Supporting Learning:**

**Materials**

* **Use coloured paper** – Evidence suggest that different colours for background and font can enhance some children’s reading and attention.
* **Layout** – should be visual and not overcrowded. Coloured background. Font size can be an important factor, and should not be too small. It has been suggested that font itself should be Sassoon, Comic Sans and Times New Roman are the most dyslexia-friendly fonts.

(Reid, 2010)

**Tasks**

* **Provide a tick list** – This can help to keep them on track. It will also help him or her to monitor progress.
* **Break task into manageable chunks** – children with dyslexia have low self-esteem, if they can achieve small task at a time, this achievement provides the success to raise their self-esteem.
* **Oral feedback** – it is a good idea to get dyslexic children to provide oral feedback on the task they have to do. This ensures they have understood the task. It is also important to provide oral feedback to dyslexic children on how they managed the task. Oral feedback can be more effective than written comments.

(Reid, 2010)

**Other**

* Use an IDE (integrated development environment) that highlights variable names, misspelling, auto-indent code and built in features like intellisense and code refactoring (JeffO, 2010). IDEs such as IntelliJ and Visual Studio.
* In (Powell, et al., 2015), it outlines what to look out for when designing a dyslexia-friendly user-interface:
* Font type
* Font size
* Colour of fonts and background/foreground
* Consistent layouts and formats
* Clear Structuring of texts
* Use of Screen reader
* Clear and concise use of language

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