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ZAVRŠNI MAGISTARSKI RAD

**READING AND WRITING ERRORS IN LEARNERS OF ENGLISH WITH  
DYSLEXIA – A PSYCHOLINGUISTIC APPROACH**  
**POGREŠKE U ČITANJU I PISANJU NA ENGLESKOM JEZIKU KOD UČENIKA S  
DISLEKSIJOM – PSIHOLINGVISTIČKI PRISTUP**

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## **Abstract**

The aim of the present master's thesis is to identify errors which occur in the processing of text and writing in English, and to pay close attention to the importance of these processes in students with dyslexia. In the first, theoretical part, this thesis will refer to the modern understanding of dyslexia ('error' vs. 'mistake') and consider the issue of learning English in students with dyslexia. In the second, research part, the thesis will deal with the analysis of applications such as *StoryKit*, *Alpha Writer*, *Sentence Maker* that are intended for students with dyslexia in order to consider their usage in practice. In addition to analyzing available examples and materials from the University of Lancaster (Kormos & Smith, 2012) the thesis will also address the analysis of available examples from the second part of the corpus. The research will try to examine the most common specific reading difficulties (difficulties in connecting graphemes with phonemes, difficulties in connecting sounds and syllables in a word, moving words or letters, replacing graphically similar letters, replacing phonetically similar letters, replacing syllables, word substitution/guessing, adding letters and syllables, difficulties in tracing a letter or number sequence, difficulties in the sequence of reading directions (left-right), returning to an already read line, omission of words and whole lines), as well as non-specific difficulties related to reading (various blockages, disturbed rhythm and expressiveness of reading, unclear and very superficial articulation, reading by heart, poor comprehension of what is read) that occur in students with dyslexia. In addition, the paper will explore specific difficulties (difficulties in connecting phonemes to graphemes, replacing graphically or phonetically similar letters, 'mirror' writing letters or numbers, inserting, adding, moving, omitting letters, parts of words, difficulties in the sequence writing) and what non-specific difficulties ("slowness" and disorder in work and poor handwriting, difficulties in using spelling and grammar rules, undeveloped sense of syntax) occur when writing (Bjelica et al. 2009, p. 21). The thesis will seek to propose multimodal concepts and practical digital tools that will facilitate the teaching process for both teachers and students with dyslexia while focusing on language reception and production when it comes to the English language.

**Key words:** dyslexia, reception, production, difficulties, errors, specific difficulties, non-specific difficulties

## Sažetak

Cilj ovog završnog magistarskog rada je prepoznati pogreške koje se javljaju u procesiranju teksta i tokom pisanja na engleskom jeziku i pri tome se osvrnuti na važnost tih procesa kod učenika s disleksijom. U prvom, teorijskom dijelu, rad će se referirati na savremeno shvatanje disleksije (greška/pogreška), te će teorijski razmatrati problematiku učenja engleskog jezika kod učenika s disleksijom. U drugom, istraživačkom dijelu, rad će se baviti analizom aplikacija poput *StoryKit*, *Alpha Writer*, *Sentence Maker* koje su namijenjene za rad s učenicima s disleksijom kako bi se razmotrila njihova primjena u praksi. Pored analize dostupnih primjera i materijala Univerziteta u Lancasteru (Kormos & Smith, 2012), rad će se također baviti analizom dostupnih primjera iz drugog dijela korpusa. Kroz istraživanje će se nastojati ispitati koje su to najčešće specifične teškoće povezane s čitanjem (teškoće prilikom povezivanja grafema sa fonemom, teškoće prilikom povezivanja glasova i slogova u riječi, premještanje riječi ili slova, zamjena grafički sličnih slova, zamjena fonetski sličnih slova, zamjena slogova, zamjena riječi/pogađanje, dodavanje slova i slogova, teškoće prilikom praćenja slovnog ili brojanog niza, teškoće u slijedu smjera čitanja, vraćanje na već pročitani redak, izostavljanje riječi i cijelih redaka) kao i nespecifične teškoće povezane s čitanjem (sporost, različite blokade, poremećen ritam te izražajnost čitanja, nejasna i vrlo površna artikulacija, čitanje napamet, slabo razumijevanje pročitano) koje se javljaju kod učenika s disleksijom. Osim toga, rad će istražiti koje su to specifične poteškoće (poteškoće u povezivanju fonema sa grafemom, zamjena grafički ili fonetski sličnih slova, „zrcalno” pisanje slova ili brojki, umetanje, dodavanje, premještanje, izostavljanje slova, dijelova riječi, teškoće u slijedu smjera pisanja), a koje nespecifične poteškoće („sporost“ i neurednost u radu, te nečitak rukopis, teškoće u upotrebljavanju pravopisnih i gramatičkih pravila, nerazvijen osjećaj za sintaksu) koje se javljaju prilikom pisanja (Bjelica et al. 2009, p. 21). Rad će nastojati predložiti multimodalne koncepte i praktične primjene digitalnih alata koji će olakšati nastavni proces kako za nastavnike tako i za učenike s disleksijom pri čemu će fokus biti usmjeren na jezičnu recepciju i produkciju kad je u pitanju engleski jezik.

**Ključne riječi:** disleksija, recepcija, produkcija, poteškoće, pogreške, specifične poteškoće, nespecifične poteškoće

## 1 INTRODUCTION

It is worth mentioning at the very beginning of this thesis that people around the world have more and more intensely and by means of social media been trying to communicate about the difficulties people with dyslexia are facing. Currently, at the time of writing the present paper, the most prominent are the hashtags such as: #EDAdyslexiaday, #WorldDyslexiaDay, #DyslexiaAwarenessMonth, which promote the dyslexia awareness concept on social media. In the lines that follow, recent events that marked dyslexia awareness will be presented chronologically and the current issues related to the context of Bosnia and Herzegovina will be briefly discussed before the theoretical and the research part of the paper are to be presented.

Aside from social media, in 2020, the cover topic of the *British Dyslexia Association* was *Dyslexia Creates*, looking at the power of dyslexia to create ideas and plenty of useful resources (posters, presentations, guides) were made to help schools, colleges, and universities. Also, *Nessy* has been giving away free dyslexia training to every interested teacher in the world in order to make a change for children with dyslexia. *Go Red for Dyslexia* is part of the *Succeed with Dyslexia* movement which celebrates dyslexia at a global level. People are, for that purpose, encouraged to wear something red to raise awareness of dyslexia in schools and workplaces. Furthermore, even the buildings are lighting up in red. The colour red is being used on this occasion since many people with dyslexia have experienced the use of red ink by means of which their work was marked in schools and now it is used in a positive way, i.e. to raise awareness of dyslexia (see: #GoRedForDyslexia). Organisations such as *Made by Dyslexia* aim to help the world properly understand and support people with dyslexia.

As for other related events around the globe, *European Dyslexia Awareness Week* starts from the first Monday of October each year and the *Dyslexia Awareness Day* is on the Thursday of that week. In 2020, *European Dyslexia Awareness Week* lasted from 5th to 11th October and *Dyslexia Awareness Day* took place on 8th October. The event was founded by the *European Dyslexia Association* and people throughout Europe organized various events, produce resources and share information with teachers, employers and the general public to emphasize and highlight dyslexia-related issues.

Two years ago, in 2018, Scotland had a *Dyslexia Awareness Week* and the theme of the week was *My Wider World*. At the same time, *Italian Dyslexia Association* arranged 300 events during the *Dyslexia Awareness Week*. In 2016, *Dyslexia Awareness Week* in Ireland was marked by raising awareness in the media (interviews on radio and TV), starting social media

campaigns as well as a series of information seminars and events over the course of the week. Before that, in 2014, *British Dyslexia Association* held another dyslexia awareness week titled *Dyslexia Matters*, looking at the way it matters not just to people with dyslexia but the whole society.

In Bosnia and Herzegovina, the concept of inclusive education is relatively new and dyslexia is not well-supported through schools; furthermore, teachers do not receive any formal training on dyslexia. Researches on dyslexia in Bosnia and Herzegovina have not been conducted until recently and there is only one Department of Speech-Language Pathology at the University of Tuzla which provides education on dyslexia. Nevertheless, teachers need to develop adequate knowledge, skills, and confidence in order to work with students with dyslexia according to inclusion policies. Moreover, they need to be aware of the signs of dyslexia, to know what steps need to be taken to help students with dyslexia and to deliver curriculum in a way that meets the needs of individual students.

Modern pedagogy, for instance, classifies dyslexia as a difficulty that can be acted upon pedagogically depending on the degree of reading and writing difficulties and individual needs of the student. The key is in early identification and diagnosis so the students with dyslexia can get appropriate levels of support throughout their education in order to reach their full potential. Scholarly performance of students with dyslexia depends on several aspects, including the educational system and the teaching-learning process used, as well as the relationship with family members, teachers and other students. It is difficult to accurately estimate the prevalence of dyslexia due to different definitions and different criteria taking into account different studies in different countries (Miles, 2004). What is also important to mention is that in Bosnia and Herzegovina, a study has been conducted which determined the prevalence of reading difficulties of 3,23% among primary school students from third to seventh grade (Duranović et al., 2013, p.11).

Furthermore, Article 2 of the Law on Primary Education of the Sarajevo Canton defines dyslexia as follows:

“Dyslexia is a neurological disorder that interferes with language learning and processing and manifests itself in problems with reading, writing, speaking, and/or listening; inability to master reading and writing despite proper intelligence and sufficient effort. The word comes from the Greek words *dys* (weak or insufficient) and *lexis* (words or language). Dyslexia is congenitally conditioned, and some believe that the basis for organic differences in language-related centers in the brain is genetically transmitted.

It is not caused by mental or sensory deficiencies, emotional disturbance, or cultural deprivation.”<sup>1</sup>

In Article 66 of the Law on Primary Education dyslexia, dysgraphia and dyscalculia are referred to as *specific learning difficulties*. In some other countries, the term *dyslexia* is used for reading difficulties whereas *dysgraphia* or even *dysortography* for writing difficulties, although the underlying problem almost always involves both reading and writing, which is why this thesis will observe dyslexia as a topic relevant for studies in psycholinguistics and applied linguistics as well.

In 2016, from October 3rd to October 9th, under the motto “Dyslexia is not a disease –it’s diversity”, the *International Dyslexia Awareness Week* was marked for the first time in Bosnia and Herzegovina, and October 6th was marked as the *International Dyslexia Day*. Since the public in Bosnia and Herzegovina is largely uninformed about dyslexia, the *Association for Support of People with Dyslexia Vjetar*, in collaboration with the Ministry of Education of the Sarajevo Canton, initiated the marking of the week to raise awareness and spread the message about diversity.

The ceremony started with an exhibition of dictations of students which the Association, together with the help of parents, collected from all parts of Bosnia and Herzegovina. The following day, a lecture was given to the professional staff and teaching staff of primary schools in Sarajevo under the title “Dyslexia—How to Recognize and Provide Support”. The first press conference in Bosnia and Herzegovina on the topic of dyslexia was also organized and attended by a significant number of media outlets.

Furthermore, a special half-hour show was produced for one of the leading TV stations in Bosnia and Herzegovina (FTV). The campaign was also launched on social networks, as well as on the site of the *Vjetar* Association. During this campaign, elementary school students of the Sarajevo Canton, who do not suffer from dyslexia voluntarily agreed to feature in the posters shown as “criminals”, whose crime is that “they read and write badly” and their posters were posted in elementary schools. The message that dyslexia is not a disease but a diversity, was marketed through a number of TV appearances, radio reports, newspaper articles and interviews. On 6th October, the *International Day of Dyslexia*, several media changed their

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<sup>1</sup> *Official Gazette of the Sarajevo Canton*, No. 23/2017, 33/2017, 30/2019/ *Sl. novine Kantona Sarajevo*, Br. 23/2017, 33/2017, 30/2019 and 34/2020). <https://www.paragraf.ba/propisi/kantona-sarajevo/zakon-o-osnovnom-odgoju-i-obrazovanju.html> (paragraph translated by S.H.).

logos in a “dyslexic way”, i.e. the web portal in BiH, Klix, thus became *Kilx*, and the logos were also changed by Gracija, sportsport.ba and bljesak.info. This campaign raised awareness in the public perception, expressed empathy and support for diversity, making sure there is no room for stigma and lack of understanding and became a link between the professional staff, speech therapists, special education teachers and teaching staff.

For all the reasons given above, and to honour all the work that has been done so far around the world and in Bosnia and Herzegovina as well, this paper aims to help not only students with dyslexia learning a foreign language (the English language in the case of the present paper); moreover it aims to help teachers and parents since only together they can create a fruitful collaboration, positive atmosphere and adapt ways of working to help children and young people to overcome difficulties. In addition, we should raise the scientific questions about the need of a greater investment on research and professional formation in this field.

In conducting the research, three hypotheses were established. The three hypotheses presented in the lines that follow were postulated after a thorough examination of the available literature regarding the theoretical researches, as well as the literature regarding the reading and writing errors in learners of English with dyslexia:

H1: Students with dyslexia will report difficulties in the acquisition of both English as L1 or English as a foreign language since the learning materials are not adapted to learners’ specific needs.

H2: The presence of specific errors in students suffering from dyslexia and learning English as a foreign language is expected to be common in the reading process.

H3: The presence of non-specific errors in students suffering from dyslexia and learning English as a foreign language is expected to be common in the writing process.

Furthermore, the adjustment of the materials used in research methodology was modeled on research conducted by Hebert et al. (2018).

## 2 THEORETICAL BACKGROUND: DEFINITION AND APPROACHES TO DYSLEXIA AS A LANGUAGE IMPAIRMENT

The term dyslexia has its origins in the Greek language, *dys* meaning *impaired* and *lexis* meaning *word* (Malmkjær, 2010). The term was coined in 1884 by Rudolf Berlin who was a German ophthalmologist trying to explain the condition in which people's intellectual abilities were perfectly fine, however their reading was impaired. The term *dyslexia* became the general term used in order to label reading difficulties. Until then, *dyslexia* and *word-blindness* were used interchangeably (Kormos and Smith, 2012). Furthermore, the definition of dyslexia is created according to certain criteria of describing a person's behavior and language functions that are insufficient. Previous research contained references to what was considered a cause of reading difficulties, such as "minimal cerebral dysfunction", "organic disorder", or "psychoneurological disorder". Despite decades of research into dyslexia, there is still no general agreement among researchers about the cause of dyslexia.

Still, dyslexia occurs in 5-17,5% of school-age children (Shaywitz and Shaywitz, 2005). It occurs three to six times more in boys than girls (Peterson and Pennington, 2012) and belongs to the group of specific learning difficulties also called *reading disorders*, meaning that the reading performance and competence is lower than it should be when taking into consideration aspects such as chronological age, measured intelligence and age-appropriate education.

Four different levels need to be taken into consideration when defining dyslexia, i.e. behavioural, cognitive, biological and environmental. According to some definitions, dyslexia is a reading difficulty, however this statement is not sufficient since problems in reading are not caused only by dyslexia. Moreover, reading problems can decrease overtime in children with dyslexia, whereas spelling problems might still be present. At the cognitive level, dyslexia needs to be differentiated from other types of general learning difficulties. The biological level implies that in order to understand exact causes of dyslexia and provide supportive tools, further research needs to be conducted into the neurological field. According to the aspect concerned with the environmental level, a few factors need to be considered such as: exposure to written language, attitudes to literacy in the family, and the effectiveness of reading instruction.

In that way, effects of developmental dyslexia would be separated from the effect of social, cultural and economic status and inadequate teaching on reading behaviour (Kormos and Smith, 2012).

One of the most extensive definitions of dyslexia today is that of the *International Dyslexia Association*, that takes all the four levels into consideration:

“Dyslexia is a specific learning disability that is neurological in origin. It is characterized by difficulties with accurate and/or fluent word recognition and by poor spelling and decoding abilities. These difficulties typically result from a deficit in the phonological component of language that is often unexpected in relation to other cognitive abilities and the provision of effective classroom instruction. Secondary consequences may include problems in reading comprehension and reduced reading experience that can impede growth of vocabulary and background knowledge.” (Kormos and Smith, 2012, p.38)

There are also three main theories on the cause of dyslexia: the theory of phonological deficit (PDT), the theory of visual magnocellular deficiency (MDT), and the theory of cerebellar deficiency (CDT).

The central claim of PDT is that people with dyslexia have specific difficulties in the representation and processing of phonemes. According to PDT, dyslexia manifests itself through: phonological awareness (difficulties with analyzing, connecting, and manipulating the voice structure of words), verbal short-term memory (difficulty in remembering a series of numbers and words, and repeating meaningless words and sentences), words (reduction of verbal fluency and naming speed) and recoding in reading (which is especially evident when processing unknown or meaningless words) (Duranović et al., 2013, p.11).

CDT was originally formulated as a theory of automation deficits. According to this theory, there is biological evidence that the cerebellum in people with dyslexia is mildly dysfunctional, with numerous cognitive difficulties. The cerebellum has a significant role for motor control and, therefore, for articulation. It is stated that dysfunctional articulation should lead to deficiencies in phonological representation. Furthermore, the cerebellum is important for automating tasks such as driving, typing, and reading. Various studies suggest poorer performance in people with dyslexia on motor tasks and impaired balance automation. Brain research has also shown anatomical, metabolic differences, and differences in cerebellar activation in people with dyslexia (Duranović et al., 2013, p.11).

MDT argues that the root cause of the problem is not specifically linguistic, however, that there are difficulties in the area of the visual or auditory magnocellular system. The visual

magnocellular system specializes in processing fast visual temporal information, while the auditory magnocellular system specializes in processing fast auditory temporal information.

Magnocellular theory tries to integrate all the above-mentioned theories, according to which magnocellular dysfunction is not limited only to visual pathways, but generalizes all the modalities (visual, auditory, tactile). Evidence for magnocellular theory includes magnocellular abnormalities in the medial as well as lateral genicular nucleus in people with dyslexia, poor performance of people with dyslexia in the tactile domain, and the presence of visual and auditory problems (Duranović et al., 2013, loc. cit.).

Furthermore, according to Brown (2000) in order to analyze a learner language, it is important to distinguish between the terms *error* and *mistake*. Mistakes can be seen as deviations in the speakers' language that occur when the speakers fail to perform according to their competence, even though they are familiar with the rule. Mistakes can be self-corrected with or without being pointed out to the speaker. Mistakes can happen in both native and second language and they result from some sort of temporary breakdown, hesitations, slip of the tongue, random ungrammaticalities or imperfection in the process of producing speech. On the other hand, errors are defined as deviations which result from a degree of or ignorance of the rule. Errors are not self-corrected since they are part of the learner's lack of understanding; therefore, the learner does not consider them as errors. Errors may thus point to the competence of the learner and related to the learner's performance.

## **2.1 Different types of dyslexia and different types of errors**

Among the different types of dyslexia, *acquired dyslexia* results from a brain injury when there were no previous signs of dyslexia. We can distinguish two sub-types of *acquired dyslexia* and those are *central and peripheral*. In case of *peripheral acquired dyslexia*, there is an impairment in the visual analysis of letters and words, whereas in *central acquired dyslexia*, there is an impairment in one of the two routes necessary for reading, either semantic (or lexical) route, or phonological (or sub-lexical) route. Subtypes of *peripheral acquired dyslexias* are *word-form dyslexia*, *neglect dyslexia* and *attentional dyslexia*, whereas the subtypes of central acquired dyslexias are *deep dyslexia*, *surface dyslexia* and *phonological dyslexia*. *Visual dyslexia* is another type which cannot be classified as peripheral or central, but rather being somewhere in between those two types (Malmkjær, 2010).

*Word form dyslexia* or the so-called *pure alexia* results from injury to the left occipito-temporal cortex. It is a reading disorder due to which words cannot be recognized instantly, but rather when naming the words' constituent letters having enough time to produce it. *Word form dyslexia* or *pure alexia* is also known by other names such as: letter-by-letter reading, spelling dyslexia, alexia without agraphia, verbal dyslexia, word blindness or letter-by-letter dyslexia (Montant and Behrmann, 2000).

Furthermore, *neglect dyslexia* occurs when one side of words or letter strings, either left or right is produced incorrectly whereas the other side is produced correctly. Neglect dyslexia results from the damage to the right hemisphere, which further causes difficulties with understanding spatial orientation as well as binding of word features (Malmkjær, 2010). In the case of *attentional dyslexia*, letters move between words, thus an initial letter from one word will replace the initial letter of the word next to it. It is associated with damage to the parietal lobe in the left cerebral hemisphere which is dominant with regard to language and logical processing (Friedmann, Kerbel and Shvimer, 2010). In addition, *visual dyslexia* can be defined as a confusion of words that are visually similar. However, real words and words with few orthographic neighbours are read more correctly than non-words and words with many orthographic neighbours. Visual dyslexia is rare and little is known about its cause (Malmkjær, 2010).

*Deep dyslexia*, as its name suggests, is a severe reading impairment which manifests itself through: semantic errors in reading aloud, visual errors in reading aloud, derivational errors in reading aloud, reading of non-words is impossible, reading of function words is very poor, concrete words are read much better than abstract words, writing to dictation and spontaneous writing is severely impaired. Deep dyslexia occurs due to the damage of the left hemisphere (Weekes and Gordon, 1997) whereas *phonological dyslexia* is a reading impairment due to which sufferers read regular and irregular words without difficulty, however, problems occur when they read non-words.<sup>2</sup> It is the result of disruption to either a component of a non-lexical orthographic-phonological reading route (Tree and Kay, 2006).

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<sup>2</sup> Non-word is a word which is not recognized or accepted as legitimate, as one produced by a spelling or typographical error (Collins Dictionary. <https://www.collinsdictionary.com/dictionary/english/nonword>).

*Surface dyslexia*, quite contrary to *phonological dyslexia*, manifests itself through reading all regular words well, but having difficulty in reading exception or irregular words since irregular words are the words with irregular pronunciations that do not follow the most common letter-sound pattern. Three subtypes of surface dyslexia have been identified: *input surface dyslexia*, *central (semantic) dyslexia* and *output surface dyslexia*. Even though it is still unknown, researchers assume that damage to the left hemisphere regions (involved in visual word recognition and semantic processing) is the cause of *surface dyslexia* (Karanth, 2003).

Finally, *developmental dyslexia* is a reading impairment due to which sufferers have difficulties with accurate or fluent word recognition and spelling. In the past few years, *developmental dyslexia* has been researched on behavioural, neuropsychological, neurobiological, and causal level. Nevertheless, *developmental dyslexia* is neurobiological in origin and persists across one's lifespan. Furthermore, dyslexia is associated with dysfunction of the left hemisphere language network and also implicates an abnormal white matter development (Peterson and Pennington, 2012).

## **2.2 The process of developing reading skills and their importance in students with dyslexia**

Students with dyslexia have both reading and writing difficulties since reading is recognized as a central component of writing in some cognitive models of writing development. We could propose that reading implies decoding, i.e. interpreting and understanding written messages, whereas writing involves encoding, that is, creating written messages. Reading is a complex function that involves the transfer of one code to another, visual code to spoken (when reading aloud) or transfer from visual to subvocalic reading, which assumes the existence of all phonetic and linguistic structures (Vladislavljević, 1991). In the lines that follow, more information will be provided on the reading ability, the reading process and the reading difficulties.

The reading ability is based on the complex structures and processes of the cerebral cortex as the reading center is connected by neural connections to a number of specific areas involved in the reading process (sensorimotor centers: the hearing center, eyesight, voluntary eye movements, head movements, handwriting, etc.). The general reading speed is affected by the speed of perceptual grapheme recognition, speed of pronunciation (speaking aloud during oral reading or pronouncing in the form of internal speech when reading within oneself), speed of

comprehension (especially anticipation of words and their meaning). Moreover, specific psychological factors that affect reading are related to the visual perception, auditory perception, hand motor skills, and lateralization (handedness and ambidexterity). Perceptual functions that affect reading may be linked to visual acuity, visual field width, perception of shapes and colors, and type of perceptual activity. The visual perception, visual memory, attention, the ability to distinguish spatially and the ability to graphically symbolize are needed in order to convert sounds into letters, i.e. to translate phonemes into graphemes (Duranović et al., 2012).

The critical phase in the reading process is the conversion of letters into sounds. Therefore, the most important thing in learning to read is being able to apply the alphabetic principle. The alphabetic principle is the principle according to which letters, and groups of letters, match individual sounds in words. Readers must have phonological awareness skills and be able to recognize individual sounds in spoken words so they would be able to master the alphabetic principle, meaning it is necessary to be able to notice which sounds (phonemes) the word consists of. This means that voice analysis of words can be performed, i.e. hear the sounds in the same order in which they are arranged in the word. Even though it sounds pretty straightforward and many children learn to read until the age of five, many children, however, struggle in learning and applying the alphabetic principle, especially in English since the same letter can represent more than one sound, depending on the word (e.g., the /a/ sounds are different in the words *mat* and *mate*) (Baker et al., 2018).

The most common specific reading difficulties are difficulties in connecting graphemes with phonemes, difficulties in connecting sounds and syllables in a word, moving words or letters, replacing graphically similar letters, replacing phonetically similar letters, replacing syllables, word substitution–guessing, adding letters and syllables, difficulties in tracing a letter or number sequence, difficulties in the sequence of reading directions (left–right), returning to an already read line, omission of words and whole lines whereas non-specific difficulties related to reading are various blockages, a disturbed rhythm and expressiveness of reading, unclear and very superficial articulation, reading by heart, poor comprehension of what is read) that occur in students with dyslexia (Bjelica, et al., 2009, p. 21).

Of course, there are many factors that can affect the processes involved in reading and writing which are related to the neurological functioning of the brain and factors affecting memory and information processing.

### **2.3 The process of developing writing skills and their importance in students with dyslexia**

Recent research has been mainly focused on reading while less attention has been given to writing even though dyslexia affects writing as much as reading. Moreover, writing problems are present even after the reading problems have been remedied. Sometimes students can be articulate, fluent and understand concepts, however, their writing might be impaired.

Reading difficulties contribute to writing difficulties such as: poor spelling, poor legibility, lack of diverse vocabulary, poor idea development, lack of organization. Reading and writing difficulties are interconnected in a sense that they rely on related underlying processes and reading is a subskill required throughout the writing process. According to Berninger and Amtmann (2003), a model of the simple view of writing includes four subskills essential for writing: transcription (handwriting/typing, spelling/typing), executive function (setting goals, planning/recording ideas, providing self-instruction and using self-speech, self-monitoring), working memory (phonological loop, visuospatial sketchpad, executive control), and text generation (Hebert, 2018).

What is important to mention here is that, as a coping strategy, students may try to choose the words they can spell rather than those they want or would like to use. Students with short-term memory problems have difficulty transcribing a mentally composed sentence, therefore much backtracking is required which further disrupts the flow of thought. What is also important to mention is the difficulty of backward processing as in English we move forwards when we process sentences (e.g. we could compare the processing difficulties for “Mary, Peter and Priscilla play the flute, the piano and the guitar respectively.” and “Mary, Peter and Priscilla play the guitar, the piano and the flute reversely.” (Aticheson, 2008, p. 230).

Since a great number of words in the English language are in some way irregular, students very often struggle with spelling. Therefore, in order to understand the connection between reading and writing, we need to mention that specific writing difficulties pertain to difficulties in connecting phonemes to graphemes, replacing graphically or phonetically similar letters, ‘mirror’ writing letters or numbers, inserting, adding, moving, omitting letters, parts of words, difficulties in the sequence writing whereas non-specific writing difficulties are: slowness and disorder in work and poor handwriting, difficulties in using spelling and grammar rules, and an undeveloped sense of syntax (Bjelica, et al., 2009, p. 21).

### 3 DYSLEXIA AS AN EXPERIENCE DESCRIBED BY INDIVIDUALS SUFFERING FROM READING AND WRITING DIFFICULTIES

In the present thesis, aside from providing the theoretical background, the author of the thesis decided to analyse the learning experiences of students now studying at Lancaster University which have been made available through a free online course on dyslexia and which reflect the issues they usually struggled with before studying at the university, i.e. at an earlier age (Kormos & Smith, 2012). The experiences described were then used for the purpose of the present research in order to make the issues learners and students of foreign languages are struggling with more accessible and more straightforward to the reader and then proceed to the second phase of research, i.e. finding online tools that would facilitate processing reading and writing – reading observed as a decoding and writing observed as an encoding process for primary school students struggling with dyslexia and learning English as a foreign language. Furthermore, the experiences of people suffering from dyslexia (see: Appendix 1) are provided in the lines that follow. Table 1 presents the first part of my research, i.e. an analysis of narratives from Lancaster University. Among the narrators, there are three students and one teacher. They are sharing their personal experiences on dyslexia. All of them are speaking the English language and additional languages such as French, Spanish, Arabic, Italian. They are expressing their thoughts and feelings on dyslexia-related issues, i.e. listing the easiest and most difficult parts regarding dyslexia as well as some strategies for learning which helped them overcome reading and writing difficulties:

**Table 1: Analysis of narratives from Lancaster University**

Name	Anastasia	Brandruff	Kirstie	Markos
Occupation	Teacher of the English Language in Greece	Student of Biochemistry	Student of English and Spanish	Student of Biomedicine
Languages	English Greek	English, Spanish, French, Arabic	English, Spanish, Catalan, Italian	English, French, Arabic
Educational system	learning by heart not being taught in a special way traditional way of teaching			Dyslexia Department (secondary school)
	low attention span daydreaming low self-esteem		feeling “stupid” , feeling nervous	frustrating experience,

Signs and symptoms of dyslexia	poor organisational skills feeling isolated seen as lazy			annoyed at inconsistencies
Strategies for learning	hanging out with native speakers, watching TV, listening to the radio, reading books	mnemonics, monologues		
Few difficulties with		symbols, speaking, reading, grammar	seeing patterns between languages spelling in Spanish	reading
Difficulties with	no diagnosis memorisation meaning and spelling of words auditory processing	writing, comprehension, being consistent, transfer from working short-term memory to longer- term memory	no diagnosis reading, memorising new words, grammar reading out loud spelling writing	spelling, writing

Having taken the experiences of learners presented so far and relating them to the first hypothesis, in the chapter that follows, my research will be presented by means of an analysis and detailed review of available online tools and applications that focus on reading and writing and thus may assist in (1) detecting the errors in reading and writing, as well as (2) reducing the number of errors produced by students learning languages or, in the case of the present paper, learning English as a foreign language. The selection of the multimodal tools has been made based on a qualitative analysis of the narratives from Lancaster University students to assist both teachers and learners.

#### **4 ONLINE APPLICATIONS SUITABLE FOR STUDENTS WITH DYSLEXIA TO REDUCE ERRORS IN READING AND WRITING**

Dyslexia makes language learning challenging due to phonological difficulties and understanding the sound system of languages, difficulties with memory, difficulties with auditory and visual perception, sequencing difficulties, oral or speech difficulties, and reading fluency. However, technology (computers, the internet, various devices such as interactive whiteboards, tablets, phones, computer programmes/software, applications, in general) can ease the learning process for students with dyslexia.

Information Technology (IT) can be a source of motivation for pupils who are struggling, moreover, IT helps teachers find ways to help individuals in a busy classroom situation since tasks can be individualised to meet the needs of each and every student. Computer programmes can speed up or slow down the language production depending on the learners' needs. Students need to be encouraged to repeat the sounds or the words when they come onscreen. Learning games are also a good way to help reinforce sounds and vocabulary once these have been taught. Furthermore, games help students process from short-term and working memory into long-term memory. Many of such games are available on applications that learners can play on their tablets or smartphones. Occasionally, learners might have visual difficulties or they may have a specific sensitivity to black ink against a white background, which influences how they perceive words, especially in the reading process. This seems to make the letters jump or move around on the page or gives unusual effects that cause distraction away from the print. For that reason, students could successfully overcome some of the above-mentioned issues by means of technology and multimodal approaches to text.

The list of various websites and applications suitable for students with dyslexia will be classified in the following way: 4.1 organizational applications, 4.2 reading applications, 4.3 writing applications, 4.4 spelling applications, 4.5 vocabulary learning applications, 4.6 phonemic awareness applications, 4.7. speech-to-text applications, 4.8 text-to-speech applications, 4.9. other applications: application stores, platforms for learning, songs and videos for kids (Kormos & Smith, 2012).

## 4.1 Organizational applications

The term “mind map” was coined by Tony Buzan, an English researcher in the 1970s. Buzan was looking for a way to deal with the large amounts of information during his studies, thus he combined approaches of the greatest thinkers and his own research about psychology, creative thinking and memorization. Eventually, the first edition of *The Mind Map Book* was published in 1995. Moreover, the first completely web-based mind map tool was released in 2007. *MindMeister* (see: Appendix 2, Screenshot 1) is an online mind mapping tool that allows capturing, developing and sharing ideas visually. This tool has many advantages compared to traditional note-taking and writing techniques, i.e. mind maps help in structuring information, improving memory, fostering creativity, facilitating collaboration. The application possibilities of mind maps are almost endless, however, there are six of the most common uses of mind maps: brainstorming, note-taking, planning, meeting management, idea management, knowledge management. *MindMeister* is web-based, which means that mind maps can be accessed inside the web browser.<sup>3</sup> Another application, *Time Timer* (see: Appendix 2, Screenshot 2), is a mobile time tracking application. Time is managed with visual depiction of time and audible signals. Mobile time tracking can make clocking in and out and sharing schedules easier for everybody, regardless of location. Mobile timesheet application allows tracking, submitting and approving time directly from the application, attaching photos, managing multiple timesheets at once, etc.<sup>4</sup>

*Popplet* (see: Appendix 2, Screenshot 3) is an online tool that enables students to learn visually and creatively, with greater *retention*, enhancing collaboration among students, helping them with project work. Students with dyslexia, for instance, can more easily organize their thoughts and structure the foundation of essays and letters by creating mind maps online. This tool is simple and so visual it can be utilized in any language and is currently being used in over a hundred different languages.<sup>5</sup>

After a careful analysis of the content available online, the following reading/writing/spelling applications have also been found: *StoryKit*, *Pocket Phonics*, *First*

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<sup>3</sup>[https://www.mindmeister.com/?utm\\_source=bing&utm\\_medium=cpc&utm\\_campaign=world\\_en\\_search&utm\\_content=mm&utm\\_term=mindmeister](https://www.mindmeister.com/?utm_source=bing&utm_medium=cpc&utm_campaign=world_en_search&utm_content=mm&utm_term=mindmeister)

<sup>4</sup> [https://www.tsheets.com/pages/app-twopart?utm\\_source=Bing&utm\\_medium=pay-per-click&utm\\_campaign=Clock\\_In\\_Out\\_RLSA&utm\\_term=best%20app%20for%20clocking%20in%20and%20out&utm\\_content=Clock\\_In\\_App](https://www.tsheets.com/pages/app-twopart?utm_source=Bing&utm_medium=pay-per-click&utm_campaign=Clock_In_Out_RLSA&utm_term=best%20app%20for%20clocking%20in%20and%20out&utm_content=Clock_In_App)

<sup>5</sup> <https://www.popplet.com/>

*Word Deluxe, See Read Say, ABC Spelling Magic 1/2/3/4, Spy Sam Reading Series, Sentence Maker, Learn to Read, Write, and Spell, Clicker Books (from Crick software), British Council – Learn, English Teens, First Step Reading, Reading A-Z, Make Beliefs Comix, Teach your Monster to Read, Wikipanion, Vocabulary Spelling City, Newsela, Dvolver Movie Maker.*

## 4.2 Reading applications

*PocketPhonics Stories* (see: Appendix 2, Screenshot 4) is “learn to read” application for four to seven year-olds. This application is useful for classroom or group use and its design is suitable for individual work. It guides students through the “literacy journey” by helping them to learn and write their first letter sounds and at the end enabling them to read the application’s 43 stories. *PocketPhonics Stories* is split into twelve groups of letter sounds, and each group is followed by a set of storybooks that use those letter sounds. Students read storybooks that suit their level. Parents and teachers can check what stage the child is currently at, any letter sounds they are having difficulty with and what storybooks have been read. By using this application, students could master the following skills: writing letters (more choice of handwriting styles than any other application), recognising 72 letter sounds (e.g. ‘ch’ are the letters that make the initial sound in ‘chat’), blending letter sounds together to make words (e.g ‘ch-a-t’), hearing a word and selecting its written form (e.g. the application says, “chat” , the child has to select ‘chat’ from a group of words —some of which are similar to chat).<sup>6</sup>

*See Read Say* (see Appendix 2, Screenshot 5) includes 220 Dolch sight words (Dolch words are also known as frequency words, or “sight words”) which children should be able to read before they finish the first grade. This list of 220 words, prepared by E.W. Dolch, generally make up from 50 to 75 percent of the reading material encountered by students. Word levels that are included are: Pre-Primer, Primer, First, Second, and Third grade. The characteristics of the application are such that they allow up to four different users to save individual progress. This application is suitable for both children and adults (of all ages) who are learning to read, or anyone who is learning sight words, or people who are learning English or the alphabet, parents who homeschool, teachers, as well as children who are using phonics techniques.<sup>7</sup>

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<sup>6</sup> <https://www.educationalappstore.com/app/pocketphonics-stories>

<sup>7</sup> <https://appadvice.com/app/see-read-say/322313775>

Another application worth mentioning for improving general reading skills is *Spy Sam Reading Series* (see Appendix 2, Screenshot 6) since this is an application consisting of three books.<sup>8</sup>

*Sentence Maker* (see Appendix 2, Screenshot 7) is a *sentence-forming* application that enables students to learn the basics of *word pairing* and *sentence structure*. This application is especially helpful for students who have difficulty with spoken and written language (e.g. a photo appears on the screen along with scattered words in order to create a sentence). Gray-scale tiles for each word line the bottom of the screen in sentence order, therefore, students need to read each scattered word (or tap it and have it read by the narrator) and then put the words in the correct order. In case that students fail to move the word to its match, the application makes a sound, and the word will not fit into that place. Once all the words are matched, the narrator produces the entire sentence, so the students can also hear it. *Sentence Maker* can also be adapted to suit a student's needs including using only word pairs, giving hints, deleting or adding specific images and sentences, etc.<sup>9</sup>

*Learn to Read, Write, and Spell* (see: Appendix 2, Screenshot 8) is an application that teaches young children essential literacy skills. There are two options regarding the application: "Exercise & Report Card" and "Tutorials & Videos." The first "Exercise & Report Card" option includes the following skills: Letter, Reading, Writing, Spelling, Language, and Dictionary. It presents a lesson that teaches and/or reviews the lesson topic that the users selected. The activities in each lesson may require users to trace and/or identify a letter, or to respond to prompt or directive orally.<sup>10</sup>

*Clicker Books* (see: Appendix 2, Screenshot 9) is an application that develops literacy skills and builds confidence including extensive support for students of all abilities<sup>11</sup> whereas *First Step Reading* (see: Appendix 2, Screenshot 10) is an application based on step-by-step learning including phonics, sight words and grammar. Students learn to pronounce unfamiliar words while reading, reading faster and with more accuracy, or by looking for patterns of letters that produce different sounds. *First Step Reading* offers over fifty videos, three reading books with over 250 pages and hundreds of flash cards, starting with the alphabet.<sup>12</sup>

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<sup>8</sup> <http://www.spysam.com/>

<sup>9</sup> <https://www.commonensemedia.org/app-reviews/sentence-maker>

<sup>10</sup> <https://appedreview.com/app/learn-to-read-write-and-spell-2/>

<sup>11</sup> <https://appadvice.com/app/clicker-books/645936237>

<sup>12</sup> <https://www.firststepreading.com/>

*Reading A-Z* (see: Appendix 2, Screenshot 11) is an application consisting of thoughtfully designed literacy-focused resources and tools designed to satisfy the needs of all students. Furthermore, *Reading A-Z* aims at raising *cultural awareness*, understanding, and respect through various instructional resources. This application covers materials that can help teachers, students, and families of different ethnic backgrounds around the world. It has many subsections, i.e: *Reading A-Z, Raz-Kids, Raz-Plus, Connected Classroom, Headsprout, Science A-Z, Writing A-Z, Vocabulary A-Z, ELL Edition*.<sup>13</sup>

*Teach Your Monster to Read* (see: Appendix 2, Screenshot 12) is an application which offers students to learn how to read in an engaging way. The application is suitable for students in the first stages of learning to read, as well as for older students who need more practice. The game revolves around a magical journey during which children meet colourful characters along the way and collect fantastic rewards. As they progress, they rehearse a range of essential reading skills: matching letters to sounds, blending, segmenting, tricky words and reading full sentences.<sup>14</sup>

Some applications are also connected to the web. For example, *Wikipanion* (see: Appendix 2, Screenshot 13) is connected to Wikipedia. Therefore, automatic search results appear while typing. The application also offers setting the font size that is saved and applied to every page without future adjustment, which may be useful for students suffering from reading and writing difficulties and font-related issues.<sup>15</sup>

Furthermore, *Newsela* (see: Appendix 2, Screenshot 14) is an application which offers a digital reading experience (in 5 levels) and learning in every subject. The *Newsela* content is described through five As: *authentic, accessible, active, aligned, accountable*. This application provides content that comes from the real world, about people and topics students can relate to. In terms of the choice of texts and their relevance for contemporary English, the application offers ten new texts every day across twenty genres, which is very important to mention in these times when new and interesting articles emerge every day.<sup>16</sup>

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<sup>13</sup> <https://www.readinga-z.com/>

<sup>14</sup> <https://www.teachyourmonstertoread.com/>

<sup>15</sup> <http://www.wikipanion.net/>

<sup>16</sup> <https://newsela.com/>

### 4.3 Writing applications

Now that the applications for improving reading, i.e. receptive skills have been presented, in this part of the thesis, additional applications related to language production will also be mentioned.

For example, *Storykit* (see: Appendix 2, Screenshot 15) is a multimedia storytelling mobile application that allows its users to create electronic storybooks and share them with others. It allows one to write or draw on the screen, attach photos, record audio and add sound effects, etc.<sup>17</sup> In addition, *British Council – Learn English Teens* (see: Appendix 2, Screenshot 16) helps in improving writing skills. Students can write stories on various topics. Moreover, the application offers matching the part of the story to what usually happens in it, a usage of different tenses while writing the story, as well as parts of speech, discourse markers, choosing the title, true/false, etc.<sup>18</sup>

*Dvolver Movie Maker* (see: Appendix 2, Screenshot 17) is another application for practicing writing skills. Students are given the opportunity to make a short movie choosing characters, backgrounds and movements. Once they finish that, they can proceed to writing the dialogue. Finally, a movie appears as a cartoon with balloon dialogues.<sup>19</sup> A similar application is *Make Beliefs Comix* (see: Appendix 2, Screenshot 18), which is a multimedia storytelling application helping students in better understanding of news, culture and current events related to their lives through creating comics. Moreover, it serves for empowering students to express their ideas and stories about current events. This application is available in many languages from Arabic to Spanish, including English as well.<sup>20</sup>

### 4.3 Spelling applications

*First Words Deluxe* (see: Appendix 2, Screenshot 19) is a word-building game. Words are pronounced, letter by letter, as they are dragged into the appropriate grey boxes or, if chosen in

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<sup>17</sup> <https://www.educatorstechnology.com/2011/05/storykit-free-mobile-multimedia.html>

<sup>18</sup> [https://learnenglishteens.britishcouncil.org/skills/writing/upper-intermediate-b2-writing/story?utm\\_source=facebook&utm\\_medium=social&utm\\_campaign=bc-learnenglishteens](https://learnenglishteens.britishcouncil.org/skills/writing/upper-intermediate-b2-writing/story?utm_source=facebook&utm_medium=social&utm_campaign=bc-learnenglishteens)  
[https://learnenglishteens.britishcouncil.org/skills/writing/intermediate-b1-writing/short-story?utm\\_source=facebook&utm\\_medium=social&utm\\_campaign=bc-learnenglishteens](https://learnenglishteens.britishcouncil.org/skills/writing/intermediate-b1-writing/short-story?utm_source=facebook&utm_medium=social&utm_campaign=bc-learnenglishteens)

<sup>19</sup> <http://www.dvolver.com/moviemaker/make.html>

<sup>20</sup> <https://www.makebeliefscomix.com/Comix/>

the settings, a smaller set of words can be played out with phonics. Each page of *First Words Deluxe* has an object and a word to spell. Students click on the object to hear the name, then drag and drop letters into the right slots to spell the word. When the word is complete a voice says “b-a-g, bag!” the object spins around, and the next page appears with a new word to spell. This application may, therefore, help early spellers and it is organised into everyday words categories.<sup>21</sup>

*ABC Spelling Magic 1* (see: Appendix 2, Screenshot 20) is an application which helps students build words with three sounds. It teaches the essential reading skill of *segmenting*. Words are separated into categories by middle vowel sounds. Therefore, this application boosts and reinforces the knowledge of the sounds that the letters make and two levels of challenge are available. The first part of the application has a limited alphabet for building words whereas the second part has the entire alphabet available for building words, which is very interesting. The main focus of the application is on the skill of learning to spell words with three phonetic sounds with short vowel words. Another version, *ABC Spelling Magic 2* (see: Appendix 2, Screenshot 21) is an application created for helping students read words with consonant blends. This version of the application teaches sounds of letters and word-building. Students can learn the sounds of the alphabet and practice the essential reading skill of segmenting. *ABC Spelling Magic 2* also focuses on the skill of learning to spell words with four phonetic sounds with short vowel words, whereas *ABC Spelling Magic 3* (see: Appendix 2, Screenshot 22) is another application which aims at helping students build five-seven letter words using syllables and consonant blends. Furthermore, it helps teach the essential reading skill of segmenting. Words are separated into nine categories to help maintain interest and organization. This application teaches and reinforces the knowledge of the sounds that the letters make<sup>22</sup> whereas *ABC Spelling Magic 4* (see Appendix, Screenshot 23) is an application which focuses on children's mastery of the silent final *e*.<sup>23</sup>

*Vocabulary Spelling City* (see: Appendix 2, Screenshot 24) is an application which may help both teachers and students. Originally, it was created to save teachers time by automating spelling tests. Furthermore, the idea was to support students to independently study through engaging game-based learning activities. *Vocabulary Spelling City* also provides cross-

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<sup>21</sup> <https://www.commonsemmedia.org/app-reviews/first-words-deluxe>

<sup>22</sup> <https://sites.google.com/site/interactwithmyboard/ipad-apps-and-apptivities/language-development-apps/abcsPELLINGMAGIC123>

<sup>23</sup> <https://appadvice.com/app/abc-spelling-magic-4/598794973>

curricular word study with online vocabulary, writing, phonics, and spelling programs, giving students immediate feedback and recording their progress on any device. It may help students suffering from dyslexia in the way that it is effective in vocabulary building and word retention.<sup>24</sup>

#### **4.5 Vocabulary applications**

Since word retention is important for both the reading and the writing process, we need to mention vocabulary applications as well. For example, *Quizlet* (see: Appendix 2, Screenshot 25) is an application that helps in memorization of words, allowing one to add photos and includes pronunciation as well. It may be used with students who have difficulties with reading and writing because by using this application, vocabulary may be improved as it is studied together with related topics such as: languages, science, arts, humanities, math, social science, etc.<sup>25</sup> *Pic Collage* (see Appendix, Screenshot 26) is another application that enhances vocabulary knowledge of words with multiple meanings and shades of meaning.<sup>26</sup>

As for younger children, *English 4 kids* (see: Appendix 2, Screenshot 27) is an application for parents and teachers trying to help children study English. It offers worksheets, fun games, videos, tutorials, flashcards, powerpoint presentations all of which aim at practicing English vocabulary online. It can be used for students who have dyslexia because they can be taught reading through phonics.

#### **4.6 Applications suitable for practicing phonemic awareness**

*Macmillan–Pronunciation Skills* videos (see: Appendix 2, Screenshot 28) represent a series of short videos on pronunciation, pronunciation learning and pronunciation teaching. It offers practical advice to help teachers and students in mastering different sounds in the English language. This application contains around forty video series about pronunciation skills, demonstrating importance of taking practical approach in teaching pronunciation for both speakers whose L1 one is English and learners who study English as a foreign language.

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<sup>24</sup> <https://www.spellingcity.com/>

<sup>25</sup> <https://quizlet.com/>

<sup>26</sup> <https://pic-collage.com/>

Furthermore, this video series examines in detail the Phonemic chart, the three levels of pronunciation, the physicality of pronunciation and contains the so-called “muscle buttons.”

*Montessorium: Intro to Words* (see: Appendix 2, Screenshot 29) is an application based on learning letter sounds and word formation. The application includes a tactile approach to learning, since students can physically manipulate letters onscreen, after they hear the sound of each letter or letter combination, and may drag the combination into a position to form words. The application is divided into four sections. The first two sections focus on asking students to spell words after seeing a picture of the word and hearing it spoken. In the third section, students can use letters and images to write their own stories. The fourth section is similar to *I Spy*, incorporating letter sounds.

*Kiz Club* (see: Appendix 2, Screenshot 30) is an application offering printable phonics activities for students as well as stories and props, rhymes and songs, flashcards. All of the materials are suitable for preschool and elementary age children and for teachers and parents as well. In the context of dyslexia, rhyming picture cards can be used in order to help children distinguish between similar sounding words such as: *back* and *pack*, *glad* and *sad*, *bag* and *flag*.

#### **4.7 Speech-to-text applications**

Technology has also allowed us to work with converting speech to writing and vice versa. This option is quite recent and is becoming integrated into different platforms not only for learning but even in Word documents, for example. One of the applications for speech-to-text conversion is *Dragon Dictation* (see: Appendix 2, Screenshot 31) is an application that allows users to dictate documents of any length, edit, adjust formatting and share them on cloud-sharing services and directly from an Android device.

*Dragon Search* (see: Appendix 2, Screenshot 32) is another accurate application allowing users to search online content on their devices using their voices. After speaking search queries, simultaneous results appear from a variety of websites and content-related sources, e.g. Google, YouTube, Twitter Search, iTunes, Wikipedia, etc.

#### 4.8 Text-to-speech practice

When it comes to text-to-speech practice, *Texthelp* and *Claro Software* may be useful. For example, *Texthelp* (see: Appendix 2, Screenshot 33) supports students of all ages in reading and writing in the classroom as well as at home. It is used by millions of young people around the world. In addition, *Claro Software* (see: Appendix 2, Screenshot 34) is software for learners with reading and writing difficulties (such as dyslexia), which aims at helping them ease the learning process. *Claro Software* products help with reading and writing on many different platforms. Furthermore, this software offers help in speech synthesis, word prediction, spellchecking and *switch access*, another important term to be mentioned in the context of learning difficulties.<sup>27</sup>

#### 4.9 Application stores, platforms for learning, songs and videos for kids

After a thorough analysis of tools and application available during the research, the following other most suitable application stores, platforms for learning have been found: *Starfall*, *PEATC – Parent Educationa Advocacy Training Center*, *Educational App Store*, *Literacy Apps*, *Edutopia’s resource on Game-Based Learning*, *LearnEnglish Kids*, *ESL Games Plus*, *Classtools*, *English activities*, *Study ladder*, *Promethean Planet*, *English 4 kids*, *Socrative*, *Kahoot!*.

For example, *Starfall* (see: Appendix 2, Screenshot 35) is a website which supports children in the reading process. The program was founded by Dr. Stephen Schutz who, as a child, had difficulty learning to read due to dyslexia. Therefore, Schutz created a website with multisensory interactive games that allow children to use their sense of seeing, hearing and touching while they are learning. It includes language arts and mathematics for preschool, kindergarten, first grade, second grade, and third grade. *Starfall’s* main focus is on phonemic awareness, systematic sequential phonics, and common sight words. The program reinforces exploration and play, encouraging children to become confident and intrinsically motivated. Moreover, *Starfall* is especially effective for special education, homeschooling, and English language development. *Starfall* also includes animated songs, mathematics, and reading activities.<sup>28</sup>

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<sup>27</sup> <https://www.clarosoftware.com/>

<sup>28</sup> <https://www.starfall.com/h/>

When it comes to working together with students (i.e. parents, caregivers or teachers), *The Parent Educational Advocacy Training Center (PEATC)* (see: Appendix 2, Screenshot 36) works in collaboration with families, schools and communities in order to improve opportunities for excellence in education and success in school and community life. *PEATC's* special focus is on students with learning difficulties. This program provides: services and support for families and professionals, and an easy-to-understand research-based information and training. *PEATC's* policy revolves around the following: families are children's first and best teachers, information and training enrich and empower families and professionals to build strong partnerships, all children deserve the opportunity to live, learn and participate fully in their communities, children with disabilities can achieve independence and make valuable contributions to the society.<sup>29</sup>

*Educational App Store* (see: Appendix 2, Screenshot 37) is another platform for educational applications. All of the applications are made to help educators progress a younger student's education. *Educational App Store* has over 3,000 applications: *BlockStarPlanet*, *Google Bolo*, *Quizziz*, etc.<sup>30</sup> *Literacy Apps* (see: Appendix 2, Screenshot 38) support students' language and literacy development. *LiteracyApps* has been created by the National Literacy Trust that is a national charity in the United Kingdom dedicated to raising literacy levels. The main aim of this program is to improve reading, writing, speaking and listening skills in the UK's most disadvantaged communities, where up to 40 percent of people have literacy problems.<sup>31</sup>

*Edutopia's resource on Game-Based Learning* (see: Appendix 2, Screenshot 39) is a collection of articles, videos, and resources on using video games, simulations, and gaming concepts in the classroom. It is dedicated to transforming K-12 (kindergarten to twelfth grade in the USA) education for the sake of acquiring and effectively applying the knowledge, attitudes, and necessary skills for future studies and careers.<sup>32</sup>

When it comes to the UK, *LearnEnglish Kids* (see: Appendix 2, Screenshot 40) is a website of the British Council. It provides a lot of free online games, songs, stories and activities for children. Moreover, for parents, it provides articles on supporting children in learning English,

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<sup>29</sup> <http://www.peatc.org/>

<sup>30</sup> <https://www.educationalappstore.com/>

<sup>31</sup> <http://literacyapps.literacytrust.org.uk/>

<sup>32</sup> <https://www.edutopia.org/game-based-learning-resources>

videos on using English at home and information about English courses designed for children.<sup>33</sup> *ESL Games Plus* (see: Appendix 2, Screenshot 41) offers interactive online games for both learning and teaching English as a Second Language whereas games are mostly suitable for teaching ESL Kids and Teenagers. Moreover, a lot of free activities are created for teaching and practising English grammar, vocabulary, sentences, listening and pronunciation skills. The above-mentioned educational games enhance vocabulary, sentence structures, grammar, listening, pronunciation and phonics.<sup>34</sup> *Classtools* is another useful application that can be accessed easily (see: Appendix 2, Screenshot 42) and offers one to create and participate in free games, quizzes, activities and diagrams in very short time, which further can be posted on a blog, or a website.

*English Activities* (see: Appendix 2, Screenshot 43) is a free website for English learners, both children (including parents of children) as well as adults who want to learn English as a second language. It is divided into three main sections: *Topics*, *Lessons*, *Games* and beside that, it has two more sections: *Start* and *Tests*. *English Activities* has been specially designed to help those who want to practice English away from the EF/ ESL classroom in an engaging way.<sup>35</sup>

*Studyladder* (see: Appendix 2, Screenshot 44) is an online tool offering thousands of engaging learning resources for children including games, video tutorials and printable activity sheets. *Studyladder* covers a wide range of subjects such as Mathematics, English, Science. It is a comprehensive program suitable for students aged four (kindergarten) to twelve (end of primary school) that helps in developing confidence and better learning outcome during the formative years of a student's education. This program includes videos, interactive activities, worksheets and assessments for reporting to teachers and parents. Moreover, children receive instant feedback on what they need to learn, rewards and certificates for achievement, while parents and teachers receive information on progress.<sup>36</sup>

*Promethean Planet* (see: Appendix 2, Screenshot 45) provides millions of interactive resources from educators around the world. *Promethean Planet* is a global leader in *interactive displays* for education and *interactive boards* for schools and its main goal for the future is to reimagine and reinvent educational technology solutions to create dynamic environments that

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<sup>33</sup> <http://learnenglishkids.britishcouncil.org/>

<sup>34</sup> <https://www.eslgamesplus.com/>

<sup>35</sup> <https://www.englishactivities.net/>

<sup>36</sup> <https://www.studyladder.com/>

will empower teachers and motivate students to learn.<sup>37</sup> Another application which allows one to participate in a dynamic environment is *Socrative* (see: Appendix 2, Screenshot 46), an application which offers many possibilities for effective engagement and it also provides immediate feedback for students, which is an important part of the learning process.<sup>38</sup> This platform has also been widely used during the COVID-19 pandemic.

What is also important to mention, aside from the need to engage the students in a multimodal learning setting that would enhance the receptive and productive skills, is group work. One platform that allows one to participate in a group setting is *Kahoot!* (see: Appendix 2, Screenshot 47), a game-based learning platform that makes it easy to create, share and play learning games or quizzes, and it may also help students struggling with spelling e.g. regarding the feedback.<sup>39</sup>

Finally, the most suitable websites with songs and videos for children are: *ELF Kids Videos Kids*, *TV123* and *Busy Beavers* (see: Appendix 2, Screenshot 48). For instance, *ELF Kids Videos* (see: Appendix 2, Screenshot 49) are designed for children aged from two to ten and deal with a wide range of topics. Furthermore, many videos work well with special educational needs students, especially those with autistic disorder, speech and language impairments and speech, reading and learning difficulties.<sup>40</sup> *Kids TV123* (see: Appendix 2, Screenshot 50) offers educational songs and videos for children, toddlers and babies. Furthermore, it provides additional material: free mp3s, free posters, free alphabet worksheets, free phonics worksheets, etc.<sup>41</sup>

## **5 DYSLEXIA AND LEARNING ENGLISH AS A FOREIGN LANGUAGE- AN ANALYSIS OF READING AND WRITING ERRORS**

Having taken into consideration: 1) the theoretical background, 2) an analysis of the interviews presented above and 3) a step-by-step insight into available multimodal tools that were filtered on the basis of their usage in terms of enhancing receptive and productive skills, the third part of the research comprising three phases of exploratory research was conducted in Maglaj (in the period from November 2020 until December 2020) since it was necessary to

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<sup>37</sup> <https://prometheanplanet.com/>

<sup>38</sup> <https://www.socrative.com/>

<sup>39</sup> <https://kahoot.com/what-is-kahoot/>

<sup>40</sup> <https://www.youtube.com/watch?v=eU13w4DIgJE>

<sup>41</sup> <https://www.youtube.com/user/KidsTV123>

collect reading and writing errors while assessing reading comprehension and writing skills of a participant who is a twelve-year-old seventh grade primary school student and after informed consent for this exploratory study has been obtained. The research was conducted in three phases. In the first phase of the research, the participant of the study was presented with a text from the textbook *Project (Third Edition)*, entitled *Animal Migrations*. The text was typed into Microsoft Word Document in order to help the student focus on one text only:

#### **Animal migrations – original text**

A lot of animals travel from one place to another. We call this migration. In Africa, large mammals, like elephants, zebras and wildebeests, migrate to find food and water. They usually follow the same routes every year. A lot of birds migrate to find food and better weather, too. They are usually birds, like swallows, that eat insects. They spend the summer in northern Europe, because there are lots of insects there. In the winter there aren't any insects, so the birds fly south to southern Europe and Africa. Some insects migrate, too. In North America, millions of monarch butterflies fly south to spend the winter in Mexico, California and Florida, where it's warmer. They travel 50-65 km each day and they travel about 1, 125 km. Some fish migrate to breed. Salmon can swim over 20,000 km in their life. They are born in rivers in Ireland, Scotland and other places in northern Europe. The young fish swim down the river to the sea and into the Atlantic Ocean. They live in the ocean until they are adults. Then they return to the river where they were born. They lay their eggs in the river and then they usually die. Salmon do this, because their eggs are safer in the river. Other fish can't eat them. Arctic terns travel the furthest when they migrate. They spend the summer in the Arctic, but when winter comes they fly to the Antarctic, because it's summer there. The next year they fly back to the Arctic again. In one year these small birds travel 36,000 km from one end of the earth to the other and back again. Nobody knows how they do it.

The first step in part one of the research comprised a reading exercise (Task 1) whereas step two comprised a writing exercise (Task 2). During the reading process, the participant of the study read the text aloud and the author of the present paper (in further text: the researcher) marked the errors on her copy of the text. The reading errors are presented below in blue colour:

#### **Animal migrations**

A lot of animals travel from one place to another. We call this migration. In Africa, large mammals, like elephants, zebras and wildebeests, migrate to find food and water. They usually follow the same routes every year. A lot of birds migrate to find food and better weather, too. They are usually birds, like swallows, that eat insects. They spend the summer in northern Europe, because there are lots of insects there. In the winter there aren't any insects, so the birds fly south to southern Europe and Africa. Some insects migrate, too. In North America, millions of monarch butterflies fly south to spend the

winter in Mexico, California and Florida, where it's warmer. They travel 50-65 km each day and they travel about 1, 125 km. Some fish migrate to breed. Salmon can swim over 20,000 km in their life. They are born in rivers in Ireland, Scotland and other places in northern Europe. The young fish swim down the river to the sea and into the Atlantic Ocean. They live in the ocean until they are adults. Then they return to the river where they were born. They lay their eggs in the river and then they usually die. Salmon do this, because their eggs are safer in the river. Other fish can't eat them. Arctic terns travel the furthest when they migrate. They spend the summer in the Arctic, but when winter comes they fly to the Antarctic, because it's summer there. The next year they fly back to the Arctic again. In one year these small birds travel 36,000 km from one end of the earth to the other and back again. Nobody knows how they do it.

During the writing process, the researcher read the text three times. The first time, the researcher read the text and the participant was just listening, the second time the researcher dictated the text and the participant wrote down the text dictated, and, finally, the third time, the researcher read the text and the participant corrected his errors. Table 2 and Table 3 present specific and non-specific errors found in the reading and writing task:

**Table 2. Task 1- Reading errors**

Specific reading errors	Word
1. Word substitution – Guessing	spend/speed, same/some, weather/water, aren't/arrest, each/eight, breed/bird, born/birth
2. Adding letters and syllables	animals, years, insect, place, egg
3. Omission of words and whole lines	winter
4. Reading words in the wrong way	usually, birds, migrate, because

**Table 3. Task 2 – Writing errors**

Non-specific writing errors	Participant	Word
1. Slow-paced writing and disorder in work and poor handwriting	✓	
2. Difficulties in using spelling and grammar rules	✓	place/pace, water/whater same/seam, were/where

What can be concluded from Table 2 and Table 3 is that the participant of the study demonstrated some of the linguistic features which can be ascribed to students with dyslexia during both the reading and the writing process. Furthermore, in Task 1, the participant made no pauses when there was a comma or a full stop. However, in Task 2, the participant placed all of the punctuation marks where necessary. Additionally, the participant showed some difficulties with transcription but formed letters in a conventional way. It was also noted that the same word was spelled in different ways, which may also be ascribed to learning vocabulary.

What can also be concluded in terms of the title of the thesis is that errors were detected in both the reading and writing processes since they are interconnected as readers produce a grapheme for each phoneme, retain each in memory, combine them into single pronunciation, and connect this pronunciation with a word in memory (Herbert et al. 2018; Kearns, Rogers, Koriakin & Al Ghanem, 2016). The encoding process encompasses listening to an unknown word, breaking it into smaller chunks or units – phonemes, selecting the right grapheme for the phoneme, repeating the process and checking the results. Students with dyslexia are often unable to construct a coherent representation of a text meaning and as each new piece of information is coming in, they might be constantly updating and revising this representation of the text meaning, drawing on cognitive processes, such as working memory, activating information but maintaining and storing what has been heard or read so far.

Two weeks after<sup>42</sup> Task 1 and Task 2 were conducted, the material was adjusted to suit the learner's specific needs for the purpose of reading, where the key words repeated throughout the text were coloured and other content words were practiced by means of a dialogue (see: Herbert, 2018) as learning or reading out new content words may create difficulties for learners of English in general (e.g. *terns*, *wildebeests*, which could be replaced by its three-letter synonym (*gnu*)). The text *Animal migrations* was now presented to the participant for the second time, however in a completely different form, given below:

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<sup>42</sup> The exploratory study was conducted in person.

## Animal migrations

A lot of animals travel from one place to another.

We call this **migration**.

In Africa, large mammals, like elephants, zebras and wildebeests, **migrate** to find food and water.

They **usually** follow the same routes every year.

A lot of **birds migrate** to find food and better weather, too.

They are **usually birds**, like swallows, that eat insects.

They spend the summer in northern Europe, **because** there are lots of insects there.

In the winter there aren't any insects, so the **birds** fly south to southern Europe and Africa.

Some insects **migrate**, too.

In North America, millions of monarch butterflies fly south to spend the winter in Mexico, California and Florida, where it's warmer.

They travel 50-65 km each day and they travel about 1, 125 km.

Some fish **migrate** to breed.

Salmon can swim over 20,000 km in their life.

They are born in rivers in Ireland, Scotland and other places in northern Europe.

The young fish swim down the river to the sea and into the Atlantic Ocean.

They live in the ocean until they are adults.

Then they return to the river where they were born.

They lay their eggs in the river and then they **usually** die.

Salmon do this, **because** their eggs are safer in the river.

Other fish can't eat them.

Arctic terns travel the furthest when they **migrate**.

They spend the summer in the Arctic, but when winter comes they fly to the Antarctic, because it's summer there.

The next year they fly back to the Arctic again.

In one year these small birds travel 36,000 km from one end of the earth to the other and back again.

Nobody knows how they do it.

Furthermore, the text was also presented through the application *Make Beliefs Comix* and *Vocabulary Spelling City* as a part of the writing exercise (see: Appendix 3). In the Table 4 below it is explained how the researcher approached each error that the participant made, apart from adding colour to previously-mentioned words repeated in the text.

**Table 4. Adjustment of the material for reading**

Specific reading errors	Word	Adjustment
1. Word substitution - Guessing	spend/speed, same/some, weather/water, aren't/arrest, each/eight, breed/bird, born/birth	Pause and break words into syllables and illustrate them (see: Appendix 4)
2. Adding letters and syllables	animals, years, insect, place, egg	In words without ending (-s) underline the last letter (year); In words with ending (-s), bold the letter -s (animals)
3. Omission of words and whole lines	winter	The sentences are written one below the other
4. Reading words in the wrong way	usually, birds, migrate, because	Use a different colour for different word every time a certain word is mentioned in the text (birds, migrate)

During the adjustment of the material, colour red was not used as well for the reasons mentioned in the Introduction.

After the adjustment of the material, the progress made was significant and the number of errors reduced, as can be seen from the texts presented below. However, we need to take into consideration that the student was already familiar with the text *Animal migrations*. The results have shown that the participant did not substitute words after they were broken down into syllables and could quite well distinguish the words once presented with the illustrations. Some errors were still present but their number reduced. Moreover, the participant did not add an -s ending where it did not belong and also did not drop the ending (-s) where it was written. Nevertheless, the participant omitted one word while reading and some of the words were mispronounced. What is important is that in the cases one word was pronounced in many ways,

after the materials were adjusted and the words presented in colours, this was no longer the case. The number of errors was reduced as can be seen from the texts below (40 errors/ 284 words and 17 errors/284 words):

<p style="text-align: center;"><b>Animal migrations</b></p> <p>A lot of animals travel from one place to another. We call this migration. In Africa, large mammals, like elephants, zebras and wildebeests, migrate to find food and water. They usually follow the same routes every year. A lot of birds migrate to find food and better weather, too. They are usually birds, like swallows, that eat insects. They spend the summer in northern Europe, because there are lots of insects there. In the winter there aren't any insects, so the birds fly south to southern Europe and Africa. Some insects migrate, too. In North America, millions of monarch butterflies fly south to spend the winter in Mexico, California and Florida, where it's warmer. They travel 50-65 km each day and they travel about 1, 125 km. Some fish migrate to breed. Salmon can swim over 20,000 km in their life. They are born in rivers in Ireland, Scotland and other places in northern Europe. The young fish swim down the river to the sea and into the Atlantic Ocean. They live in the ocean until they are adults. Then they return to the river where they were born. They lay their eggs in the river and then they usually die. Salmon do this, because their eggs are safer in the river. Other fish can't eat them. Arctic terns travel the furthest when they migrate. They spend the summer in the Arctic, but when winter comes they fly to the Antarctic, because it's summer there. The next year they fly back to the Arctic again. In one year these small birds travel 36,000 km from one end of the earth to the other and back again. Nobody knows how they do it.</p>	<p style="text-align: center;">Animal migrations</p> <p>A lot of animals travel from one place to another. We call this migration. In Africa, large mammals, like elephants, zebras and wildebeests, migrate to find food and water. They usually follow the same routes every year. A lot of birds migrate to find food and better weather, too. They are usually birds, like swallows, that eat insects. They spend the summer in northern Europe, because there are lots of insects there. In the winter there aren't any insects, so the birds fly south to southern Europe and Africa. Some insects migrate, too. In North America, millions of monarch butterflies fly south to spend the winter in Mexico, California and Florida, where it's warmer. They travel 50-65 km each day and they travel about 1, 125 km. Some fish migrate to breed. Salmon can swim over 20,000 km in their life. They are born in rivers in Ireland, Scotland and other places in northern Europe. The young fish swim down the river to the sea and into the Atlantic Ocean. They live in the ocean until they are adults. Then they return to the river where they were born. They lay their eggs in the river and then they usually die. Salmon do this, because their eggs are safer in the river. Other fish can't eat them. Arctic terns travel the furthest when they migrate. They spend the summer in the Arctic, but when winter comes they fly to the Antarctic, because it's summer there. The next year they fly back to the Arctic again. In one year these small birds travel 36,000 km from one end of the earth to the other and back again. Nobody knows how they do it.</p>
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As for omissions, in Task 1, for instance, the participant omitted one noun, i.e. the word *winter* and after the adjustment of the materials, again one noun was omitted, i.e. the word *river*.

The text *Animal migrations* was also presented through organizational applications: *Make Beliefs Comix* and *Vocabulary Spelling City*. The researcher read the text three times: the first time the researcher read the text aloud and the participant was just listening, the second time, the researcher read the text and the student typed down the words on PC using the application *Make Beliefs Comix* and the third time the researcher read the text, the participant checked his errors. The participant showed progress in the writing exercise as well. Since the text was being typed by the participant, the task did not involve any struggle with handwriting. Moreover, there were fewer difficulties in using grammar and spelling rules. The participant was also able to practice writing and spelling through the application *Vocabulary Spelling City* (see: Appendix 3). In this way, the number of spelling errors can be reduced and an easier process of correcting them ensured by means of inbuilt options of the application selected, which does not mean that writing by hand should be avoided.

As for the limitations of the study, it could be said that general conclusions cannot be made on the basis of a microcorpus but it can definitely be concluded that adjustment of the material is not impossible but may be a challenging experience for some teachers due to different factors. Furthermore, not all the examples from the handwriting samples could have been presented to the readers because the data have been anonymized.

## **5. 1 Accommodating students with dyslexia to reduce errors in reading and writing**

For language teachers, the greatest challenge is to find the most efficient methods of teaching a foreign language. Research from the United States emphasises a systematic structured approach to a multisensory nature as the most effective method for students with specific learning difficulties. Multisensory Structured Language (MSL) approach, based on the work of Gillingham and Stillman (1960), is also described by Ganschow, Sparks & Schneider (1995) in *The International Dyslexia Journal* and can be also used in the framework of psycholinguistics. Grammar, syntax, and language phonology require to be taught through a programme that emphasises hearing, seeing, speaking and writing the language. However, a major challenge to teachers is to determine how these methods can be employed in a busy modern languages classroom. One way is to use the techniques with a whole group of students

so that, in addition to the direct teaching being given, students can also practise among themselves. Methods should explicitly teach correspondence between written aspects and the sounds produced.

When it comes to the classroom environment, some students with dyslexia may be very sensitive to their surroundings, particularly in terms of temperature, light, and noise. Sometimes, the classroom is unbearably hot for some students while for others it is perfectly fine. If the lights are too bright students may experience visual problems, even headaches. In case when the environment is noisy, students might be distracted or even distressed. Therefore, teachers can allow students to use ear plugs or perhaps even personal stereo systems to block out the noise with quiet music. Teachers also need to avoid displaying too much visual information since it can be overwhelming for some students. Even though it is great to have colourful displays on the classroom walls, the wall around the board or screen should be clear. In this way, students can focus on the material that is being presented at that moment, which is what has been done with the text presented in this research. Textbooks can often be too busy, with too many pictures and small exercises on a page. In order to help students focus, a text window can be used to block out the rest of the page. It can be as simple as two L-shaped pieces of card that can be moved to frame the exercise or text that the student is looking at. If a student is easily distracted by visual stimuli on a full worksheet or page, a blank sheet of paper can be used to cover sections of the page not being worked on at the time.

If student has some difficulty finding the essential information, the teacher can mark this information with a highlight pen. When it comes to handwriting, a simple way of helping students produce clearer handwriting is using a slope to rest on keeping the paper in the eye line and supporting the hand and the wrist in the writing position. Students with dyslexia sometimes may need more space than other students in order to work comfortably. In terms of communication, it is true that working in pairs in small groups allows students lots of time to practise the new vocabulary and the structures that they are learning. The teachers need to consider the talents and the difficulties of the learners in class to ensure that the pairs and groups work well together. Depending on the aim of the activity, it may be helpful to group students with different skills together.

Considering teacher-student interaction, the teacher needs to pay attention when giving the instructions and when giving feedback on students' work. Some directions are written in paragraph form and contain many units of information which can be overwhelming to some students. The teacher can help by underlining or highlighting the significant parts of the

directions or rewriting the directions. Another important issue to consider is breaking the tasks down into small chunks so that the students can focus on just a small amount of information at a time. The teacher can select pages from workbooks and materials to present small assignments to students who are anxious about the amount of work to be done.

This technique prevents students from examining an entire workbook, text, or material and becoming discouraged by the amount of work. An outline, chart, or blank web can be given to students to fill in during presentations. The teacher can give a copy of lecture notes to students who have difficulty taking notes during presentations. Mnemonic devices can be used to help students remember key information or steps in a learning strategy.

For students who have difficulty with fine motor responses (such as handwriting), the response mode can be changed to underlining, selecting from multiple choices, sorting, colouring, or marking. However, teachers should not have lower expectations of students with dyslexia since learners pick up on our expectations and tend to meet them. Teachers should know their students really well and encourage them to become more aware of their own abilities and can help them with language learning by suggesting memory strategies that might work for them (see: International Dyslexia Association's fact sheets on Accommodating Students with Dyslexia).

## 6 CONCLUSION

Dyslexia has wide ranging effects on various aspects of language and it influences not only students' academic progress and performance, but also other areas of life. Most recent research suggests there are neurobiological origins of dyslexia and it is often inherited. The origin of the term *dyslexia* suggests that it is a difficulty associated with reading. In fact, most definitions describe dyslexia as a difficulty with accurate and fluent *word recognition*. These definitions also add that dyslexia can cause difficulties with spelling and processing spoken information. Therefore, dyslexia is not just a difficulty in reading. It has an effect on both receptive and productive skills. This thesis has demonstrated through qualitative research how reading and writing tasks can work together to reduce the number of errors and, more importantly, help students understand the text. However, problems with spelling may still be present even after the reading problems have been remedied. In the second part of the research, this has been noted through a brief analysis of spelling errors present in both the handwritten and typed samples.

Another problem students and their teachers often mention are the difficulties with memorising new vocabulary items. Students with dyslexia, as can be seen from the studies and interviews presented, may need many more encounters with the word, and more practise and revision opportunities to successfully learn new words. If the student's first language is more "transparent" than English, it might often happen that students with dyslexia do not experience the same significant difficulties with reading and spelling in their L1, or they successfully overcome them with efficient strategies that need to be revised and updated to reduce the number of specific and non-specific errors. Just as in the student's first language, dyslexia can cause problems in reading in another language, e.g. the English language. Students may mix up letters, misread words, read more slowly, and have difficulties understanding the meaning of the text.

Therefore, in terms of specific and non-specific errors, it is necessary to shorten reading texts for students with dyslexia, or to divide them into shorter sections. To reduce the number of occurrences of what is considered to be "an error" and enhance both reading and writing skills, illustrations, different colours, glossaries of unknown words, quick and easy comprehension questions, can also be used to help the students. Having presented all the online applications and platforms that can be used in both an online and offline environment, this paper

aims to encourage educators, parents and caregivers to work together and start exploring such great possibilities as dyslexia is quite common and should be embraced as a difference in acquiring new knowledge and skills.

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## **APPENDIX 1**

### **A) Narratives of students with dyslexia**

#### **Anastasia**

Learning hasn't been fun at school. The Greek educational system is based on memorisation, memorising loads of vocabulary, dates, names. So a student with dyslexia cannot really cope all this, especially if the student is not taught in a special way. At that time, I didn't even know I was dyslexic. People didn't know what dyslexia was. So that wasn't really easy. Also, I had a very low attention span. That means that during the lesson I couldn't really stay focused for more than five or 10 minutes. So I was daydreaming. So when I went back home to study I really couldn't remember anything the teacher had explained during the lesson. So it was just me in front of a book trying to work out what it says and trying to memorise all the information by heart. A number of characteristics I had resulted in low self-esteem. So my self-esteem was really low. That was even worse than the difficulties I had in learning. It was not easy to make friends and maintain friendships. So I felt pretty isolated on many occasions. My organisation skills were also awful. So this affected both my learning and my life in general. For example, my room was always in a mess. I couldn't find things on time, being late at school. It's a chain. One difficulty brought the other. At a young age learning English-- well for me it was English as a foreign language-- it was a complete nightmare. My teacher-- my first teacher-- was just sitting at the back of her desk. We were about 13 or 15 students in the classroom. The books we were taught were really dull and boring. She wasn't making the lesson interesting at all. She was just sitting at the back of her desk trying to explain to us what the book says. The best scenario was her to stand on the blackboard to explain something and that was it. In some cases the experience was even traumatic. For example, one day she asked us to memorise about 30 or 20 irregular verbs. Obviously it was impossible for me to learn them-- not only learn the meaning but the spelling as well. And then obviously I hadn't learned all this. So the following day, when we had the lesson, she called my mum after the lesson saying that I hadn't studied at all although I had spent hours trying to learn them. And obviously my parents weren't happy with this. My teacher wasn't happy with this. And I was really amazed because-- I was really upset actually because I could spend so much time working and everybody kept saying, oh you're really lazy, well you don't study. That was really-- I just felt it was really unfair. Well when I went to university, I had to survive in the university. So I had to find ways around it, to learn English to begin with, because in the first year I had to attend foundation year when I had to take an English examination and which I had to pass with a high score. So I had to come up with my own strategies. My main strategy was to hang out with English people, watch TV, listen to the radio, read books for fun, expose myself as much as possible to real English. I went to the library-- the university library-- and I practised listening skills for many hours every day. So although my auditory processing was really slow, this really improved rapidly and I managed to pass the exam with a high score, which I was really proud of.

## **Brandruff**

My name is Brandruff (...). I am a second year Biochemistry undergraduate. Dyslexia, it's mainly impacted my writing and my comprehension, which makes it very difficult for me to learn things. It takes me longer to, I think, actually take information and actually understand it. And it's also quite difficult with subjects like maths because I can quite frequently make errors. Even though I can understand a topic, but it's just very difficult for me to sometimes be consistent. Five years of Spanish and about a year of French and a year of Arabic. It's not been very easy for me because it does take me a lot of time to learn a new language. I think the most difficult part for me was trying to transfer from my working short-term memory to my longer-term memory and actually understand what I'm learning. Otherwise it's just syllables. It's not very-- it doesn't have any meaning. So trying to actually make everything have a meaning was probably the most difficult part for me. On-- kind of contrasting that, the easiest part was probably things like symbols which are abstract by definition. So for example, in Arabic you have the writing script which is completely different than what's used in the West. But I was able to learn that very quickly. But that being said, I'm not able to necessarily know what the words mean themselves. But the actual symbols, I kind of know how to say them and I can try to base it-- what I learn after that-- off what I know then. I had to learn a language for school. So for me personally I didn't really enjoy a lot of it because I felt like I was having to be forced to do it. But if I was really dedicated and devoted to something that I found interesting I think I would enjoy it quite a lot. It would be difficult in some respects but I think it would be a nice challenge, and something that I would enjoy, and something that certainly has applications in real life. For me personally I've found saving the writing to the end of learning things. Because I found speaking more enjoyable and easy for me, and also reading as well. But the actual act of writing down what I've learned is, for whatever reason, very difficult for me. I've had people-- like my friends-- say that it's kind of the opposite for them sometimes. They find the writing better and reading more difficult. So I think it's finding what works for you. But definitely for me the writing was probably the most difficult. So I avoided that until I understood a topic better. I found the grammar not too difficult. But one thing to learn new vocabulary and try to apply it is definitely mnemonics. Just as long as you-- while you use them make sure that you know and are making an effort to know what they mean as well because you don't want to lose the understanding. Because that's key of course-- in a language you have to understand what you're saying, not just talking syllables. They have meaning. I'd often speak to myself like I was having a conversation, which I found was quite helpful because then I'm-- first of all-- speaking, which I'm better at than writing. But I'm also making an effort to learn what I'm saying and to understand what I'm saying.

## **Kirstie**

Hello, my name is Kirstie, and I study English language and Spanish studies at Lancaster University. I think it's affected me especially when I was at school a lot because I didn't get diagnosed until a lot later. And I felt that I was stupid because I couldn't do things that the other the children could. So my reading was a lot slower. And it took me a lot longer to learn things. And since being at university again, my reading is a lot slower so it affects it because we have lots of reading. And it takes me a lot longer than other people. Also learning new words. I found that obviously when you're doing languages you learn a lot of words. And it takes me a long time to actually finally remember them. So I have problems sometimes with tests. And so if we have a test soon after we've learned new vocabulary it takes me-- I usually score quite low. But if it's a few weeks after that then I'm lots better. So I think what I found difficult is actually learning the words and sometimes getting the grammar to make sense. But I've also found that I can look at patterns a lot easier than other people so that I can see patterns between languages.

And I find that a lot easier. Because I officially study English language and Spanish, but I've also studied Catalan and Italian as well. And I find that I see patterns between those languages that other people can't. I think I have difficulty sometimes with reading, like what it says. Like sometimes I misread the words, and especially if I have to read out loud. Because I can read OK in my mind but reading out loud I'm quite bad. So sometimes I feel very nervous if a teacher asks me to read in front of the class. And because I'm nervous it's even worse and I tend to stutter and fall over the words. But I find that with Spanish at least because it's a very phonetic language my spelling in Spanish is a lot better than my spelling in English because the writing system is exactly how it sounds. So I find that a lot easier. I find that I understand grammar really well when just learning it but it's in practise where it falls apart. When I'm speaking sometimes I forget the grammar. Or when I'm writing I'll sometimes not notice that I've made an error until it's returned to me and then it appears really obvious. But usually when I'm just doing the tests and being asked questions on it I can score quite high. But then when I'm asked to do it in practise I sometimes forget.

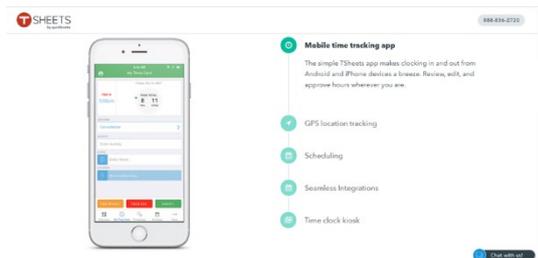
### **Markos**

I'm Markos (...). I'm a student here at Lancaster University. I am currently in my second year of studying Biomedicine. Outside school it hasn't really affected me. Most of my friends are really understanding when I spell things wrong or mixed up words. Inside school though, I did have a rough time with spelling tests and just generally writing. History was really hard on me. However, thankfully, the secondary school I went to had a really good dyslexia department. And they helped me work through it. Basically, every day during the summer my mother would take me at around midday and have a two to three hour spelling session just to try and improve my grasp on the words. Eventually, I started seeing patterns in how the words were formed. And then I had a lot of progress over the summer. It was really frustrating at the beginning because I was really annoyed at some inconsistencies that showed up. Like I distinctly remember not being able to spell or say the word bird for some reason. It was really frustrating-- and it was hard-- but I got through it. It needed a lot of hard work but I got through it. After English my parents had the great idea to try and make me learn French. It went slightly better because I had already worked out some problems with dyslexia. But I never went really far in French. I passed my GCSEs and that was it. Other than that, whenever I did try to pick up a new language it's never really worked out for me. I tried to pick up Arabic at some point. And it just never clicked at all. I know three words-- that's it now. The words just wouldn't stick to my head. I just found it really hard. Particularly difficult was the spelling-- spelling was really difficult for me. The easiest part was probably reading because even if I didn't really make out the word I could infer what the word was from other parts of the sentence (Kormos & Smith, 2012).

## APPENDIX 2



Screenshot 1. MindMeister application ([bit.ly/2TKS206](http://bit.ly/2TKS206))



Screenshot 2. Time Timer application ([bit.ly/3kWeDCE](http://bit.ly/3kWeDCE))

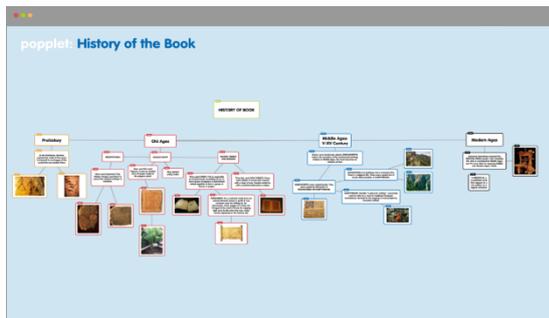


Figure 3. Popplet application ([bit.ly/34RW6SH](http://bit.ly/34RW6SH))



Screenshot 4. PocketPhonics application ([bit.ly/2HYO29G](http://bit.ly/2HYO29G))



Figure 5. See Read Say ([bit.ly/32an2LD](http://bit.ly/32an2LD))



Screenshot 6. Spy Sam Reading Series application ([bit.ly/3eiYdSy](http://bit.ly/3eiYdSy))



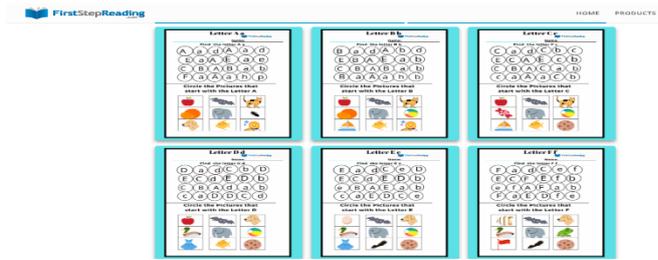
Screenshot 7. Sentence Maker application ([bit.ly/3enxF2](http://bit.ly/3enxF2))



Screenshot 8. Learn to Read, Write and Spell application ([bit.ly/2HPWxUR](http://bit.ly/2HPWxUR))



Screenshot 9. Clicker Books application ([bit.ly/3mKyWDK](http://bit.ly/3mKyWDK))



Screenshot 10. First Step Reading application (bit.ly/3kTD6Zs)



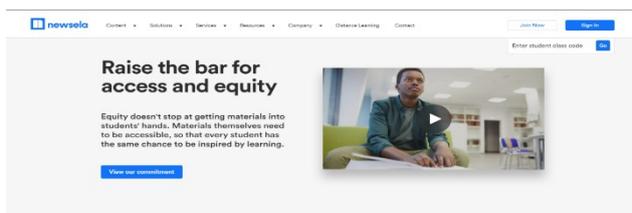
Screenshot 11. Reading A-Z application (bit.ly/2GmZMCi)



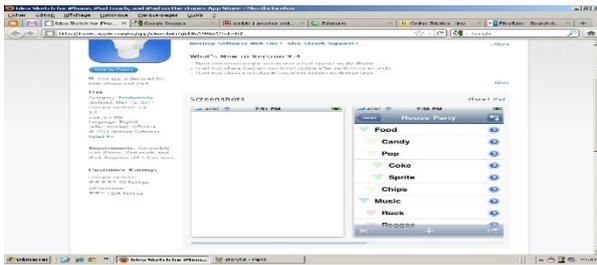
Screenshot 12. Teach your monster to read application (bit.ly/3oRjIUO)



Screenshot 13. Wikipanion application (bit.ly/327IbWM)



Screenshot 14. Newsela application (bit.ly/328jSbj)



Screenshot 15. Storykit application (bit.ly/3mNXHz2)

**Exam question**  
Write a story with the title 'The English Exam'. You should use a variety of tenses and your story must be between 180 and 220 words.

**The English Exam**

Dimetri woke up at 7:00 a.m. He had been chatting with a friend on the computer until nearly midnight the previous night so he was feeling quite tired but also rather nervous because this was the day of an important English exam at school. Dimetri had been studying very hard for this exam for the previous two weeks so he thought he had a good chance of passing it.

While Dimetri was travelling to school on the bus, he remembered that he had forgotten to take his wallet with him so he didn't have any money to buy lunch. Just after this, his friend Lucas got on the bus.

"Can I borrow some money, Lucas?" asked Dimetri. "Sure, no problem," replied Lucas. "Here you go."

The two boys did the English exam. While they were having lunch, Dimetri asked Lucas if he thought the exam had been difficult. Lucas smiled and picked up the slice of chocolate cake that he was eating.

"It was so easy! It was a piece of cake!" said Lucas, smiling.

**Top Tips for writing**

1. Your story should have a clear beginning, middle and end.
2. Use clear paragraphs.
3. Use a variety of narrative tenses.
4. Use direct speech or indirect speech when the characters talk.

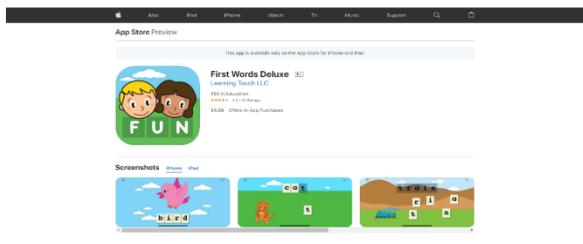
Screenshot 16. British Council – Learn English Teens website (bit.ly/2I08mqY)



Screenshot 17. Dvolver movie maker application (bit.ly/3oUESf6)



Screenshot 18. Make Beliefs Comix application ([bit.ly/3634M89](http://bit.ly/3634M89))



Screenshot 19: First Words Deluxe application ([bit.ly/325t1kU](http://bit.ly/325t1kU))



Screenshot 20. ABC Spelling Magic 1 application ([bit.ly/3ekEckR](http://bit.ly/3ekEckR))



Screenshot 21: ABC Spelling Magic 2 application ([bit.ly/3ekEckR](http://bit.ly/3ekEckR))



Screenshot 22. ABC Spelling Magic 3 application ([bit.ly/3ekEckR](http://bit.ly/3ekEckR))



Screenshot 23. ABC Spelling Magic 4 ([bit.ly/3ekFhTn](http://bit.ly/3ekFhTn))



Screenshot 24. Vocabulary Spelling City application ([bit.ly/32ayrea](http://bit.ly/32ayrea))



Screenshot 25. Quizlet application ([bit.ly/35XC08J](http://bit.ly/35XC08J))



Screenshot 26. Pic Collage application ([bit.ly/38dMjrQ](http://bit.ly/38dMjrQ))



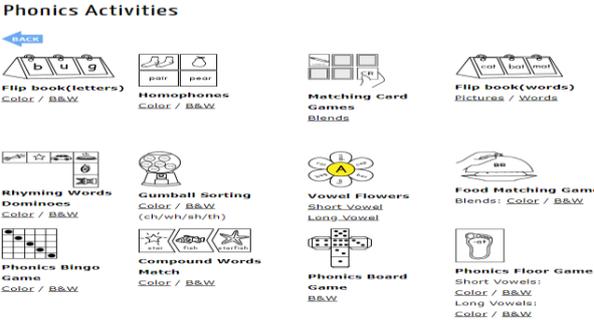
Screenshot 27. English 4 kids application ([bit.ly/3jZxZ8Y](http://bit.ly/3jZxZ8Y))



Screenshot 28. Macmillan – Pronunciation Skills Videos ([bit.ly/3mQd8X8](http://bit.ly/3mQd8X8))



Screenshot 29. Montessorium: Intro to Words application ([bit.ly/38dNkjE](http://bit.ly/38dNkjE))



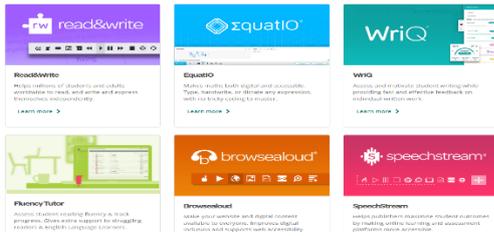
Screenshot 30. Kiz Club application ([bit.ly/35XKAo6](http://bit.ly/35XKAo6))



Screenshot 31. Dragon Dictation application ([bit.ly/328hTn3](http://bit.ly/328hTn3))



Screenshot 32. Dragon Search ([apple.co/3177QGF](http://apple.co/3177QGF))



Screenshot 33. Texthelp application ([bit.ly/38mWJWo](http://bit.ly/38mWJWo))



Screenshot 34. Claro Software ([bit.ly/35X3ITb](http://bit.ly/35X3ITb))



Screenshot 35. Starfall website ([bit.ly/3oVgRoc](http://bit.ly/3oVgRoc))



Screenshot 36. The Parent Educational Advocacy Training Center (PEATC) ([bit.ly/3kU9bQU](http://bit.ly/3kU9bQU))



Screenshot 37. Educational App Store ([bit.ly/3epT7UG](http://bit.ly/3epT7UG))



Screenshot 38. Literacy Apps ([bit.ly/2I1c0Bh](http://bit.ly/2I1c0Bh))



Screenshot 39. Edutopia's resource on Game-Based Learning ([edut.to/34RVMmC](http://edut.to/34RVMmC))



Screenshot 40. LearnEnglish Kids website ([bit.ly/34So7JL](http://bit.ly/34So7JL))



Screenshot 41. ESL Games Plus website ([bit.ly/3jRqNLR](http://bit.ly/3jRqNLR))



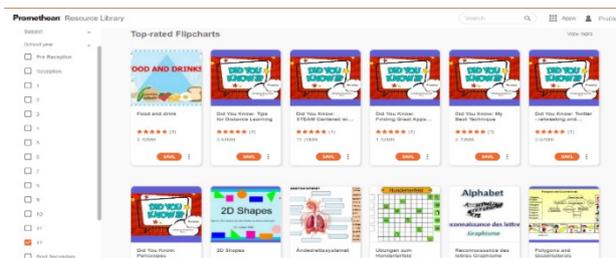
Screenshot 42. Classtools application ([bit.ly/388JUPw](http://bit.ly/388JUPw))



Screenshot 43. English Activities application ([bit.ly/3863lrX](http://bit.ly/3863lrX))



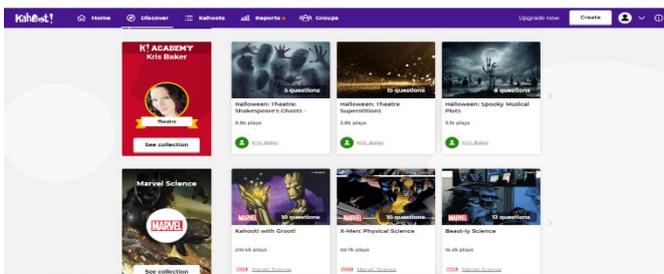
Screenshot 44. Studyladder website ([bit.ly/3293lne](http://bit.ly/3293lne))



Screenshot 45. Promethean Planet application ([bit.ly/3mQQ8Y2](http://bit.ly/3mQQ8Y2))



Screenshot 46. Socrative application ([bit.ly/3jOTitv](http://bit.ly/3jOTitv))



Screenshot 47. Kahoot! application ([bit.ly/3kXh87R](http://bit.ly/3kXh87R))



Screenshot 48. Busy Beavers ([bit.ly/328lcdX](http://bit.ly/328lcdX))



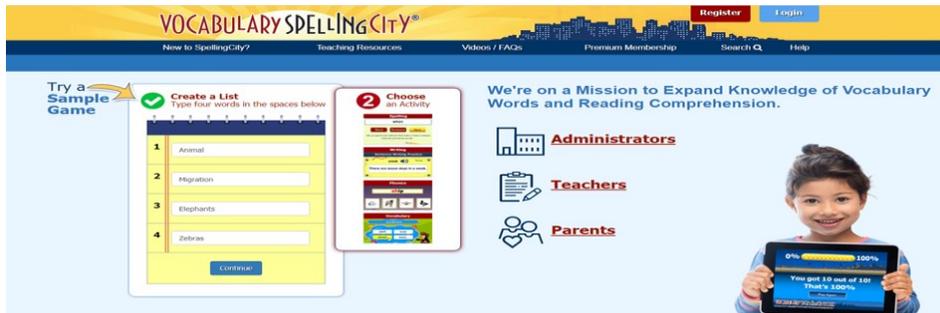
Screenshot 49. ELF Kids Videos ([bit.ly/325dn8P](http://bit.ly/325dn8P))



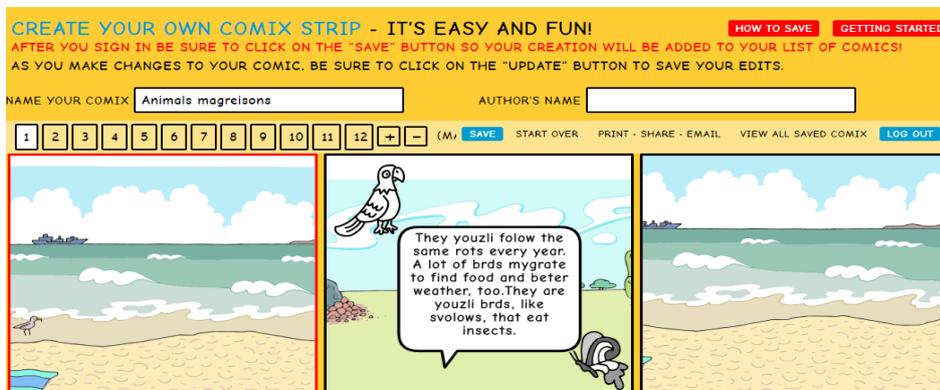
Screenshot 50. Kids TV123 ([bit.ly/34TZKLLH](http://bit.ly/34TZKLLH))

## APPENDIX 3

(1) Using online applications to accommodate students with dyslexia



Screenshot 51. *Vocabulary Spelling City* Reading Task



Screenshot 52. *Make Belief Comix* Writing Task



Screenshot 53. *Vocabulary Spelling City* Writing Task

(2) Using illustrations and conversation to accomodate students with dyslexia (Hebert, 2018)

Spend /'spend/



Speed /spi:d/



The word is spend.  
What is the word?

Spend. She spend a lot  
of money on her dress.

What is the first  
sound in spend?

/s/

/p/

What is the next  
sound? Could you  
please write it.

/end/

How do we spell  
the following  
five letters?

The word is speed.  
What is the word?

Speed. The car was  
gathering speed.

What is the first  
sound in speed?

/s/

/p/

What is the next  
sound? Could you  
please write it?

/i:d/

How do we spell the  
following three  
svllables?

Univerzitet u Sarajevu  
Filozofski fakultet  
Odsjek za Anglistiku (Engleski jezik i književnost – Nastavnički smjer)

**Izjava o saglasnosti roditelja za učestvovanje djeteta/štićenika u istraživanju  
za potrebe diplomskoga rada**

Izjava kojom ja, \_\_\_\_\_, roditelj/staratelj  
(ime i prezime roditelja)

učenika/ce, \_\_\_\_\_, razreda \_\_\_\_\_,  
(ime i prezime učenika)

\_\_\_\_\_, u \_\_\_\_\_  
(naziv škole) (mjesto škole)

dajem saglasnost za učestvovanje mog djeteta/štićenika u istraživanju koje studentica  
\_\_\_\_\_ (ime i prezime studenta) koristi za potrebe  
istraživanja u okviru postdiplomskog studija u školskoj godini \_\_2019/2020\_\_. Tema  
istraživanja je:

*Reading and Writing Errors in Learners of English with Dyslexia - A Psycholinguistic  
Approach/Pogreške u čitanju i pisanju na engleskom jeziku kod učenika sa disleksijom –  
psiholingvistički pristup.*

Sukladno Dokumentu koji je sačinila Agencija za osnovno i srednje obrazovanje Bosne i  
Hercegovine o zaštiti djece u učestvovanju u istraživanju i Etičkom kodeksu Društva psihologa  
u Federaciji Bosne i Hercegovini, svi podaci dobiveni od djece bit će strogo čuvani i isključivo  
će biti korišteni za potrebe istraživanja.

Za sva pitanja na raspolaganju Vam je voditeljica istraživanja, doc. dr. Nejla Kalajdzisalihović,  
Filozofski fakultet Univerziteta u Sarajevu (kontakt telefon: 033 253 129) .

Datum i mjesto:

Potpis roditelja/staratelja:

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