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# A GUIDE TO PRODUCING TEACHING MATERIALS IN THE ONLINE ENVIRONMENT FOR STUDENTS WITH HEARING IMPAIRMENT AND LOW VISION

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# Contents

# CHAPTER 1. WEB ACCESS STANDARDS

The World Wide Web Consortium (W3C) develops international web standards: HTML, CSS and more. The W3C Web standards are called W3C Recommendations. All W3C standards are reviewed for accessibility support by the Accessible Platform Architecture (APA) working group. W3C standards define an Open Web platform for application development that has unprecedented potential to enable developers to build rich interactive experiences powered by vast data stores that are available on any device.

While the platform's boundaries continue to evolve, industry leaders are talking almost in unison about how HTML5 will be the cornerstone for the platform. But the platform's full resilience relies on several technologies that the W3C and its partners are creating, including CSS, SVG, WOFF, the Semantic Web stack, XML, and a variety of APIs.

W3C develops these technical specifications and guidelines through a process designed to maximize consensus on the content of a technical report, to ensure high technical and editorial quality, and to gain endorsement by W3C and the broader community.

## 1.1. ACCESSIBILITY GUIDE

The essential components of Web accessibility show how Web accessibility depends on several components of Web development and interaction working together and how WAI guidelines (WCAG, ATAG, UAAG) apply.

### 1.1.1. WEB CONTENT ACCESSIBILITY GUIDELINES (WCAG)

Web "content" generally refers to the information on a web page or web application, including:

- Natural information such as text, images and sounds
- Code or marking defining structure, presentation, etc.

The Web Content Accessibility Guidelines (WCAG) is being developed through the W3C process in cooperation with individuals and organizations around the world, with the goal of providing a

single common standard for web content accessibility that meets the needs of individuals, organizations and governments worldwide.

WCAG applies to dynamic, multimedia, "mobile" content, etc. WCAG can also be applied to non-web information and communication technologies (ICT), as in WCAG2ICT.

Guidance on Applying WCAG 2.0 to Non-Web Information and Communications Technologies (WCAG2ICT) describes how Web Content Accessibility Guidelines (WCAG) 2.0 can be applied to non-information and communications technologies (ICT). It provides harmonised accessibility solutions across a range of technologies.

The WCAG is mainly intended for:

- Web content developers (page authors, website designers, etc.)
- Developers of web authoring tools
- Developers of web accessibility assessment tools
- Others who want or need a standard for web accessibility, including mobile accessibility

Related resources are designed to meet the needs of many different people, including insurance producers, managers, researchers and others.

WCAG is a technical standard, not an introduction to accessibility. It is part of a series of accessibility guidelines, along with the Authoring Tool Accessibility Guidelines (ATAG) and the User Agent Accessibility Guidelines (UAAG).

The WCAG technical documents are developed by the Accessibility Guidelines Working Group (AG WG) (formerly known as the Web Content Accessibility Guidelines Working Group), which is part of the Web Accessibility Initiative (WAI) that belongs to the W3C.

### 1.1.2. WCAG 2.0 AND 2.1

WCAG 2.0 is a normative web standard - it is a W3C recommendation and an ISO international standard (ISO/IEC 40500:2012) - that explains how web content (including static web pages, dynamic web applications, etc.) is more accessible to people with disabilities. WCAG 2.0 was published on 11 December 2008. WCAG 2.1 was published on 5 June 2018. All requirements ("success criteria") from 2.0 are included in 2.1. The 2.0 success criteria are exactly the same (verbatim, word-for-word) in 2.1. There are additional success criteria in 2.1 that are not found in 2.0.

WCAG 2.1 compliant content is also WCAG 2.0 compliant. This is often referred to as "backward compatible". A website that meets the WCAG 2.1 criteria should comply with the policy requirements that reference WCAG 2.0.

WCAG 2.0 and WCAG 2.1 are both existing standards. WCAG 2.1 does not eliminate or replace WCAG 2.0. W3C encourages the use of the latest versions of WCAG when developing or updating content or accessibility policies.

WCAG 2.0 and WCAG 2.1 are stable, reference technical standards. They have 12-13 guidelines that are organized are 4 principles: perceivable, operable, intelligible and robust. For each guideline, there are testable success criteria, which are on three levels: A, AA and AAA.

## CHAPTER 2. CREATING ACCESSIBLE TEXT-BASED RESOURCES

It is important that the resources made available to users are taken into account. We all want to create attractive resources, but very colourful presentations full of artistic images and fonts can be difficult to read and process efficiently. While it is not always possible to tailor resources in one way for each individual student, the following recommendations are a good help in making resources more accessible to as many students as possible.

### FONT

Sans serif fonts are generally considered easier to read, and ideally one should be found with the small letter "a" that most closely resembles how a student would spell that letter. For example, the Comic Sans font is very affordable. The British Dyslexia Association also recommends alternatives such as Arial, Verdana, Calibri and Century Gothic.

Text should be created at least 12 or 14pt for documents and 24pt for presentations. It is worth mentioning the avoidance of italics, underlining and capitalisation of text. Use bold for emphasis if necessary.

### LAYOUT

Divide text blocks into paragraphs with key points, headings and subheadings. This helps students remember what they read and find key information more easily. For example, if you are using Microsoft Word or Google Docs, use the built-in style tools for different elements of the text (e.g. 'Heading', 'Heading 1', 'Subheading'). This makes it much easier for learners, especially those using screen readers, to navigate the text and understand the document.

Make sure there is plenty of white space around headings and between paragraphs. Left-aligned text is easiest to read; text written completely with justify creates uneven gaps between words. Increasing the spacing between lines also helps the readability of the text (1.5 spacing is ideal).

## 2.3. CONTENT

Regardless of the language in which the document is written, it is best to use as simple elements as possible. It is advisable to keep technical language to a minimum and to teach vocabulary in advance where possible. Care should be taken with the use of jargon and metaphors, as these can be harder to understand. Keep sentences short to aid comprehension and try to avoid the use of passive diathesis. As an example: 'The poster is to be planned first on paper' is a passive construction. The active form is "You should plan the poster on paper first". As a rule, if "of robots" can be added to the end of the sentence, then this is passive diathesis.

Another example might be: 'A poster should be designed for Key Stage 1 students to help them understand the impotence of recycling rubbish to help the environment'. This sentence can be broken down into sentences to make it easier to understand, like this: "Design a poster for students in Key Stage 1. It aims to help them understand the importance of recycling rubbish to help the environment".

## 2.4. COLOURS

Don't use colour as the only indicator of meaning (e.g. identifying code blocks in Scratch by colour), as it can be confusing for a student with colour vision impairments.

Make sure there is plenty of contrast between the background colour of a document or slide and the text. Many students with dyslexia prefer a background that is not white - try using a pastel colour instead. Avoid using patterned backgrounds and non-essential images.

## 2.5. MAKING THE TUTORIAL

After all the above, I decided to make a tutorial showing how to create a document accessible to people with disabilities. I made this tutorial in Google docs, as not many people work and know exactly how to create files with it. The most widely used software for creating documents is Microsoft Word.

I started by opening the program and writing some text, harder to read at first, to highlight all the settings to be made.

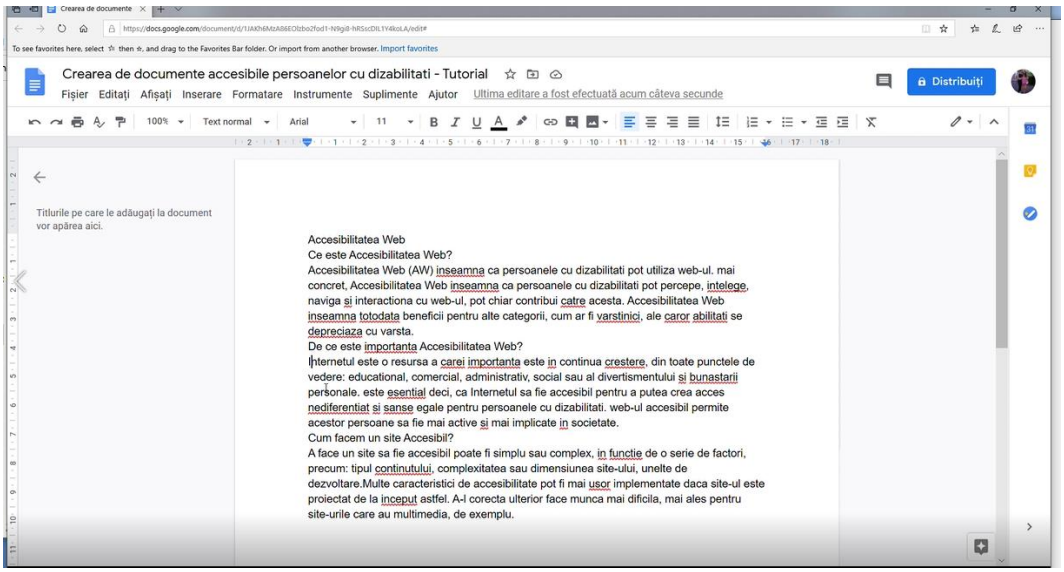


**Figure** 2: Text at the beginning

Styles can be chosen from the toolbar under Styles, where there are only a few options (Normal Text, Title, Subtitle, Title 1, Title 2, Title 3) or from Formatting -> Styles and Paragons, where in addition to the ones mentioned above, the program also offers the options of Title 4... Title 6. Once the styles are set, they can be updated, so you don't need to set them each time. This makes your work much easier.

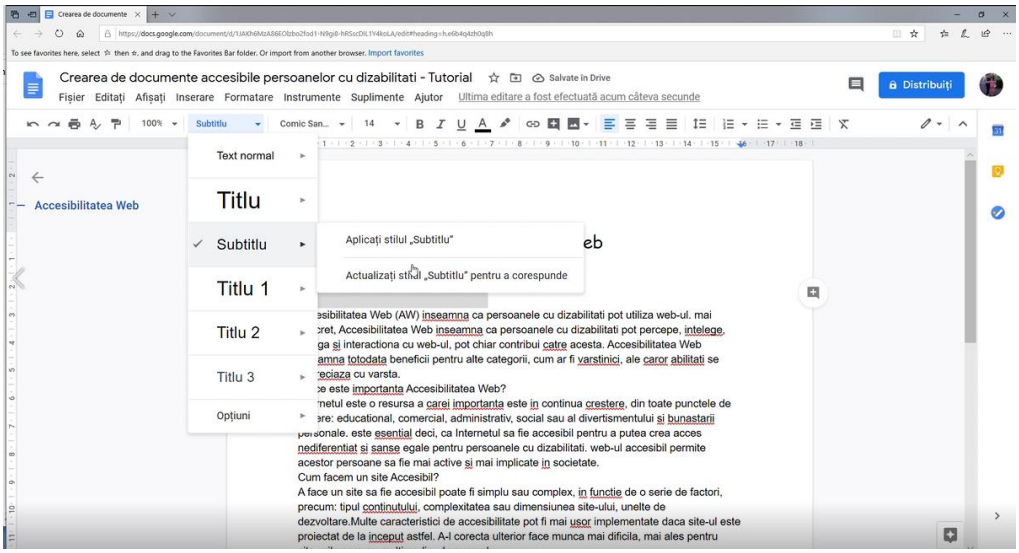


**Figure** 3: Styles

The use of fonts imposes a condition, namely, they must resemble the way we handwrite the letter "a". Some examples of such fonts are Century gothic, Comic sans, Arial or Calibri. The font size in such a document should be 12 or 14pt.

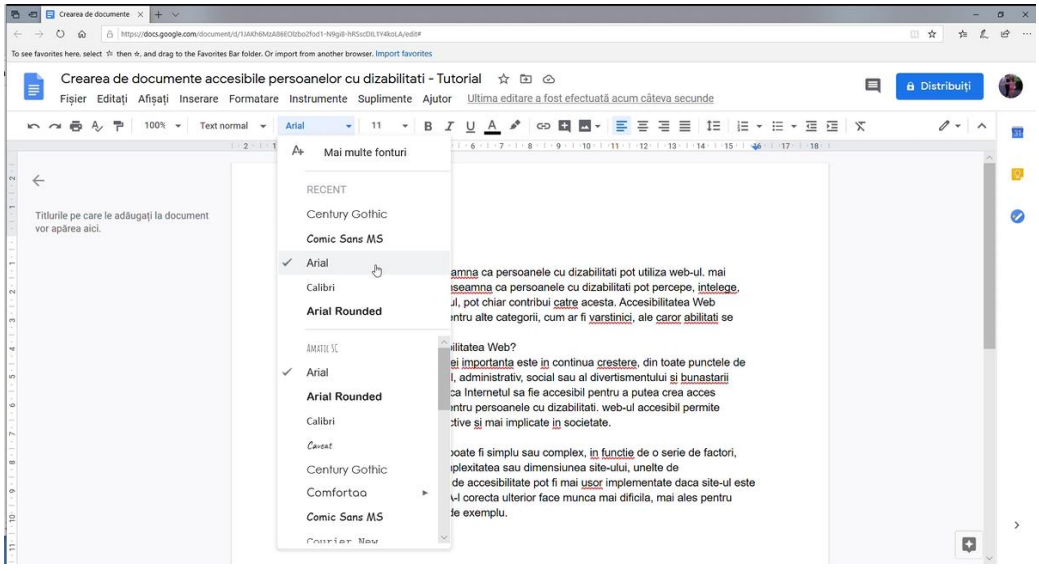


**Figure** 4: Fonts

So, in editing the text in the document I chose "Web Accessibility" as the title, as font I chose Comic sans with size 18 pt, aligned in the middle. The first subtitle is "What is Web Accessibility?" also in Comic Sans font, but 14 pt, left aligned.

For the first paragraph I have chosen as style "Normal text", the font this time is Century gothic written in 12pt size, left aligned. I set it with a line spacing of 1.5. The 1.5 size is ideal when it comes to documents like this.

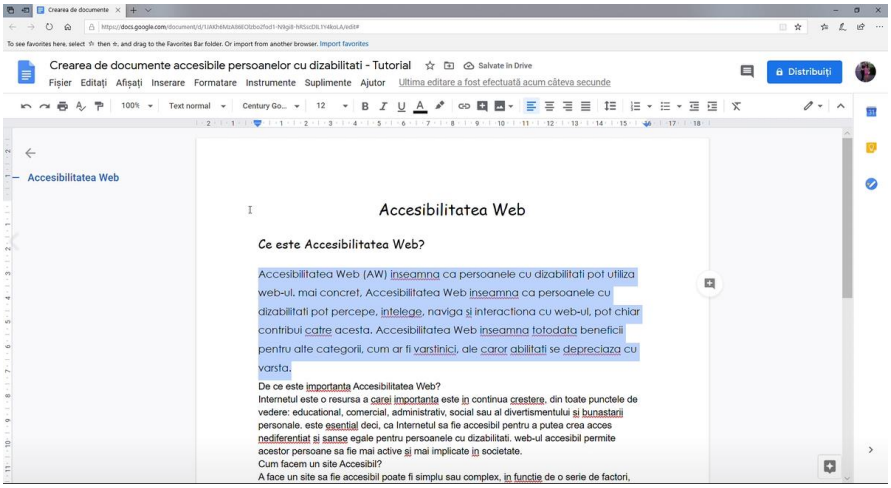


**Figure** 5: Editing the first paragraph

In the same way I did the rest of the text, except that in the third paragraph I added a list of markers to highlight certain words in the text.

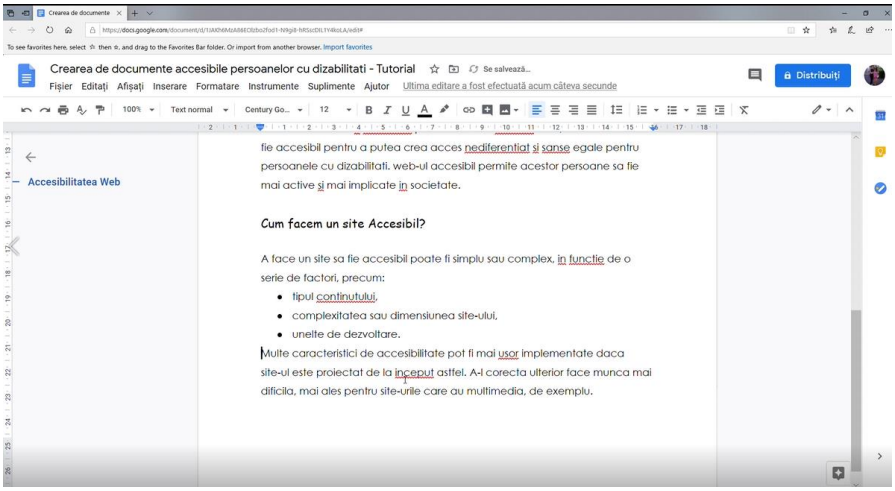


**Figure** 6: Creating the list of markers

Finally, we also decided to add a background colour to make the text stand out even more. To do this, I left the lettering black and chose a pastel colour for the background. This brings out the contrast between the two. The background colour is chosen from File -> Page Setup.

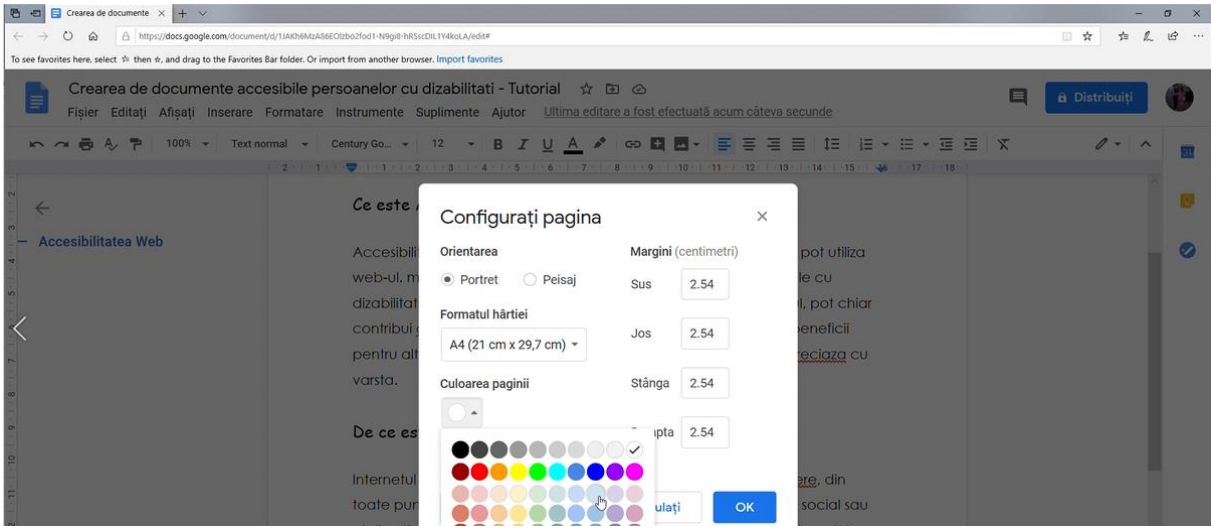


**Figure** 7: Choosing the background colour

After all the adjustments made, the text became much easier to read, navigate, understand and remember.

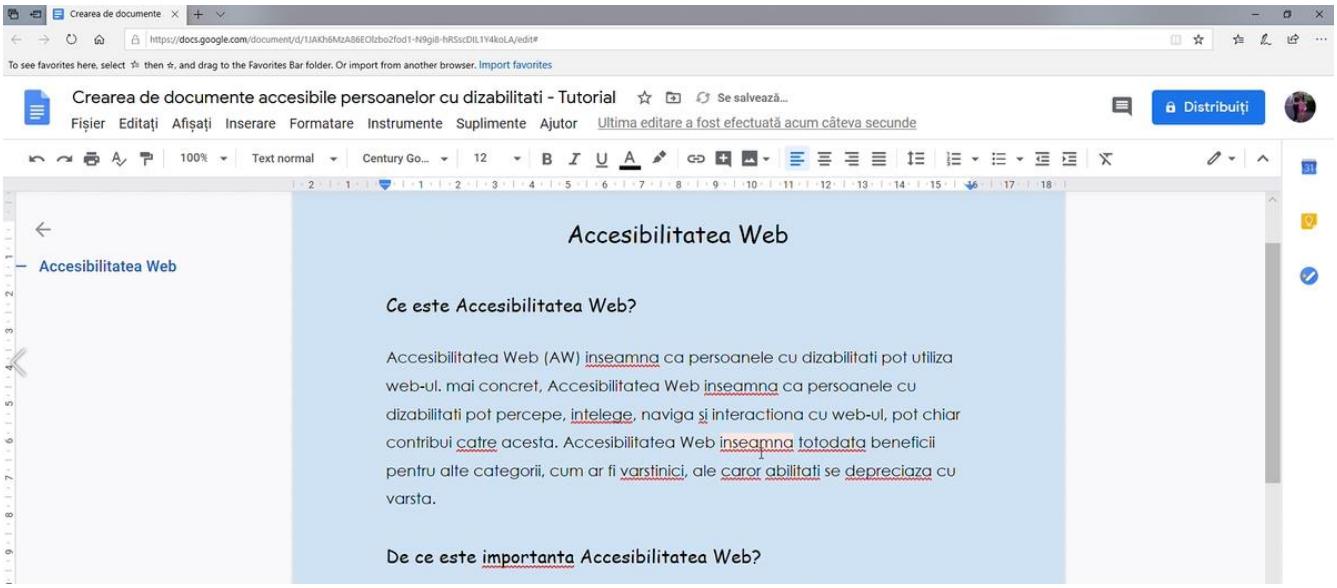


**Figure** 8: Text at the end of editing

# CHAPTER 3. STUDY ON SOFTWARE APPLICATIONS FOR THE HEARING IMPAIRED

Today, voice-to-text applications are used both by people with hearing impairment and people without hearing loss. Useful for everyone, I believe they bring a major benefit to those with hearing loss. In this chapter I will describe some of the most widely used applications available to all phone and PC users, as well as some developed software.

## SPEECHNOTES

Speechnotes is an app available on your phone (with over 5 million downloads), computer and tablet. It's created by the folks at Wellsource, a company that develops products designed to make our lives easier by making everyday activities more productive and easier to accomplish.

Speechnotes is an online notepad with the ability to reproduce in writing what the user says in speech. It's a powerful application that can be downloaded to your phone and used entirely online on your computer. No download is required in the browser and no registration is necessary, so the application can be used immediately.

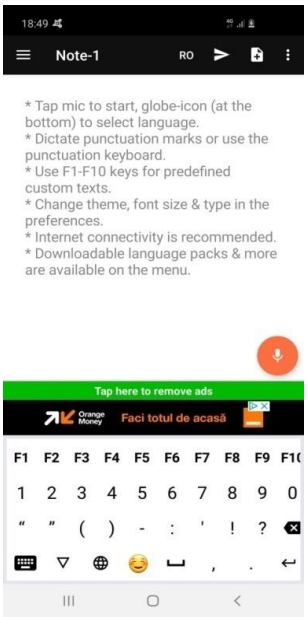


**Figure** 9: App interface on the phone

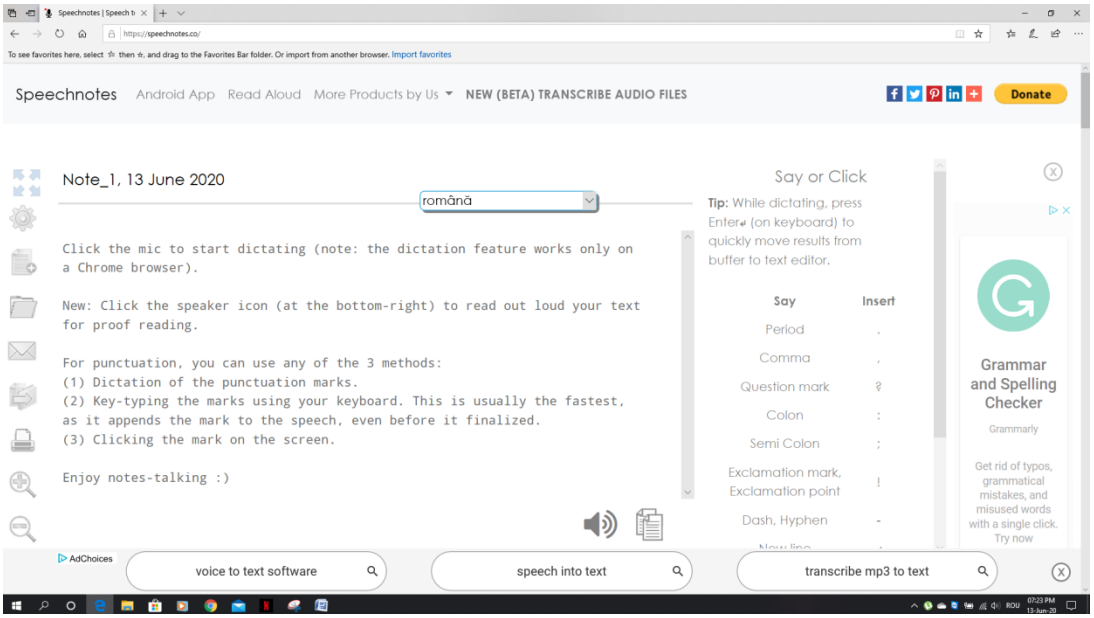


**Figure** 10: Application interface in the browser

On the phone, as can be seen in Figure 9, the instructions are displayed on the screen next to the keyboard, which contains only numbers and punctuation. The application contains a main menu consisting of several options, namely: the file can be saved, sent, deleted and printed or exported as a pdf file. You can open older saved notes or export to your phone's SD card.

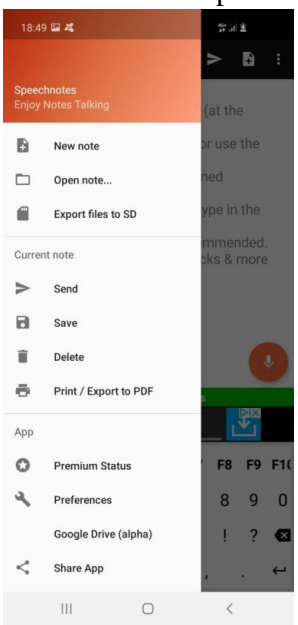


**Figure** 11: Speechnotes application menu

The application contains a total of 122 languages, making it possible to reach as many users as possible. To display the text on the screen, just press the microphone icon once and then you can start dictating the text. It can be named according to the user's preference. The chosen language can also be changed immediately, and the option is displayed both on the screen and in a submenu also displayed on the screen in the form of three dots, without having to enter the main menu of the application.


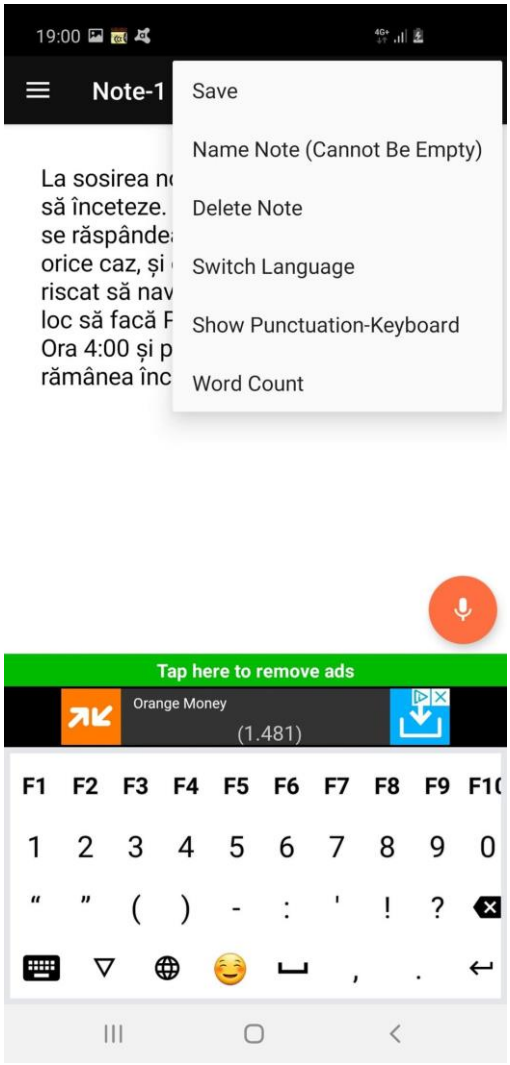


**Figure** 12: Text displayed on the screen **Figure** 13: Submenu and its options

This app isn't very accurate when it comes to recognizing all the words, but it's pretty useful. Its biggest advantage is that it also has an online version, making it much easier to use on a computer.

VOICE NOTES

Voice Notes is an app developed by the folks at Pacific Fisher Group, a team of software developers active since 2017 creating apps for the Android operating system. Voice Notes is one of the most popular apps they've created, with over 5 million installs worldwide, making it one of the most popular apps on Google Play.

Like Speechnotes, it is an easy-to-use app, with no registration required to use the app. Its interface is simple and easy to understand. The app's menu contains in addition to language and interface settings, the ability to set reminders, how to display the date, add "." after sentences, font, font size, as well as automatic saving to Google Drive.

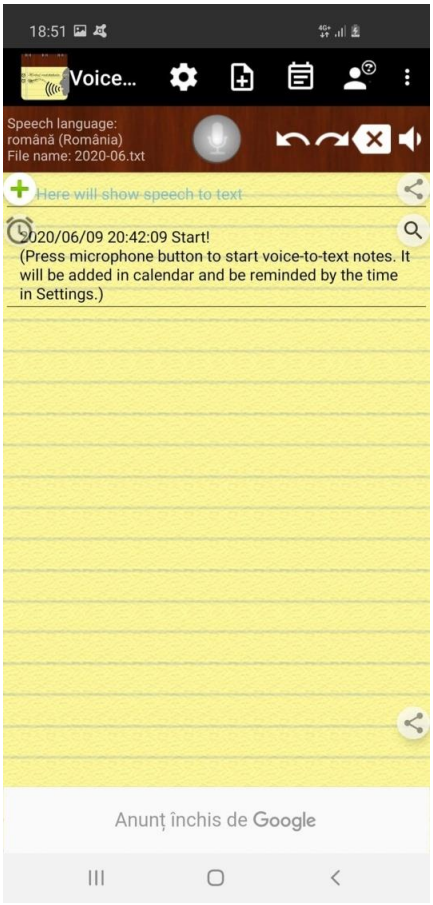


**Figure** 14: Voice Notes application interface

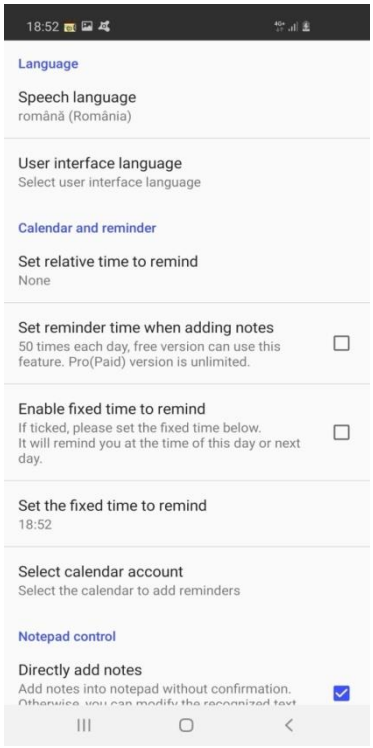


**Figure** 15: Menu

When the text is dictated, the application displays the date and time it was recorded. After a pause of a few seconds in dictation, the application detects a pause between sentences and starts writing on a new line at the beginning of the next sentence. When you close the application, the text is saved and appears on the screen the next time you open it. You can send your text to friends at any time, either as a message on your phone or as an email.


**Figure** 16: Text displayed

And this app has over 100 languages available for text display, as well as 22 languages for the interface.

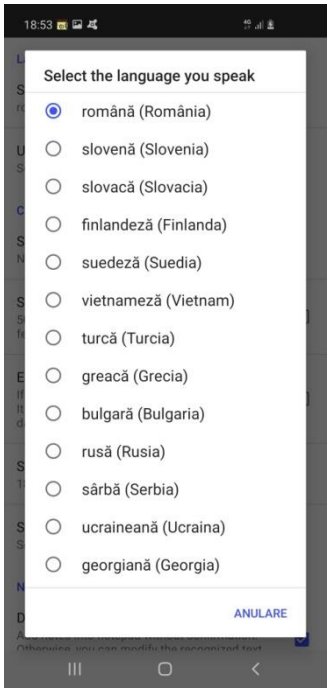


**Figure** 17: Languages available for text display

This app is also not very accurate at word recognition and although it has about the same number of downloads as Speechnotes, I wouldn't use it. I'm not attracted to its look and feel or the way the text content is displayed on the screen.

SPEECH TO TEXT

Speech To Text is an app for android users, developed by Xenom Apps. Active since 2011, Speech To Text is their most popular app, with over 1 million downloads.

Compared to the other two apps, this one also has Text-to-Speech. Here, too, you only need to press the microphone once to start dictating text. The menu is displayed on the screen as 3 dots, with the ability to change the language, set the date and time, view available app information, see the most frequently asked questions and access settings.


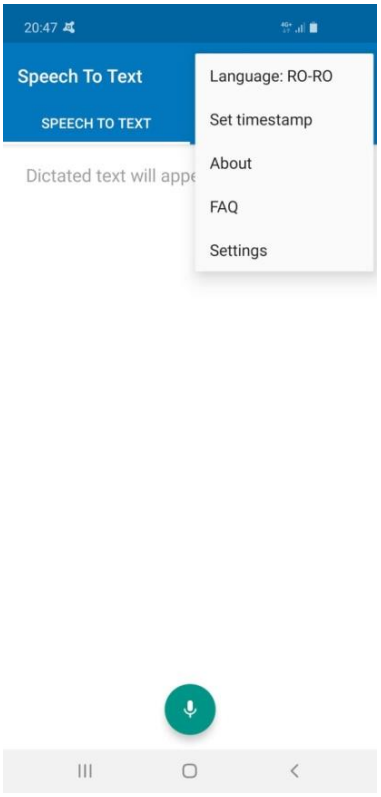


**Figure** 18: Interface **Figure** 19: Application menu

The application allows automatic saving of text on output. In use it is not the most accurate at recognising all words, and there are some mistakes that can be edited from the phone's keyboard.

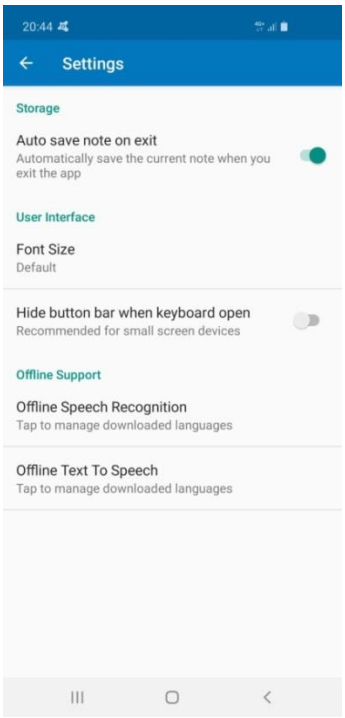


**Figure** 20: Application settings

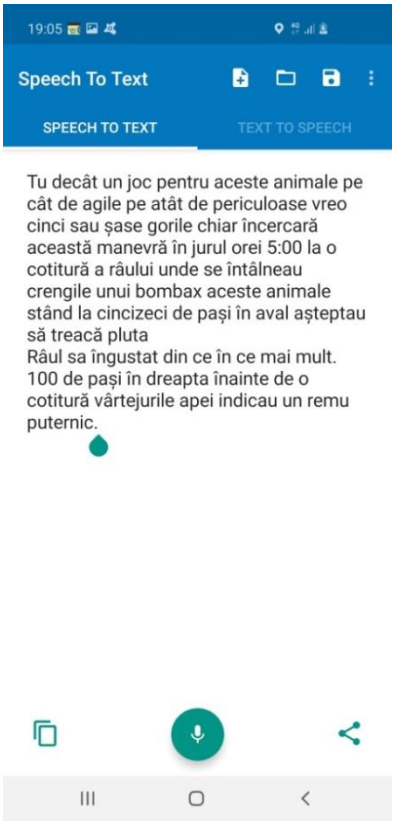


**Figure** 21: Text display

Speech to Text is the only one of the three that also has a Text to Speech option, which is a big enough advantage that hearing-impaired people can use it to communicate more easily with those who hear but don't know sign language. There is still room for improvement in its word recognition speed, but overall it's a pretty good app.

DRAGON HOME

Dragon Home is voice recognition software that helps everyone make things easier and faster on the computer. It's developed by Nuance Communication, an American software technology company. This software intelligently transcribes the user's spoken words into text on the screen. Simply speak and the words appear on the computer screen. The software is easy to install and use, and makes doing things successfully a pleasure. With up to 99% recognition accuracy, this software can create documents, solve homework, tasks, send emails, update social

networks and more. Dragon Home adapts to the voice and words the user uses and delivers better and better results over time.

The program learns new words while making corrections in the document. Dragon Home detects formatting corrections, abbreviations, numbers, so that the dictated text is as correct as possible and looks the way the user wants it to every time. The disadvantage of the program is that it is not free, but must be purchased. I can't comment on this software as I haven't used it, but there are pros and cons. Of course it differs from user to user, but most opinions have been positive about it.

## CHAPTER 7. ASSISTIVE TECHNOLOGY AND ITS SERVICES

About 20 years ago, International Business Machines (IBM) offered an assistive technology training package, in which they noted that "For people without disabilities, technology makes things easy; for people with disabilities, technology makes things possible." Of all the statements about assistive technology and its applications, this seems to be the most succinct. There is no doubt that technological advances have made most people's lives considerably easier over the past 40 years. The first commercial handheld computers in the 1970s sold for a few hundred dollars.

For people with mathematical disabilities, balancing a workbook has become possible because their numeracy weaknesses make such a task almost impossible to accomplish independently. This is just one example of an "easier...possible" comparison. We might also recall how speaking into a computer microphone and having the words appear on paper was once a pipe dream for those of us who struggled to write a paper. Thanks to voice-to-text technology, such a task is accomplished simply by using a computer and specialised software. For most of us, writing was easy, but for a person with a severe motor or visual impairment who would otherwise "struggle" with entering text into a computer, writing has become not only possible, but somewhat simple to perform (if writing is ever simple). Advances in technology have benefited much of society, but it could be argued that for people with disabilities, technology has provided a means to completion, which is independence. That is, assistive devices serve as a means to help individuals with disabilities do what they want to do, thereby reducing the need to depend on others to do things for them.

## 7.1 ASSISTIVE TECHNOLOGY DEVICES

Interestingly, the term "assistive technology" has no dictionary definition. The term "assistive" is defined by the New World Compact Desk Dictionary and Style Guide, 2nd edition (2002) as "to assist; aid", and "technology" is defined by the same source as "1. practical arts science or industrial. 2. applied science". So it is relatively safe to say that assistive technology is "the application of the practical or industrial arts in aid of people with disabilities". the key point is that assistive technology leads the way to practical decisions about specific devices, services and adaptations that can be used by people with disabilities, their supporters and their family members to enable their independence.

Assistive Technology Devices were first defined in the *Technology Related Assistance for People with Disabilities* Act 1988. According to the *Disability Education* Act 2004, an assistive technology device refers to "any item, equipment or product system, whether purchased commercial off the shelf, modified or customized, that is used to increase, maintain or improve the functional capabilities of a child with a disability". The device must be capable of being used either to improve a person's functioning or to maintain functioning at its current level, i.e. to prevent worsening of the condition.

## 7.2. ASSISTIVE TECHNOLOGY SERVICES

The term "assistive technology service" means any service that directly assists a child with a disability in the selection, purchase, or use of an assistive technology device. When considering assistive technology services, it is good to think in terms of existing devices outside of a vacuum. That is, devices are simply "things" available for use. Use is an important aspect. Without assistive technology services, these devices would only exist on catalog pages, with no apparent use or even ability for users to purchase the devices in many cases.

The phrase "functional assessment of the child in the child's usual environment" refers to what is commonly considered "person-technology fit". Assistive technology devices are not "universal", i.e. a specific device is not suitable for everyone and each must be "matched" to a

person for proper application. Assessments are carried out so that people can be sure that the devices match the needs and attributes of the user and the tasks to be performed.

## CHAPTER 8. INTEGRATION OF ASSISTIVE TECHNOLOGY ADAPTATIONS IN THE ACADEMIC FIELD

For students with disabilities in pre-school, elementary, middle and high school, access to general education curriculum and/or functional curriculum that meets the needs of the student reflects the most reliable route to a quality education. Both assistive technology adaptations and IT provide useful and successful adaptations and opportunities to promote learning and access. Computer technology has taken a "giant leap" in enabling children with disabilities to achieve their developmental and educational goals.

The benefits of technology can be even greater for people with disabilities compared to their non-disabled counterparts. Technology has evolved tremendously in terms of ease of use, increased capacity and reduced costs, making assistive technology and IT integral components of quality education for people with disabilities.

Reading, writing and mathematics form the core academic curriculum taught in the school years and provide the foundation for further learning in social studies and science. Mastery of knowledge and skills in these subjects is essential for student success. As students progress into more advanced areas, the development of basic skills in all three areas affects their ability to succeed and underscores the need for assistive technology support. Both adaptive technologies and IT offer students new ways to learn by reducing cognitive load and improving students' mental energy and thinking capacity. The role of assistive technology in supporting students with disabilities is clearly seen in the use of software programs that compensate for reading or writing difficulties and enable the student to master higher order learning tasks more successfully.

Hand in hand with the use of assistive technology adaptations is the critical use of IT as a learning platform for people with disabilities. Teachers need to consider the integral role that IT plays in the academic development of children with disabilities. IT increases access to the mainstream curriculum by adapting the curriculum, improving instructional delivery, providing opportunities for practice and increasing motivation. Although assistive technologies do not teach

skills related to student interaction, IT provides students with learning opportunities to address literacy performance and enhance skill development performance.

Integrating assistive technology and IT into schools continues to be a major challenge for general and special education teachers. As they wrestle with the questions "How?" and "Why?", they may fail to work collaboratively to use assistive technology to improve student outcomes. For example, teachers don't have the necessary training on how the technology works. They may need ongoing ethnic support to use the technology effectively. Also, while teachers may understand how it works, they may not have experience integrating adaptations of assistive technology into instruction. Some teachers have not developed the skills to evaluate the effectiveness of technology and IT adaptations. They may continue to use the device or a particular IT program without making the necessary modifications to make its use feasible or effective. This is frustrating for both the teacher and the student. Working together and considering the needs of the student is an effective way to use both assistive technology and IT and can increase access to general education.

Instructional design focuses on the learner, curriculum and instruction, as well as IT and technology adaptations. Teachers use a variety of resources to decide what to teach, how to teach, and the resources used for instruction. Assistive technology accommodations for students with disabilities are provided in the student's Individualized Education Program (IEP). Teachers need to plan how they can best integrate IT and technology accommodations into their teaching.

To be effective, instruction should be planned around the personal/social and academic needs of students. Teachers need to spend some time taking into account students' experiences and academic levels. Understanding a student's level of performance as documented through psycho-educational assessment in the cognitive, social, motor, sensory, and language domains provides specific knowledge about functional capabilities and limitations. Students with high incidence disabilities such as learning disabilities, speech/language disorders, or emotional disorders will, of course, have different needs for both IT and assistive technology accommodations. However, they may share some common characteristics, such as the need for specific direct instruction and independent exercise, practice and repetition.

Students with low-incidence disabilities also have some common learning characteristics. According to Hamill and Everington, there are three major areas that teachers need to address for students with low-incidence disabilities. These include cognitive and learning disabilities, motivation and behaviour, physical and medical impairments.

## 8.1. IMPLEMENTATION OF INSTRUCTIONS

Instructional implementation focuses on how the teacher groups students and how instruction is taught. Grouping students plays an integral role as the teacher explores ways to directly enhance instruction. Research-based interventions stipulate the methods and time the student has for additional instruction, modeling, review, and additional targeted practice. Instructional delivery includes pacing, amount of material to be covered, and number of repetitions of key lesson elements, aided by research-based strategies and materials and accommodations. IT and technology accommodations play an integral role in implementing instruction to promote learning and access to the curriculum.

## 8.2. EVALUATION OF INSTRUCTIONS

Lesson plans should contain an assessment specifically linked to the instructional objective, and the teacher should examine the usefulness of IT and technology adaptations in the lesson. Assessment information explored at the end of the lesson should include an evaluation of environmental factors, use of adaptations, and monitoring student progress using technology in the lesson. Knowledge of how well the student uses technology and its impact on skill development is essential. Technology assessment is a critical feature that has been repeatedly emphasized. Assessment is essential to determine how students respond to instruction. Combining monitoring of lesson plan progress and evaluating the effectiveness of IT and technology adaptations helps to provide a comprehensive picture of student progress.

# CHAPTER 9. COMPARISON OF TEACHER-PROVIDED AND COMPUTER-ASSISTED PROMPTS FOR VOCABULARY DEVELOPMENT OF STUDENTS WITH HEARING IMPAIRMENT

Literacy has become increasingly important in a society that relies heavily on reading and writing to receive information. According to Easterbrooks and Stoner (2006), "The ability to read and write is an important component of potential academic and professional success". While literacy skills are crucial for success, children and adults who are deaf often have reading and

writing problems compared to people without hearing loss. Research indicates that some adults who are deaf do not exceed the reading level of a fourth grader. This difference in performance can be attributed, at least in part, to differences in language exposure prior to school age.

According to the US National Institute on Deafness and Other Communication Disorders, about 90% of infants born deaf have parents without hearing loss and may not get the exposure to language that is necessary to prepare them for school. This is especially true for language skills needed for early education acquisition. Students without hearing loss are exposed to incidental language learning from birth. They listen to adults talking to them or to others, as well as to people talking on television. Exposure to all these sources helps children develop their language. Some pupils with hearing loss may not have access to language until kindergarten or even later. This lack or delay of exposure to language can affect receptive vocabulary development.

## 9.1 VOCABULARY INSTRUCTIONS FOR STUDENTS WHO ARE DEAF OR HARD OF HEARING

More than ever, given the Common Core Standards and the increased emphasis on standardized testing, students need to be familiar with academic language, especially content-area vocabulary. Students with a small vocabulary are at a greater disadvantage when it comes to learning academic language.

For students with hearing loss, vocabulary deficiencies can prevent them from acquiring knowledge, developing higher-level thinking skills, and engaging in positive interpersonal interactions. In addition, students are required to use automatic academic vocabulary in standardized assessments, which could impact their academic success.

While academic vocabulary is increasingly important and there are numerous vocabulary deficiencies for many students with hearing loss, a relatively small number of intervention studies addressing vocabulary for them are available in the literature. Although it has often been assumed that vocabulary is acquired from reading, for many students, "intentional direct instruction" (Massaro and Light 2004, p. 143) of vocabulary will result in better outcomes than many incidental instructional approaches.

## 9.2. PROCEDURES FOR REQUESTING A RESPONSE

Response prompting procedures involve systematic prompts designed to increase correct responses by reinforcing prompts. There is a large body of evidence demonstrating the effectiveness of prompting procedures, such as time delays, a system of minimum prompts, and simultaneous prompts with students who have a range of disabilities.

A few studies have addressed the use of prompts in teaching sign language to students with intellectual or multiple disabilities; however, no studies were identified in which prompting procedures were used to teach academic skills because they provide instruction with low error rates and one particular prompting method, simultaneous prompting, was selected because of its effectiveness compared to other methods.

## 9.3 COMPUTER-ASSISTED INTERVENTIONS FOR STUDENTS WITH HEARING DIFFICULTIES

Technology has become an integral part of life in our society. In many classrooms, teachers are given access to the internet, computers and other technological elements such as interactive whiteboards. Many teachers use technology to make education fun and interactive. Technology gives teachers a way to individualize instruction to meet students' individual needs. Technology also provides the ability for students, who are often dependent on adults to manage independently, which can promote "ownership" of learning for the student and create time for the teacher to work with small groups or individually with students as needed.

For students with hearing loss, technology can provide more ways to learn, especially in providing information in a visual format. Just a few studies where computer-based vocabulary development interventions have been carried out with deaf and hard of hearing students could be found in the literature.

Barker (2003) used a vocabulary teaching software program to provide explicit instruction for 19 students (16 with hearing loss and 3 without hearing loss) who were enrolled in a school that provided elementary auditory/oral education for a mix of students who were deaf with a small number of hearing students. The software used in this study was designed specifically for the

school population and incorporated a "stimulus-response" format in a multimodal (visual and auditory) learning environment.

Key elements of the software included text-to-speech and speech-to-text capabilities, along with visual speech presented by an animated speech face called "Baldi". Based on pretest/posttest results, most students experienced large vocabulary gains using the computer intervention. There was no control group for comparison (i.e., statistical significance), but the author indicated that the cumulative learning gains of students were socially significant proportions over participants who had previously demonstrated deficits in vocabulary development.

PowerPoint software can be used to provide instructions with evidence-based prompting procedures. PowerPoint presentations allow teachers to set up the work schedule so that students can receive check prompts immediately after being presented with a work task. Thus, incorporating simultaneous prompting into PowerPoint presentations would allow systematic instruction to be paired with computer-assisted instruction. Another benefit of this software is the ability to incorporate multimedia, including videos.

## CONCLUSIONS

After all of the above, I believe that students with hearing impairments deserve a conducive learning environment and therefore such assistive technologies as Speech to Text software should be introduced into the academic environment.

Teachers need to be trained on how to show them how to use such programmes, but also how to make their material accessible not only to students with hearing loss, but also to those who do not. Such accessible materials are much easier for everyone to understand and remember.

Assistive technologies make their lives easier and performing everyday activities can become fun, only if we allow them access to them and I think it is time we implemented such options, as other countries have done.

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