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SETUP OF ACCESSIBLE AND INCLUSIVE CLASSROOMS FOR LOW VISION

OERs ADAPTED TO STUDENTS WITH LOW VISION.

redREE making projects

ALBA Asociación de ayuda a personas con albinismo

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I. INTRODUCTION

Depending on the specific needs of each student, those technological components required in the learning tasks must be incorporated into the classroom and connected with other devices. In addition to the technological devices, make available other non-technological tools useful for students with low or no vision, like magnifying glasses, tele-magnifying glasses, magnifying devices, typoscope, lectern, lamps, etc.

II. PHYSICAL DISTRIBUTION IN THE CLASSROOM

According to the specific characteristics of the student's visual problem, place them in a position that facilitates the optimal perception of the teaching explanations and presentations on the blackboard (electronic or not) or screen. The first row –in front of the teacher's table and the blackboard or screen– is usually the best location for students with low vision. However, keep other basic need of these students in mind: avoiding glare caused by windows in front of them. In other specific cases, such as scotomas, which limit the area of vision, other locations may be more appropriate depending on the student's area of vision.

In any case, students with low vision need technological aids for their daily work in the classroom: PC (laptop or fixed) and/or tablet. In any case, the screen must be at least 17 inches, since those under that size don't work well with tools like magnifiers and screen magnifiers (in Windows, the magnifier is activated with the "Windows" and "+" keys, and deactivated with "Windows" and "esc").

Windows has a wide range of resources in "accessibility" in its configuration to adapt various elements of the PC according to the needs of each person. There is also a tutorial for it. MacOS also has its own accessibility menu, as well as other operating systems such as Linux.

III. CONNECTION OF TECHNOLOGICAL DEVICES IN THE CLASSROOM

The computer devices of students with low vision must be connected to the teacher's via USB or Wi-Fi, with software to communicate. The student's computer must work parallel to the teacher's, either as a screen or so that the student can interact with the presentation or application the teacher is executing, being able to both receive information and send it. This second configuration is the most operational, because the student can interact on the blackboard or projector from their own device without having to get up.

Computers must be able to take screenshots (usually with the "print scr" key) and record their content (in Windows with the "Windows" and "G" keys). After starting and pausing the recording, it will be automatically saved to your computer (ambient sound will be recorded). In MacOS the screenshot APP is opened by simultaneously pressing "shift", "cmd", and "5". With this, the student can repeat the lesson later without having to take notes.

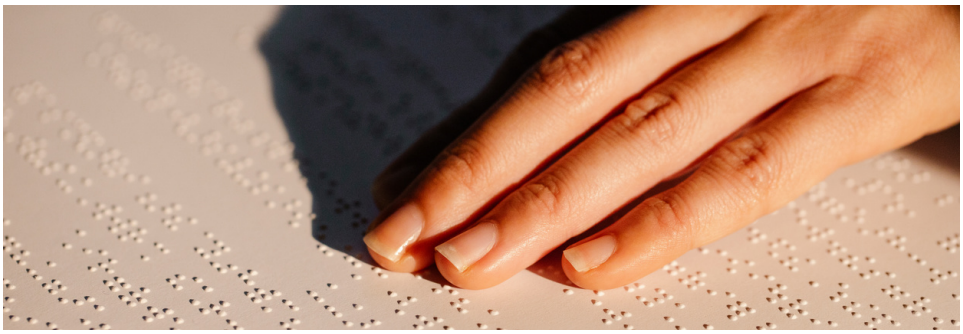
It is also very useful to have a scanner or stylus scanner connected to the device of the student with low vision, coupled with text recognition software (OCR) –not necessarily resident, they are available on the internet–. With these tools, students with low vision can recognize and transform texts written in ink into editable digital text, which may otherwise be inaccessible due to their non-inclusive format.

Other very useful hardware are touch and interactive screens. These are a way to interact with devices as in smartphones and tablets, acting directly on the screen. They consist of a screen connected to the computer, which allows not necessarily having to resort to using a mouse, favoring accessibility. Interactive screens also have other features, like being able to use the magnetic pen, regulating their tilt, adapt their configuration to the visual needs of the student (size, color, brightness...), and have their own software and specific outputs to have more functions, like audio and video recording..

IV. THE TECHNOLOGICAL DEVICES FOR STUDENTS WITHOUT REMAINING SIGHT

For students with a non-working or non-existent remaining sight, braille is recommended instead of printed text. In this case, the technological materials to be connected to the PC or equivalent device are: the braille line (with a keyboard to write in braille) and the digital or graphics tablet. You must also have headphones to listen to the text reading tools and the screen reviewer without interfering with the rest of the classroom. The student's computer device must also be connected to the teacher's.

The braille line, also called braille screen, allows to read digital contents written in this code. It is a peripheral hardware composed of a set of cells (from 40 to 80) usually with eight rods with rounded ends arranged in two columns (some, as in the printed braille system, have only six points in two columns), which when protruding or lowering can be read with the fingers. The device updates the contents of each line by pressing a button when you finish reading it. Some models indicate the cursor position with a vibration of the corresponding cell. These devices are usually placed in front of the keyboard to easily switch from one peripheral to the other, and usually incorporate other buttons to scroll through the texts and options of the screen without having to resort to the ordinary keyboard. They usually have an eight-key keyboard arranged ergonomically to write in braille.



Although this hardware seems to be replaceable by speech synthesis screen readers, it is actually essential when one has to stop at how certain expressions are written (in mother tongue or in language learning), in equations (math, chemistry...), and music.

The digitizing or graphics tablet is a peripheral device composed of a flat surface and a digital pen that allows to digitize what is drawn on it, as a substitute for the mouse. For people without vision, it enables the interaction with the computer through adapted sheets in relief that allow the user to locate the different areas or options. These sheets can be created with a Fuser furnace, which raises reliefs of what is drawn on them. An adequate configuration allows the student to act from their seat on the blackboard or projector of the classroom.

Along with these peripherals, it's also positive to have a desktop scanner (with OCR software to scan printed texts and turn them into editable digital format) and a braille printer connected to the PC or tablet. Braille printers require special paper, as Fuser ovens do. In both cases the final product is in relief.

The paper for Fuser ovens is called “microcapsule paper”, “inflatable paper”, or “fusing paper”. It is sensitive to heat due to its components, which swell up, modifying the texture of the paper, allowing to create continuous lines and surfaces with more detail (unlike braille printers). Designs are printed on a regular inkjet printer (laser printers aren’t recommended, since they use heat and sheets can get stuck). After printing, put the paper in the Fuser oven, which will make the surface printed with black ink to swell up creating the reliefs. There are several brands of it, with slightly different properties, so one must experiment to get the desired results depending on the temperature and heating time in the oven.

If you must combine braille with text, use a light green or blue color for standard text to avoid confusion (since those strokes won’t swell in the oven), and will be visible without being in relief

In this format we recommend using different textures to transmit information in drawings or graphics (lines of different thickness, dashes, dots, stripes, striped in several directions, squares, diamond squares...). However, don’t use perspective in drawings (it is a very complex concept for people without vision) or shading or unnecessary details, so it’s better to resort to drawings and schematic designs, which must also be static designs.

The paper used by braille printers is a special weight paper (from 120g/m2) that can be both continuous and in single sheets, depending on the braille printer used (printers that support single sheets are more versatile than those that use continuous paper).

Along with this hardware, software is essential to facilitate accessibility to the various functions of the device: screen reviewers that enable the user to know the elements and options displayed on the screen at any time and interact with them. The interaction is done through the keyboard, and the information is given to the user by the braille line or by voice synthesis, with configurable characteristics. There are hotkey combinations for interacting with applications using screen reviewers.

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