

HANDBOOK

**ROBOTICS THROUGH SIGN LANGUAGE: ENSURING ACCESS
AND ENGAGEMENT OF STUDENTS WITH DISABILITIES
(DEAF OR WITH HEARING IMPAIRMENT) TO THE DIGITAL WORLD
OF CODING AND ROBOTICS – ROBOTICS4DEAF**

Project no: 2019-1-PL01-KA201-065123



Erasmus+

This project has been funded with support from the European Commission.
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Introduction

The handbook provides guidelines for creating educational materials for deaf students on e-learning platforms. The handbook has been developed for trainers who teach children and youth with hearing impairment and create educational materials for them.

When deaf people were first included within the educational process, they were thought to possess cognitive development difficulties and hence that their condition was related to a cognitive problem. But the reality was that this happened because of the few stimuli received, the problem of communication between deaf and hearing people, and hence the problem in knowledge transmission.

It is known that cognition development is additionally related to language learning. This connection is so important that deafness is directly classified by the ability of speech and language, in four levels: mild hearing loss (no significant effect on development, since generally the utilization of a hearing aid isn't necessary); moderate hearing loss (may affect speech and language development, but not enough to stop an individual from talking); severe hearing loss (interferes with speech and language development, but with the utilization of a hearing aid may receive information, using hearing for speech and language development); and, profound hearing loss (without intervention, speech and language are unlikely to occur).

Approach to deafness due to knowledge of sign or phonic language

- deaf - using only sign language,
- deaf - using sign language and national language in writing,
- deaf - using sign language and national language in writing and speaking,
- hearing impaired (hearing impaired) - people who speak only the national language in writing or speaking.

Sign language deaf people use national sign language. It should be emphasized that each country has its own national sign language.

Sign languages are visual-spatial languages that use gestures (hands) to provide linguistic information but also other non-dexterity markers, like facial expressions (movement of eyes, mouth, head, eyebrows, etc.), which enrich language structure, adding grammatical elements.

Also, the translation process (which involves the interpretation of the meaning in a language and therefore the production of rendering in another, as accurately as possible) are often very complex, because for one deaf individual, one phrase is a sequence of gestures, movements and facial expressions, and therefore the technological interpretation process to detect the beginning or end of a gesture, movement or facial expression, and therefore the beginning of subsequent one, may be very difficult.

Furthermore, the majority of deaf people have reading and writing difficulties since they use spoken languages as a second language. These aspects arise as a barrier to the digital content access that's presented mostly in text form, having also an interaction impact with the interface platform, with resources and with other users, since the vocabulary utilized in the Learning Management System (LMS) might not be understood by this type of users. In this context - e-learning - digital inclusion and web accessibility issues gain significance.

Whereas universality is the fundamental premise of the web, access must be certain to all citizens, no matter their disability or user profile. Based on this, several approaches exist to accessible eLearning which can be hooked into the pedagogical model, technology, and also the accessibility and inclusion policies followed by each institution. One approach advocates a user-centered model where the platform's interface and also the contents are presented in line with the definitions applied in the user profile. Another approach relies on the pluralist paradigm: student-centered but that specializes in diversity. That is the diversity of the content and the educational resources, of pedagogical strategies, and technologies, creating a heterogeneous community. Regardless of the approach to realize accessible e-learning, it's essential a robust reflection about technology and, as such, the adoption of accessibility standards to make sure the accessibility of the platforms' interface also as of the other web tools and web content utilized in virtual learning environments.

In the web accessibility field, a large range of problems is often found related to learning platforms accessibility in web environments. A number of them also are found within the hearing community, namely: there are many graphic and action elements in the interface of the platform which confuse; some disorganized or unstructured menus should be simplified and follow logical and consistent navigation, showing just the foremost important functions.

It is also noted that the matter of translation into signing isn't restricted to the spoken or written communication, which appears within the e-learning platform interfaces, within the educational resources or maybe within the communication between pairs that arise within the forums or in other technology-mediated tools. Some content provided by teachers or students contains audible information like music or beats which will be essential for the content message understanding. Within the case of musicality, translation into sign language is even more complicated since it involves complex neurological processes that are triggered with the vibrations, the beats, and rhythms. These are very hard to be transmitted in distance mode, a whole-body interpreter is required, or the utilization of colours or other strategies which will convey the aim of sound utilized in the content.

Methods of working with deaf and hard of hearing students

Several methods of work are currently used to educate deaf children.

They can be divided into two groups. The first group includes methods that use native language in the form of audio and written speech.

The second group of methods are manual methods, of which the only one used today is the sign method (also called the bimodal bilingual method). In this method, the basis for communication is a classic sign language as the primary language of a deaf child, developed initially with parents and specialists in early education, and then in kindergarten and school, at the beginning of the didactic and educational process.

In English-language professional literature, it is generally assumed that oral education is more appropriate for hearing impaired students, while sign language education is for deaf students.

However, it is extremely difficult to determine which teaching method is better for a given child, because it results from individual factors that characterize the child and his parents and is also a logical consequence of the difficulty in defining the distinction between being deaf and hearing impaired.

In the case of adults, it is worth remembering that this group is very diverse in terms of the possibilities and preferences of acquiring knowledge and skills. This is influenced by differences temperament, personality, individual abilities, past experience and previous education. That is why it is so important to get to know the group, adapt the methods and forms to the group and, if possible, take an individual approach to people who have problems understanding the taught material.

Adults prefer learning through experience. Conducting classes should use the experience of students, i.e. their life experience, professional, knowledge they had before the training.

By learning the students' experience, the teacher has the possibility of referring to their knowledge and conducting classes in accordance with the principle of moving from known to unknown. Remembering that the basic learning mechanism is associating new things with those already known.

The most commonly used in working with hearing impaired and deaf people:

1. The method of talk

When using this method, remember to:

- *the questions were formulated in a clear, concrete manner,*
- *questions referred to the experiences of participants,*
- *questions were understandable to listeners,*
- *questions were addressed to the whole group.*

2. A description method

When using this method, remember to:

- *the description was supported by a demonstration,*
- *a story supported by e.g. a picture story.*

3. Lecture method

For deaf and hard of hearing people, a typical lecture is rarely used, more often A conversational lecture is used.

When using this method, remember to:

- *the lecture was enriched with a show,*
- *vocabulary of the lecture adapted to the group,*
- *use movies, graphic presentations.*

4. Situational method

When using this method remember that the situation presents with a film or picture story.

5. Brainstorming method

Deaf people present ideas in sign language, the teacher writes them on the board.

6. Staging method

The possibility of using body language, pantomime, without using spoken language. This method can be combined with the problem method.

7. Didactic games

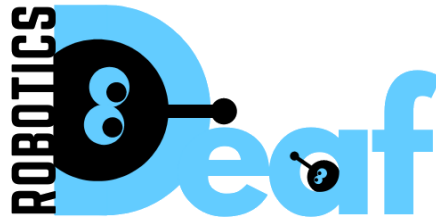
In particular simulation games using body language and pantomime.

8. Practical methods

Visual identity

Logo

The project logo should illustrate the project name and the project theme. The introduction use and objective of the project logo have also to be seen in the context of the temporary duration of the project.



The logo should be used on all project outputs and publications, at events and in documentation intended for public use, as well as for all internal project documentation; the project partners are obliged to and ensure consistency of visual identity at all times.

Colours

Black

HEX: #000000

C: 72 M: 68 Y: 67 K: 88

R: 0 G: 0 B: 0

Blue

HEX: #63CCFF

C: 50 M: 3 Y: 0 K: 0

R: 99 G: 204 B: 255

Fonts

Calibri

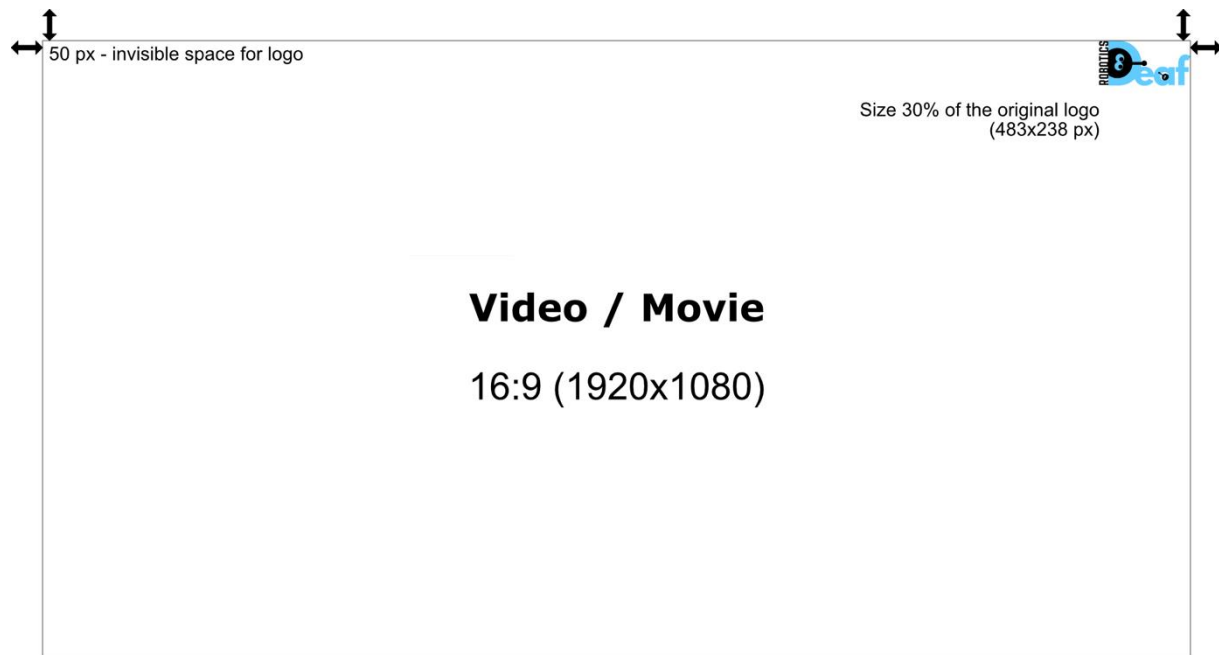
A B C D E F G H I J K L M N O P Q R S T U V W X Y

a b c d e f g h i j k l m n o p q r s t u v w x y z

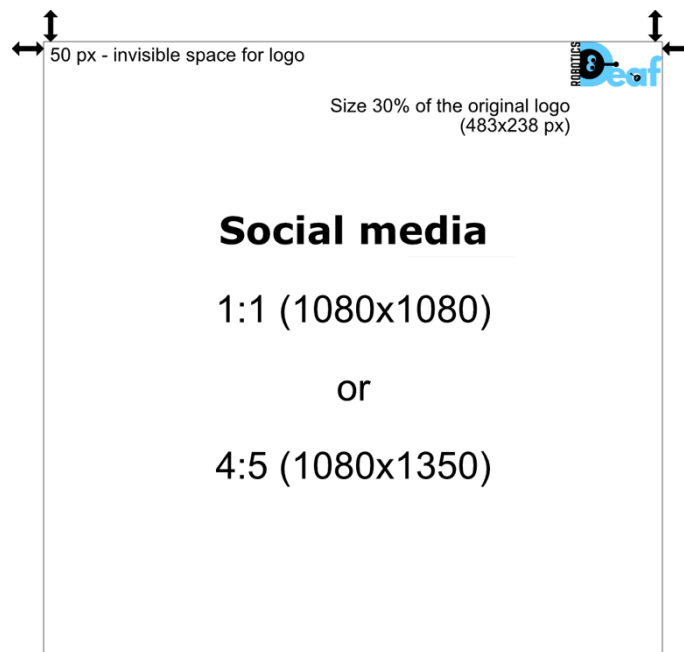
QR code



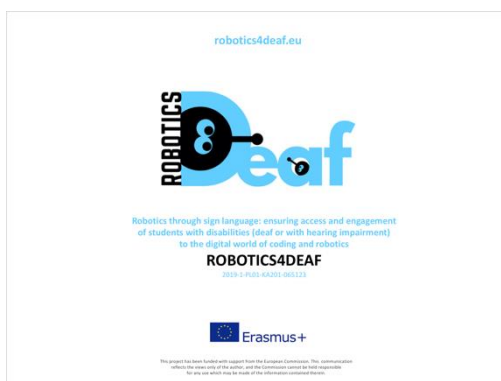
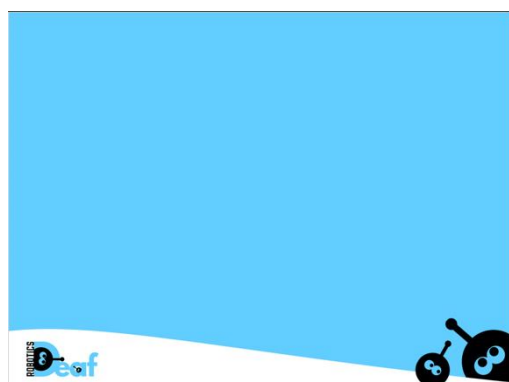
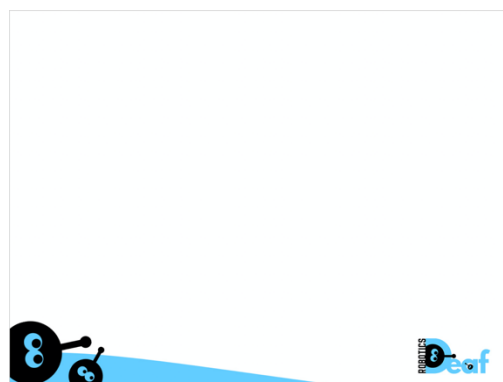
Logo for Video / Movie



Logo for Social media



Presentation



Paper



Robotics through sign language: ensuring access and engagement
of students with disabilities (deaf or with hearing impairment)
to the digital world of coding and robotics

ROBOTICS4DEAF
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Guidelines for the materials

- A. [Guidelines concerning the Teaching Material to be created.](#)
- B. [Guidelines for the Web-Platform to be created](#)
- C. [Guidelines for the educator concerning the training and classroom](#)

A. Guidelines concerning the Teaching Material to be created.

REMEMBER!

- Deaf people constitute a separate language and cultural group.
- Not all deaf people know the national language well.

TIPS:

Actions	Checklist	Additional information
Start the description with general information, then go to the details.	☐	This is a principle that occurs in sign language "from general to detailed".
Present the content in sign language with subtitles.	☐	It is presumed that providing sign language and captions at the same time can improve the content comprehension of deaf students as they learn.
Use plain language, short sentences that are easy to remember.	☐	Whenever possible, plain languages should be used. Plain language is: 1. readable, in that the reader can make sense of the writing with minimal effort; 2. intelligible, in that the message is clear, relevant, coherent, and cohesive; 3. usable, in that it is effective and appropriate for conveying the message.

Explain difficult definitions. Explain Glossaries and Vocabulary Support. IMPORTANT: Definitions must be explained in easy language and sign language	☐	Vocabulary is a major challenge for deaf students. Deaf students must rely on rote memorization, and to amass a national vocabulary comparable to a hearing student is a huge and often insurmountable task. Providing simple resources such as hyperlinking challenging terms, including a content specific glossary, or providing resources to refresh on assumed prerequisite knowledge can benefit deaf and hearing students alike.
Make comics to convey content	☐	Comics are better understood by deaf people and facilitate the development of language competences.
Include images to content.	☐	Creating images that accompany each vocabulary word or content allows a person to recall new vocabulary or understand the content. What images to attach: 1. Using purposeful content-related (non-decorative) images 2. Illustrated dictionary 3. Tagged images for new vocabulary, as appropriate 4. A number of examples illustrating abstract concepts such as movies, images and vignettes.
Organize content graphically. Create titles, subtitles, topics.	☐	1. Give titles 2. Add intersections 3. Create topics 4. List the most important elements 5. Do not write in continuous text

Make summaries of topics.	☐	Summary of each topic helps students better remember the most important information, and also helps to understand what summary is, how to identify important information, and study and store information in the future. To do this, you can: 1. Create guided summary tasks 2. Give examples from other fields / subjects 3. Provide assistance and work resources for additional practice or support
Add frames with important information such as "Remember" or "New word".	☐	This will make it easier for students to remember key terms, definitions and passwords.
Use multiple means of presentation.	☐	Universal design is based on three principles: 1. provide multiple means of representation, 2. provide multiple means of action and expression, 3. provide multiple means of engagement. What this means is that information is conveyed through many different methods and styles. For example, the same content might be presented with a video, a reading assignment, and a hands-on activity. Then, students are given different options and opportunities to show what they have learned. For example, they may have the option to take a test, write a paper, create a video, or build something to demonstrate that they learned the material. Finally, students are given opportunities to become engaged with

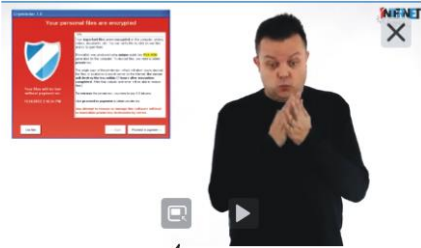
		the course. This may be through gamification, varying difficulty levels in assignments, opportunities to make decisions and choices throughout the learning process, and discussions and collaboration with their instructor.
Make your content interesting and relevant to the topic. Do not enter unnecessary content.	☐	Students are more motivated to learn if they know they will teach them something interesting or important. Researchers have confirmed that the importance of learning content and student interest in a topic affect learning.
Give arguments and examples for your statements.	☐	Translating with specific examples and arguments is more understandable for deaf students. Use examples known to students. This is especially important when introducing a completely new topic or definition.
Make sure teaching materials are prepared or consulted by deaf specialists.	☐	In order to have a guarantee of properly prepared materials, thanks to which we will achieve the educational goal, we should commission the preparation of materials to specialists belonging to the target group. This gives the best results.

Technical notes for creating didactic materials for the e-learning platform.

You need to prepare this content in a way that can be understood by the web developer (prepare it the way it supposed to look like on a web page).

1. If you are planning to use text-only tasks you need to explain difficult words.

Best practice is to use links to explanatory videos in sign language as shown in example below:



Lorem ipsum dolor sit amet enim. Etiam ullamcorper. Suspendisse a pellentesque dui, non felis.
Maecenas malesuada elit lectus felis, malesuada ultricies. **Curabitur** et ligula. Ut molestie a, ultricies porta urna.
Vestibulum commodo volutpat a, convallis ac, laoreet enim. Phasellus fermentum in, dolor. Pellentesque facilisis.
 Nulla imperdiet sit amet magna. Vestibulum dapibus, mauris nec malesuada fames ac turpis velit, **rhoncus** eu, luctus et **interdum** adipiscing wisi.

2. If it's not a text-only task each text must have a sign language translation.



Szyfrowanie połączeń

Lorem ipsum dolor sit amet enim. Etiam ullamcorper. Suspendisse a pellentesque dui, non felis.
Maecenas malesuada elit lectus felis, malesuada ultricies. **Curabitur** et ligula. Ut molestie a, ultricies porta urna.
Vestibulum commodo volutpat a, convallis ac, laoreet enim. Phasellus fermentum in, dolor. Pellentesque facilisis.
 Nulla imperdiet sit amet magna. Vestibulum dapibus, mauris nec malesuada fames ac turpis velit, **rhoncus** eu, luctus et **interdum** adipiscing wisi.

3. If you are planning a quiz prepare this quiz in a way it's supposed to be published on a web page, for example:

Quiz 1

Which sentence is true? (choose the right answer)

- ✗ I love to work
- ✗ I love to work more than in sentence 1

- ✗ I really love to work
- ✗ I'm normal, I hate work (true)

The quiz should be prepared in national language and sign language.

Question 1



1. Sex *

☐ a. Man

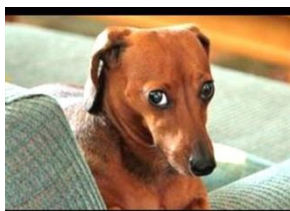
☐ b. Woman

☐ c. I do not want to provide

4. If You are planning on publishing a movie than write a word "Movie" and paste a link to the movie, for example:

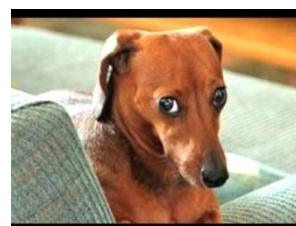
Movie 1 - https://www.youtube.com/watch?v=jOTIEVzeW_Q

5. If you are planning to have a set of pictures with text flowing from left/right/above show how you want it.



This is a gulty dog, Lorem ipsum dolor sit amet enim. Etiam ullamcorper. Suspendisse a pellentesque dui, non felis. Maecenas malesuada elit lectus felis, malesuada ultricies. Curabitur et ligula. Ut molestie a, ultricies porta urna. Vestibulum commodo volutpat a, convallis ac, laoreet enim. Phasellus fermentum in, dolor.

This is a gulty dog, Lorem ipsum dolor sit amet enim. Etiam ullamcorper. Suspendisse a pellentesque dui, non felis. Maecenas malesuada elit lectus felis, malesuada ultricies. Curabitur et ligula. Ut molestie a, ultricies porta



6. If You are planning on publishing a file for a user to download than write:

Click here to download the file (file name xxxxxxxx.pdf from the "xxxx" folder).

Of course, feel free to prepare the content in a way that suits You. Just keep in mind that it will be published on a web page, so you need to show the web developer how you want your content to be posted.

We need to be ok with WCAG 2.0 (websites accessibility guidelines) - remember to add alternative text to any graphic content (right click/properties/alternative text). Don't use colour as an information (f. ex. click the red button - don't do that).

B. Guidelines for the Web-Platform to be created

REMEMBER!

- Provide translation into sign language and subtitles.
- All materials intended for deaf people must be prepared in such a way that they would be accessible and understandable for deaf people.

TIPS:

Actions	Checklist
Create a simple and easy-to-use e-learning website.	☐
Provide multiple contact options (email, Skype, online forms or live webchat).	☐
Provide the option to register for the e-course in many ways (e-mail, Facebook, Google)	☐
Offer structured content such as headings, paragraphs and lists.	☐
Easy navigation on website. It is recommended to use a search button on the page.	☐
Use simple language.	☐
Insert "Join Social Media" tool.	☐

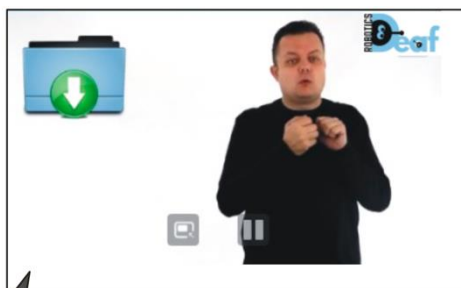
Make sure that all movies have subtitles added.	☐
Make sure that all content is in national and sign language.	☐

Examples of correctly prepared multimedia

Dictionary with word explanation

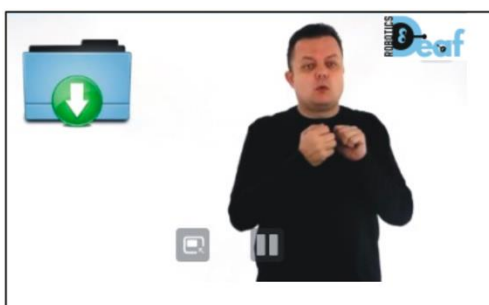
This can be done in two ways:

- as a hyperlink in this password that opens a window with explanations



ROBOTICS - Lorem ipsum dolor sit amet enim. Etiam ullamcorper. Suspendisse a pellentesque dui, non felis.

- as a movie with text



ROBOTICS - Lorem ipsum dolor sit amet enim. Etiam ullamcorper. Suspendisse a pellentesque dui, non felis.

Comic book



Themed videos

A good way to present a difficult topic is to prepare special videos. This method requires writing a script and recording special thematic videos. Videos recorded in sign language with subtitles added.

Example:



Source: <http://pzg.lodz.pl/bezpiecznie/wiedza-dla-dzieci/>

Graphics (photos, drawings, charts, maps, etc.)

For each non-text content, alternative content in the form of text should be provided, which can be converted by the user into other forms (e.g. enlarged print, Braille, synthetic speech, symbols or simplified language).

This entry from WCAG 2.1 was mainly intended for the blind. But due to the educational nature, it is recommended to include a short description (e.g. information on what to look for: detail in the picture, or differences on the chart). It will be much easier for deaf people.

You can also put legends on the map or charts for the correct interpretation of a given graphic or graphic symbol. For complicated graphics, it is worth adding an explanatory video in sign language (complex charts, drawings containing a lot of details, extensive maps).

You can also use computer animations that make understanding easier than with static drawings.

If the graphic is only a decorative function, is used for visual formatting or is not presented to the user, it should not be too highlighted. We recommend avoiding graphics that may interfere with the educational process.

Audio or video recordings

- in the case of audio recording - providing subtitles and translations into sign language,
- in the case of a video recording - providing an alternative text, e.g. audio description for the blind or visually impaired.

Please note that if a movie is an alternative to textual content (e.g. sign language translation of previously presented text), we will no longer make descriptions for this movie.

Subtitles

Subtitles/captions (i.e. ones that contain the translation of a given song into another language) do not contain descriptions of sounds important for the course of the plot or other additional information about the spoken issues (e.g. tone of voice or intention of the speaker) - the hearing viewer registers these aspects without additional help, he is interested in only the content of the dialogues.



Extended Subtitles (for the hearing impaired) is a text intended to compensate for the hearing experience of a deaf person using audiovisual material recorded or made available live. Subtitles are prepared not only for movies and television programs, but also for cinema screenings, theater performances, conferences and other events where spoken words and sounds play one of the roles.



It should be emphasized that the listening experience includes not only the content of the characters' conversations - the description also includes all sounds from the environment and the text and the nature of musical works that are relevant to the story of the song, e.g. "the phone rings", "rock and roll music is heard on the radio".

The inscriptions consist of two lines of up to approx. 40 characters each.

It is possible to use three lines in programs where the image is not important, e.g. interviews with other people, conferences, parliamentary sessions.

We can facilitate reception for hearing impaired or deaf people by assigning the colours - green, blue, pink and yellow to the most-important characters in the song - to speak.



Depending on the position of the character speaking the issue, the inscription can be moved to the left or right edge of the screen.

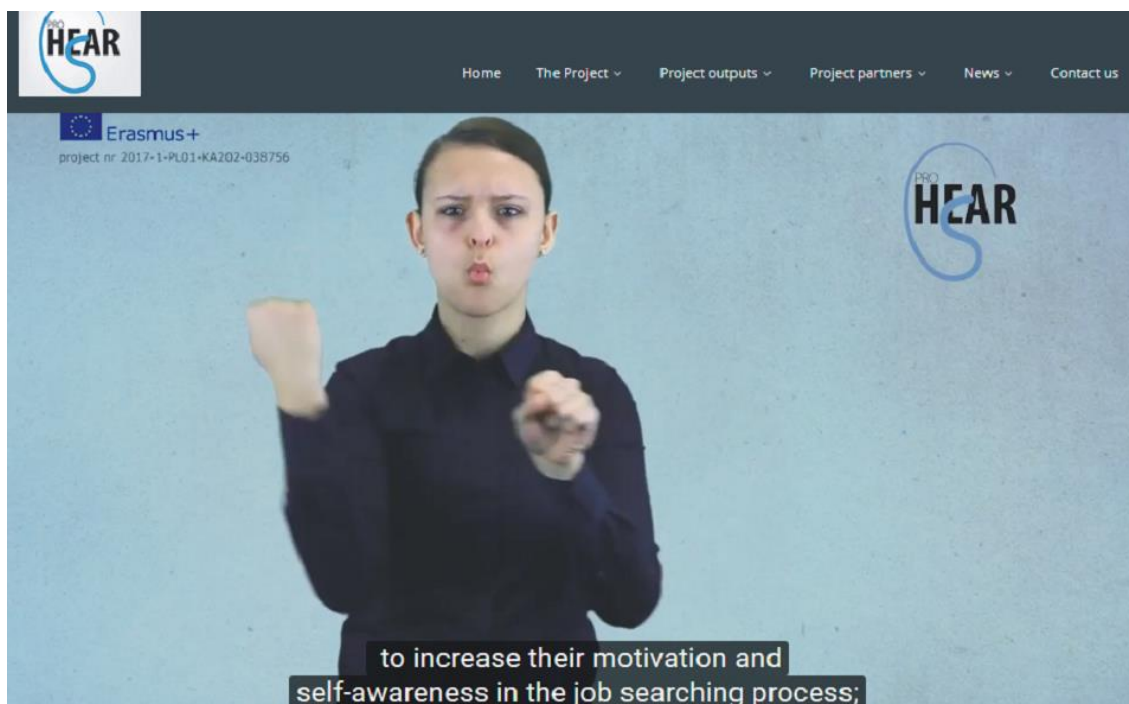


Subtitles are usually broadcast at the bottom of the screen, but with some types they are broadcast at the top to give the best visibility of the action. Sporting events can be such movies. But we also put the inscriptions at the top, when information about the person at the bottom appears, e.g. name and surname, position or organization name.



Sign language translation

1. A video with sign language translation only (text must be included above or below the film or as captions).



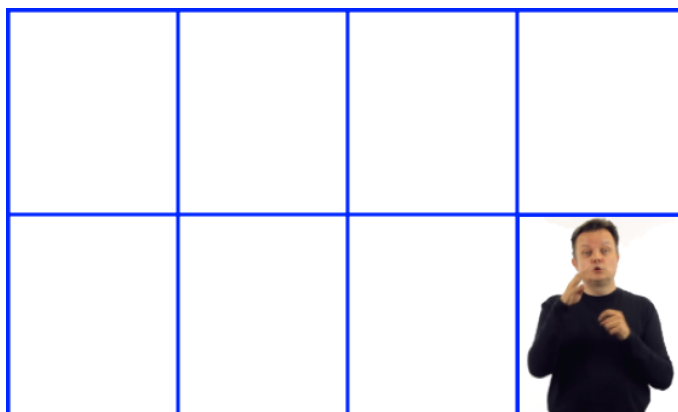
2. A video with interpreter

A. Transparent background (using the "greenscreen" technique)



Important!

The size rule of sign language interpreter applies - minimum $\frac{1}{8}$ screen size for a 16/9 aspect ratio:

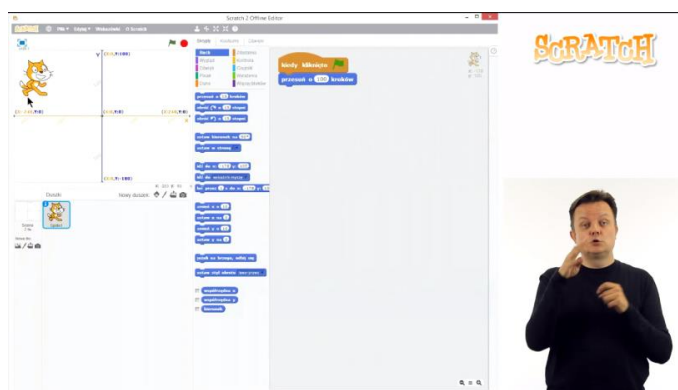


Recommended size is $\frac{1}{3}$ screen for 16/9 aspect ratio:



B. Interpreter in the window (we record the interpreter on e.g. white background)

Here, too, the sign language size rule should apply - a minimum $\frac{1}{8}$ of the screen size:

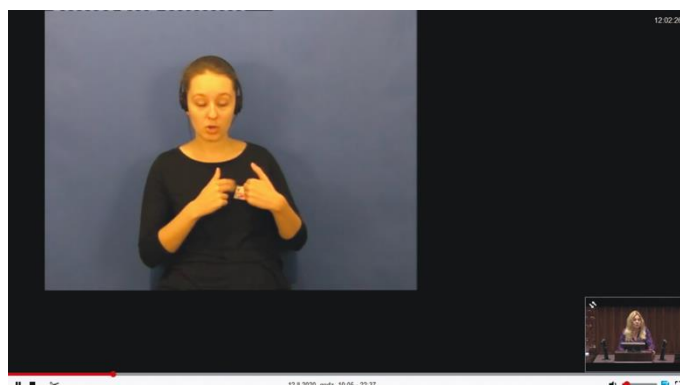


C. Two films, of which the first is a demonstration and the second is a translation (movie in movie).

The film with the interpreter is in a small window above the film with the event:



The movie with the translator is in the big window, while the movie with the event is in the small window:



C. Guidelines for the educator concerning the training and classroom

Actions	Checklist
Determine how to communicate with students (e.g. sign language, writing on a blackboard or computer, speaking loudly).	☐

Make sure communication among students and teacher is in place (e.g. having a sign language interpreter in the room, written text, use of concrete and simple language by instructor, students wear a hearing aid).	☐
Establish participants' experience and life level and readiness to learn new things.	☐
Ensure proper lighting for visuals.	☐
Incorporate well-designed acoustics (for maximum sound production).	☐
Make sure you are visible to the whole group.	☐
Speak clearly using short sentences or phrases.	☐
Do not turn around while speaking.	☐
Use visual aids.	☐
Create the possibility of using available technological solutions.	☐
Make sure the groups are not numerous (optimally 6 people)	☐
In order to attract the attention of a larger group of deaf people, fast is practiced turning on and off the light.	☐
It's best if your teacher is deaf or fluent in sign language.	☐
If a sign language interpreter is present in the class, he must always stand next to the teacher.	☐

Golden rules for working with deaf people according to Mariusz Sak (in the "Good Practice Handbook", Warsaw 2012):

- Deaf people, like everyone, should be treated with respect.
- It cannot be assumed that the deaf cannot, does not want and cannot. stereotypes are very harmful.
- Deaf people are not a homogeneous group. Remember this and never assume that everyone knows sign language in the same way, speaks in the same way and writes in the same way.
- Sign language is the default communication channel for deaf people but ask deaf people about their communication preferences.
- The way deaf people speak and write does not mean that they have intellectual, cognitive and communication limitations.

- Where possible, deaf people should be employed to work with deaf people.
- If the teacher is a hearing person, he must have experience in working with deaf people. If he doesn't know sign language, he must work with a sign language interpreter.
- All materials for deaf people must be prepared in such a way that they will be accessible and understandable for deaf people.



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