Barriers in eLearning for People with a Sensory Disability

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Abstract: Students with a sensor disability often benefit from transcription of auditory or visual media. We identify some of the techniques available as well as some gaps in Learning Management Systems suitable for synchronous collaboration such as video conferencing. Responsibility for accessibility is shared by LMS owners and authors of learning materials. We illustrate two case studies and highlight practical experiences in implementing accessible eLearning settings.

Keywords: Accessibility, eLearning

1   Introduction

Students with a sensory disability are a minority at universities. A recent study by German National Association of Student Affairs (DSW) among students with special needs reports 4.9% of participants where physically impaired (such as people relying on a wheelchair) and 5.6% have a sensor disability (related to seeing or hearing). Although the majority of participants has some form of cognitive disability (52.3%) we expect eLearning services are supporting this large group by more self-controlled learning implicitly. Fig 1 describes the distribution of special needs in German universities in more detail.

Studying is challenging for people who have a hearing disability, are deaf, have low vision or are blind due to special needs for adapting communication with other people including lecturers and examiners. Students with a sensory disability at TU Dresden attend a large variety of degree programs such as computer science, psychology, social sciences, educational sciences, medicine and more and may receive some support for compensation of a disability for examinations.

Both students and teachers may experience lack of accessibility of eLearning services by deficits in digital communication and in particular in the use of notations while reading or writing using their preferred modality. Most sensory disabled people rely on alternative media. In particular, some hearing impaired people may understand voices only if there is no background noise or prefer to follow captions accompanying verbal utterances. Deaf people use sign language and rely on sign language interpreters. People with low vision need high contrast presentations or avoid specific colour combinations (e.g., due to red-green colour blindness). Blind people use linearized notations to read for example tabular

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text by a screenreader software in Braille. Multiple sensory impairments are rare, only very few people with multiple impairments can get access to higher education.

Specifically, students who are deafblind rely on communication by finger spelling (in Germany referred to as lorming) and are excluded from self-controlled eLearning. We have no technical solution to support for computer-based interaction by finger spelling currently.

Creating above mentioned alternative media is often handled by experts and support centres, and sometimes in tandem teams with disabled people for quality assurance.
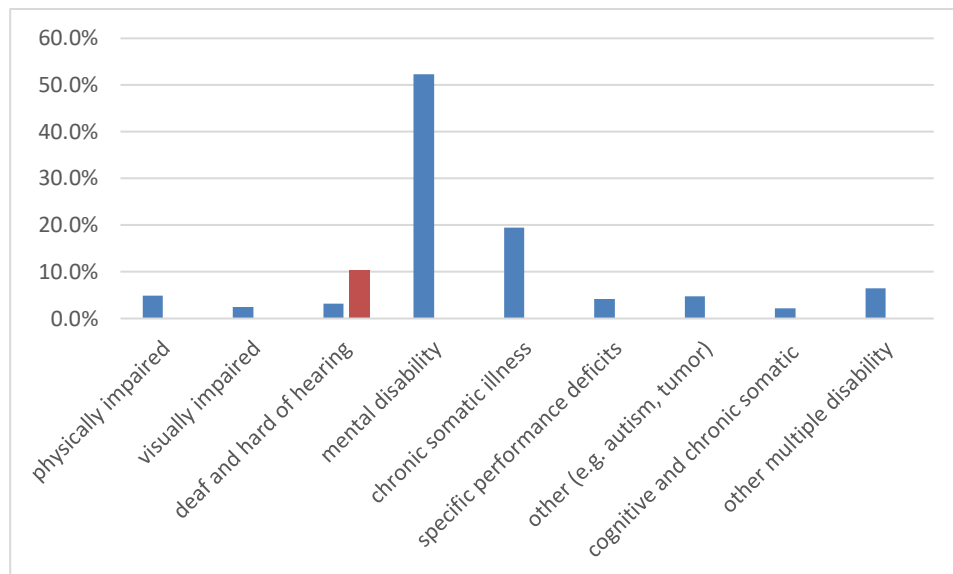
Fig 1. BEST2 Report by German National Association of Student Affairs (DSW)

In the following we focus on a higher education context. It is the lecturer who has expertise in introducing terms and notations needed for a particular scientific topic and who communicates with a sensory disabled student.

We first analyse the responsibilities for accessibility in eLearning based on current legislation in Germany and the EU. By describing two case studies on designing an accessible MOOC and accessibility of conference systems we will highlight inclusive approaches in eLearning.

2   Accessibility of eLearning

Accessible eLearning includes not only access to eLearning material but is a feature of the learning management system (LMS) with a myriad of approaches for presentation of learning objects, synchronous and asynchronous collaboration among learners and teachers, as well as for conducting assessment of learning achievements. This is affected by the recent changes on how accessibility in higher education is enforced legally in the European Union (EU).

An LMS is acquired within the framework of procurement procedures and is thus highly regulated in public institutions such as universities. Accessibility of an LMS can (and in some federal states even must) be part of the tender offer and thus becomes a contractual quality feature. LMSs should meet conformity requirements also due to EN 301 549 in order to comply with national laws and meet EU regulation 2016/2102. This standard refers to Web Content Accessibility Guidelines (WCAG) and requests conformity level AA. Each of the 16 federal states of Germany has implemented 2016/2102 as a law.

In its core, this regulation (and its legal implementation) requests not only to meet guidelines but also requires exceptions need to be declared appropriately and need to be periodically monitored. A reporting mechanism ensures that users can point out a lack of accessibility to the owner of a website (LMS in this case). Users have to get feedback in due time whether accessibility can be established or whether the reported barriers are included in the list of exceptions due to, for example, unreasonable effort.

After selection, installation and adaption of a LMS by lecturers and learners, responsibility for accessibility moves also to the content authors and the learners contributing to the LMS. Lack of competence in applying techniques such as image descriptions of mathematical terms in LaTeX mark-up is commonly a reason for creating inaccessible contents [WV14] [VBW14]. Fig. 2 gives an overview on some of the techniques for accessibility in eLearning.
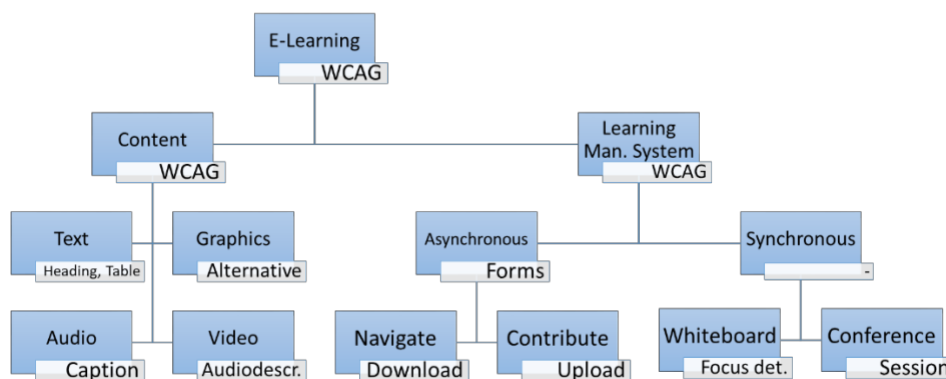
Fig 2: Techniques for accessibility in eLearning

WCAG level provides many guidelines but also many techniques how to meet the guidelines. These techniques are of a general purpose nature but can be adapted to learning materials.

Future curricula in higher education may consider accessibility as part of formal education on scientific writing skills, and in some degree programs accessibility testing can be introduced as a competence to be developed.

WCAG has only few guidelines on interactive features. A good example are links for downloading a document or forms for uploading a document when participating in a course. Links should be self-explanatory and operable by keyboard input. Each textbox of a form should be accompanied by a label in order to link the textbox with a description. We will illustrate this by a case study on an accessible Massive Open Line Course (MOOC) as developed in project MOOCAP[2].

2.1   Case study 1: MOOCAP

MOOCAP partners have developed a MOOC on digital accessibility. The course is an introduction to the topic and runs over 5 weeks each with several learning units. It contains structured text and short videos with interviews, lecture style recordings, or screen recordings of demonstrations (duration of 3-10min). Quizzes complete several learning units with multiple choice questions allowing some self-assessment.

Although there are several platforms for running a MOOC only FutureLearn[3] was identified as being an accessible LMS [Ke15]. Both the assessment of sample courses according to WCAG and a blind user tested the platform. The user was asked to register, sign into the course "Introduction to Cyber Security" and complete one learning unit. Except for managing the personal profile no accessibility or usability issues linked to the use of a screen reader were reported.

Image descriptions were not needed in this case study, but audio descriptions and captions. Both alternative media are required according to WCAG for video recordings. One of the suggested techniques for alternative media suggests to describe the speaker of a lecture briefly for an audio description. Some of the videos were produced without sufficient pauses for adding audio descriptions. In such a case, WCAG techniques suggest to pause the video and add verbal content.

Production of captions by professional services can be time consuming, but there are alternatives. A low-cost, almost automatic approach is based on the caption editing provided by Youtube. Editing allows to fix the begin and end of captions and was often

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[2] https://moocap.gpii.eu/?p=487
[3] https://www.futurelearn.com/

needed. In our experience word recognition for English works sufficiently well in our recordings. Recently, Youtube has disabled its caption editor.

The course on Digital Accessibility was repeated a few times and altogether more than 7000 learners joined it. They were engaged in lively peer-to-peer discussions and these were also tutored by some of the MOOCA partners.

2.2   Case study 2: BigBlueButton

BigBlueButton (BBB) is a web-based open source conference system suitable for a small number of attendants. It allows collaboration among learners through chat, video, audio and a whiteboard. BBB can integrate a LMS such as Moodle. In spring 2020 BBB became available at TU Dresden to support examinations and teaching in small groups due to the Covid-19 pandemic.

Accessibility of BBB is high[4] and meets level AA of WCAG with exceptions such as lack of support for editing on the virtual whiteboard by a blind user as other LMS [Kö12]. This will also be declared by TU Dresden, for example in its accessibility declaration[5]. At this point of writing a suitable organisation for accessibility declaration of more than 200 websites and subsystems of tu-dresden.de was still under work.

In a pilot study with a blind user we evaluated accessibility of BBB successfully for core tasks. The blind participant was asked to join a session by video and microphone, read and contribute to the chat, manage moderator rights and initiate a presentation. Although the chat is accessible, we recommend to avoid it as it is too time consuming to listen to a speaker. Captions can be generated only manually within BBB by uploading timed text files or by a stenographer and was not tested.

3   Outlook

Establishing accessibility of eLearning requires good support from many stakeholders. One important inaccessible component of LMS are some assessment types. ONYX, for example, may require mouse operations on graphics or dragging text blocks by a pointing device [WV14]. In this and other areas we need to improve the LMS's components and their accessibility as well as the competences of lecturers and administrators for monitoring accessibility.

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[4] https://bigbluebutton.org/accessibility/
[5] https://tu-dresden.de/barrierefreiheit

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