Inclusive teaching at ETH. What is meant by this and what are the implications for learning and working at ETH?

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Abstract

Under the title "Hindernisfreiheit an der ETH Zürich", ETH is committed to the inclusion of people with disabilities. In addition to structural measures and adaptations, organisational, and information-technological aspects also play a central role. To enable all motivated students to participate in their studies and academic life with equal opportunity, regardless of any special needs and circumstances, teaching in particular is becoming the focus of attention.

A prerequisite for inclusive teaching is the availability of accessible digital learning materials. “Accessible” means that these learning materials can be used efficiently and effectively by all students, regardless of sensory or physical disabilities or of special needs due to neurological characteristics. Many of these students are true masters of applied problem-solving strategies, but unfortunately, still today, some content remains inaccessible.

The increasingly ubiquitous digitalisation of all aspects of life, including academic life, is a blessing for the worldwide efforts to increase educational opportunities also for people with disabilities. In many cases, the availability of digital learning content is a prerequisite for its accessibility. Print is not universally accessible! Flying in the face of these opportunities, still very little publicly available digital content is accessible – and the same applies, to an unfortunately even greater extent, to teaching materials.

Digital learning materials include not only textbooks, but any informative content that is relevant to students' everyday lives. This includes electronic user interfaces of learning and information platforms, examination systems, teaching applications, document-filing systems as well as their respective content. People with disabilities often depend on electronic content being well-structured and machine-readable, in particular, that the content can be displayed in different ways, for example, greatly enlarged, or that images or multimedia have appropriate textual alternatives.

Ensuring the accessibility of information and learning content on learning platforms, in scripts, and in other documents cannot be achieved without the active assistance of all ETH stakeholders involved in the creation and deployment process. Procurement managers are encouraged to acquire accessible software and frameworks. Developers must ensure that their products can be operated using both keyboards and computer mice, and that the content can be displayed as flexibly as possible. Content creators need to ensure that their content is well-structured with rich, explicit semantics, so that it can be navigated efficiently and without additional barriers using screen readers (software that allows blind people, for example, to

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read on-screen content in spoken language or Braille). In fact, it has been shown that content created with "accessibility in mind" is generally easier to understand – for everyone!

Of course, all those involved are not left alone with these challenges. The administrative department Educational Development and Technology (LET) supports all members of ETH in all aspects of the implementation of e-accessibility: in the transfer of knowledge through practice-oriented training, targeted courses or individual consultations, or by providing and preparing the relevant resources.

Inclusive higher education

The academic world is becoming increasingly diverse and this trend is likely to accelerate in the future. Gaisch and Aichinger (2016) identify five facets of diversity and map them in the Higher Education Awareness for Diversity (HEAD) Wheel reference framework: demographic, cognitive, disciplinary, institutional, and functional diversity. Each facet brings its own requirements for adaptation for higher education.

ETH Zurich is facing up to the challenges. With the university-wide programme "Hindernisfreiheit an der ETH" (Storjohann & Weltner 2021), it is committed to the goals of an inclusive, diverse and accessible university. The programme focuses on equal-access opportunities for all members of its academic community, and its main goal is to ensure unencumbered access to studies for people with disabilities or other special needs.

This article explains what is meant by accessibility in the context of teaching, and what implementing the requirements for accessible teaching means for the university and its members. The focus is on the provision of accessible digital learning materials. Didactic aspects are discussed only marginally for the time being. Based on the experiences of the current implementation of accessible teaching at ETH, it discusses potential stumbling blocks and how best to address them.

The increased interest and commitment to inclusion, diversity and accessible education is by no means a short-term fad, but rather a result of the ongoing struggle of minorities for recognition and self-determination that has been going on for decades. In the USA, but also in other Anglo-Saxon cultural spheres, accessible educational institutions with their competence centres are now a matter of course and have become indispensable. With an estimated 15-20% (Officer & Posorac 2011) of the world's population relying on accessible content in some way, accessible educational resources are becoming an important competitive advantage. Where this competition plays out, a lack of accessibility is readily perceived as a lack of customer orientation and social responsibility.

The conditions in the USA did not develop by chance but have been largely triggered by the introduction of relevant laws (ADA 2020). In Switzerland, too, ensuring the accessibility of public institutions and their information and service offerings is regulated by legal regulations (EBGB EDI 2021). At the federal level, these include the prohibition of discrimination in the Federal Constitution[4] and the Disability Equality Act (BehiG)[5]. Since the UN Convention on the Rights of Persons with Disabilities came into force in Switzerland in 2014 (Fedlex 2020), stakeholders and disability organisations are also hoping for increased legal pressure on private providers.

However, legal considerations are not the best reason for universities to get involved in the inclusion of people with disabilities. The commitment to inclusion and diversity is an expression of a humanistic and liberal idea of society, where every person can develop freely according

[4] www.fedlex.admin.ch/eli/cc/1999/404/de#a8

[5] www.edi.admin.ch/edi/de/home/fachstellen/ebgb/recht/schweiz/behindertengleichstellungsgesetz-behig.html

to his or her own wishes, and it is simply the right thing to do! An inclusive education system is an investment in this society. For people with disabilities or any special needs, this opens up many exciting employment opportunities, facilitates social participation and promotes the independence, self-determination and self-esteem.

For the higher education institutions themselves, opening up to people with disabilities also means access to a greater diversity of promising talent. People with disabilities have a wide range of talents – not in the least precisely because of their disabilities and the alternative perspectives, acquired skills and developed problem-solving strategies associated with them.
It is no coincidence that the call for accessible education is attracting increased interest in Europe now, 30 years after the first website was launched at CERN. Sir Tim Berners Lee expressed the importance of his invention, the World Wide Web, for the inclusion of people with disabilities as follows:

"The power of the Web is in its universality.
Access by everyone regardless of disability is an essential aspect."

Unfortunately, the hopes that digitisation would by itself lead to universal accessibility have not yet been fulfilled. However, it can be stated that the digitisation of information and communication technologies (ICT) is an important prerequisite for the accessibility of information and communication channels; both are important aspects in teaching.
Especially now, when strategies for digital transformation are being revised and optimised, it is the right time to also consider electronic accessibility (e-accessibility) from the very beginning and to establish it as an important requirement in the digitisation process.

Digital accessibility as a prerequisite for the inclusion of people with disabilities

Digitalisation holds enormous potentials for inclusion and for equal and self-determined participation in the information society and in society in general. Many opportunities would be inconceivable without modern digital information and communication technologies (ICT). Electronic services and information offerings hold the potential to make accessible to people with the most diverse disabilities a multitude of activities necessary for a self-determined life:

- Thanks to online newspapers, blind people can independently call up up-to-date information and have it read out to them or printed in Braille.
- People with a wide range of visual impairments can adapt the visual representation of screen content to their individual needs – by enlarging, changing the font, individualised colour schemes, and much more.
- People with motor impairments can operate technical devices with the help of various aids. These range from special keyboards, push-button devices, eye-tracking devices (eye movement controls) to speech input software.
- People with mobility impairments can overcome many everyday challenges online from home: from administrative procedures, banking and insurance transactions, ticket purchases, hotel and travel bookings to online shopping.
- People with speech or other communication difficulties can communicate online through appropriate channels: orally, in writing, in sign language.
- People with learning disabilities or cognitive impairments can access texts in easy language, supplemented by symbols and animations, or have texts read to them.
- People with hearing disabilities can make use of subtitles or text transcriptions, which can now be generated automatically with little effort and in respectable quality. Information for people with hearing disabilities can be prepared as sign language videos and made publicly available to all.

Equitable access to such offerings through individual adaptations or through the availability of content for alternative sensory channels would be possible without any problems with the technologies available today. Would be! Unfortunately, this potential is hardly considered today. A prerequisite for these scenarios to become reality is the accessibility of the ICT used.

Who benefits from accessible digital content and user interfaces?

The shortest possible answer to this question is: everyone. Of course, given severe cognitive disabilities or lack of access to the necessary technical infrastructure, this statement is presumptuous. Nevertheless, in our understanding, e-accessibility targets all conceivable types of disabilities and special needs. As can be seen from the examples listed above, the focus is particularly on sensory, motor, and cognitive disabilities. The needs, problem-solving strategies and requirements concerning motor and sensory (visual and auditory) disabilities are largely known. As far as special needs due to cognitive characteristics are concerned, the path to solutions is less clear, not in the least because the individual needs and the corresponding requirements differ greatly, in contrast to the requirements for people with visual, auditory, and motor impairments; they cannot be so easily summarised in general guidelines.

Concept of disability

At this point, it is worth taking a look at the ICF/WHO bio-psycho-social concept of disability as it is applied today (WHO 2002). In contrast to earlier models, this model of disability does not focus on either individual physical impairments alone or social factors alone, but rather on the interplay between physical, personal, social and environmental factors and their impact on activities and participation opportunities of persons. In this context, we now speak of damage to bodily functions, limitations in certain activities and disabilities in people's participation in various aspects of social life. Disability thus manifests itself mainly in the interaction of people with their immediate physical and social environment, that is, in participation.

Principles of digital accessibility

Measures to improve the accessibility of electronic user interfaces follow different approaches, just like people with disabilities develop different adaptive strategies to deal with their limitations: by compensating for a damaged sensory channel with the help of other senses, by intensified use of memory or by direct adaptations to the immediate environment. In the case of ICT, these range from zoom (magnification) functions on screen, the use of large screens up to special assistive technologies (ATs). These include complex technical devices and software, such as speech output through screen readers, speech input, eye-tracking devices, augmentative and alternative communication (AAC), as well as special input devices for people with severe physical and motor disabilities who cannot use a computer mouse.

For individual adaptations and assistive technologies to work in interaction with the external environment, in our case with electronic user interfaces, certain conditions must also be met in that external environment. In the physical world, this is exemplified by ramps for wheelchair users.

Bolfing (2021b) suggests five easy-to-remember aspects that largely cover the prerequisites for accessible digital content and user interfaces:

1. **Flexible output:** Content can be displayed flexibly: Texts reflow when enlarged, so there is never any need to scroll horizontally. Page layouts adapt to the size of the window. Font and background colours, line spacing, fonts, etc. can be adapted individually.
2. **Flexible input:** Applications and interactive elements can always be operated with both a computer mouse and a keyboard. Computer mice are representative of other pointing devices such as mouth mice or eye-tracking devices. Keyboards are representative of

serial input devices based on special, sometimes few, keys, as often used in individual devices for people with severe physical disabilities, e.g., quadriplegics.

3. **Explicit semantic information:** Much of the information that we, as trained sighted people, immediately and implicitly perceive and process when viewing screen content is not accessible to blind people. These visual cues must be added actively and explicitly to the content as so-called semantic information. On websites, this includes, for example, labels of page areas such as header, footer, navigation or main areas, correct structuring of content by means of heading levels, correctly formatted lists and tables, correctly labelled buttons, or form fields, but also alternative texts for images or icons. Modern widgets, such as overlays, drop-down menus, accordions, sliders, or various multimedia players, etc., pose special challenges here. This semantic information allows machine readability and is an indispensable prerequisite for the functioning of complex assistive technologies such as screen readers or speech input software.
4. **Multimedia and images:** Information that is conveyed by means of multimedia or images is always provided in at least one additional sensory mode. We call this requirement the two-senses principle. Information conveyed visually in videos and images must also be provided auditorily or as text. Audio-only content, or audio content in videos, must also be provided visually, e.g., as a sign language video or as text (e.g., as (closed) captions).
5. **Colours and contrasts:** All relevant content such as text, icons or form field borders must exceed a minimum contrast ratio to the background, and essential information must not be presented using colour alone (e.g., colour legends of diagrams or reservation systems).

Guidelines and standards

While the above five aspects of digital accessibility help to develop a comprehensive understanding of the at times complex requirements for accessible ICT, they are of limited use as concrete guidelines for action.

Fortunately, at this point we can draw on the valuable groundwork done in the field of universal design and digital accessibility. The first general design principles for accessible architecture and accessible product design became known as Universal Design in the 1960s (The Center for Universal Design 1997). Even back then, the requirements requested that products 1.) be usable by as many people as possible, 2.) be adaptable to individual needs if necessary, and 3.) also be compatible with common assistive technologies.

The Web Content Accessibility Guidelines (WCAG)

In 1999, the first version of the today internationally established Web Content Accessibility Guidelines WCAG for accessible web content was published as a W3C standard. This was followed in 2008 by WCAG 2.0, which still form the basis for most legal regulations for digital accessibility worldwide. In WCAG 2.0, the guidelines were no longer formulated specifically for HTML, but were technology-agnostic. To persist in the rapidly changing technological environment, the guidelines have since been formulated in such a way that they can be applied equally to any digital user interfaces and content, regardless of the technological implementation. In 2018, WCAG 2.0 was followed by the current extension of WCAG 2.1 with 17 new success criteria, which closed known gaps in WCAG 2.0 regarding touchscreen operation and cognitive impairments. Nine additional success criteria are expected in version 2.2, which should be updated by the end of 2021.

From version 2.0, the WCAG are divided into the four POUR principles: Perceivable, Operable, Understandable and Robust. In version 2.1, these four principles contain a total of 13 guidelines with a total of 78 so-called success criteria, which in turn can be assigned to 3 levels of conformity. The success criteria on level A ensure the basic requirements for digital accessibility, those on level AA cover the most frequent and relevant barriers. Where legal regulations exist for digital accessibility, WCAG 2.0 or 2.1 at conformance level AA apply as the de-facto standard. In Switzerland, this is regulated within the framework of the eCH-0059

standard, in the EU by the European standard EN 301 549. The success criteria at level AAA meet the highest accessibility requirements and are usually considered by institutions specialising in communication with people with disabilities.

Conformity with WCAG 2.1 AA means meeting a total of 50 success criteria, 30 at level A and 20 at level AA. Although the success criteria are formulated in such a way that they are relatively easy to verify, the technology-agnostic formulation means that the guidelines themselves allow little concrete guidance for action. Therefore, the actual W3C standard WCAG (W3C WAI 2021a) is embedded in a whole series of other documents and other standards. These include How to Meet WCAG 2 (Quick Reference)[6], Understanding WCAG 2[7], Techniques for WCAG 2[8], the WAI-ARIA Standard[9], the Authoring Tools Accessibility Guidelines (ATAG)[10] or the User Agents Accessibility Guidelines (UAAG)[11].
The driving force behind these standards, guidelines, and specifications, but also a valuable source of inspiration for raising awareness and providing assistance of all kinds in the area of digital accessibility, is undisputedly the Web Accessibility Initiative (WAI)[12], a division within the World Wide Web Consortium (W3C)[13].

Digital accessibility should therefore not be underestimated, neither in scope nor in complexity. However, it is not so much the aspect of accessibility itself that is extensive and complex, but rather the digital-implementation aspect, where the requirements are spread over many shoulders; and not everyone who comes into contact with the topic needs to master all the relevant guidelines and standards.

Accessible higher education teaching

Basically, the same requirements for the digital environment as everywhere else apply to teaching. The focus here is on digital information and communication channels and on technologies for organising studies, for imparting and reflecting on knowledge and applications skills, for exchanging and reflecting on exercises and, finally, for checking what has been learned in the context of performance and skills certificates. This means that the demands on educational institutions are much more comprehensive compared to other institutions, where efforts to achieve accessibility are often limited to external communication in the form of websites or web services.

Digitisation as a prerequisite

As is the case for the topic of accessibility, the availability of information and communication channels in digital form is a prerequisite for accessible teaching in the first place. For people with very severe limitations, for example people with severely limited mobility, this also includes the possibility of completing a large part of their studies online as distance learning. However, this aspect will not be further discussed below, nor will didactic aspects.

Digital interfaces between higher education institutions and students

An important and often underestimated aspect of inclusion and accessibility is the associated independence and self-determination for those affected. However, this can only be achieved through seamless access to all relevant information, services and other interfaces between the university, the department, and the students.

[6] https://www.w3.org/WAI/WCAG21/quickref/
[7] https://www.w3.org/WAI/WCAG21/Understanding/
[8] https://www.w3.org/WAI/WCAG21/Techniques/
[9] https://www.w3.org/TR/wai-aria/
[10] https://www.w3.org/WAI/standards-guidelines/atag/
[11] https://www.w3.org/WAI/standards-guidelines/uaag/
[12] https://www.w3.org/WAI/
[13] https://www.w3.org/

Organisational aspects of study

Before students can actively and enthusiastically start their studies, they must overcome a multitude of organisational hurdles: study regulations must be studied, course catalogues must be consulted, personal study and timetables must be compiled, lectures and courses must be enrolled into. What are the rules in the individual departments, at the individual chairs, and where do which lectures and courses take place? People with disabilities, e.g., blind people, also want to be able to gather all this important information on their own. A variety of digital applications and information portals are available at ETH for this purpose: the teaching applications and the ETH websites. These are the best prerequisites for the path towards an inclusive university.

Learning materials

Undoubtedly, the most important, but also the most challenging aspect of an accessible study, is seamless access to all relevant learning content. This is demanding because during a study programme or course, an enormous amount of learning content accumulates on the most diverse media and platforms – and this from the most diverse sources and under the most diverse responsibilities.

Textbooks and academic articles

There are the textbooks and academic articles from publishers and authors outside the university itself. The direct influence on the accessibility of this content is of course limited. Often textbooks are not even available in digital form. Scientific articles are also often only passed around as photocopies or as scanned PDF documents. In these cases, it is advisable to prepare the content accessible within the university, if necessary, i.e., at the request of those concerned. For legal aspects see Marrakesh Treaty (WIPO 2013). In the USA, almost every college has an accessibility office where applications can be made. In the medium term, this practice is likely to become established in Europe as well.

Own content, lecture notes and other in-house productions

It is easier to ensure accessible learning materials wherever they are produced in-house and can be made accessible themselves. This means for own academic articles, lecture notes, contents of e-learning platforms, presentation slides, etc., but also for learning videos and lecture video recordings.

The goal of the inclusive university must be to implement as much accessibility as possible when the learning materials are created. Content should not have to be subsequently edited to make it accessible but should always be planned and implemented with accessibility in mind. This requires a gentle cultural change, which can be achieved through awareness raising and suitable, efficient, and practice-oriented training offerings. This includes lecturers, teachers, assistants, and all those who are involved in any way in the production of learning materials. Not every single person involved needs to become an e-accessibility specialist. Often, it is a matter of familiar habits that need minor adjustments, or even just adjustments to software settings, e.g., the PDF-export function of authoring tools such as Office applications. For others, a good introduction to the topic of accessible documents finally provides the convincing arguments to work with format templates. Or a department or chair makes a conscious decision in favour of accessibility to offer all learning materials centrally in HTML format in the future, at ETHZ for example in Moodle or Polybook (see LaWeb on Gitlab). This, in turn, benefits not only people with disabilities, but all students, who no longer need to laboriously search for the various documents and content resources on several platforms. The same applies to semantically well-structured content, which helps everyone, regardless of any special needs, to find their way around the content better and to better integrate the content into existing knowledge.

Accessible learning materials present authors with a few challenges that go beyond the classic requirements for accessibility, especially at the university level. Textbooks, lecture or presentation scripts, for example, often contain highly complex illustrations that depict entire system contexts. Text alternatives for such complex illustrations can only be written by specialists who are appropriately sensitised to the needs of people who depend on them. Further challenges arise from mathematical, chemical, or other subject-specific formulae and symbol languages – however, accessibility of the lingua franca of mathematical typesetting, LaTeX, is provided on all standard learning systems of ETH.

Lecture recordings & teaching videos

Another peculiarity of accessibility in teaching is the high value placed on video material. For many people with disabilities, lecture recordings are not just a nice convenience (in addition to the face-to-face lecture), but the one main source of knowledge transfer. People with hearing disabilities rely on the text transcriptions, e.g., in captions. For people with mobility impairments, lecture recordings and learning videos are often the only way to access certain courses at all. Others simply learn better if they can listen to what their professor has to say several times. Why not in the evening during a jog? The COVID-19 pandemic has shown us in recent months how helpful video recordings of lectures can be.

To ensure accessibility of video footage, some key points need to be considered. Spoken text and relevant audio content must also be available in the form of high-quality text transcripts for students with hearing disabilities. Although there are technical possibilities today to have captions of considerable quality created fully automatically at reasonable prices, their quality is often insufficient in the context of university teaching, where many complex issues are addressed, and specific technical terms are used. Fully automated captions should therefore always be checked for quality by experts and adapted if necessary. Visual content, e.g. complex illustrations or statistical analysis graphics on presentation slides, must be described verbally in such detail that their central content can be understood even if the graphics remain invisible.

E-Learning platforms, collaboration tools and teaching applications

Optimally prepared accessible learning content is of little use if it can only be accessed poorly or not at all by people with disabilities. It is therefore crucial that the technical infrastructure of the university with e-learning and video platforms, collaboration tools, document filing systems or apps and websites itself meets the highest accessibility standards. These are the platforms from where the actual content is downloaded or within which it is consumed directly.

Roughly speaking, two main sources of digital accessibility problems can be identified: editorial and content aspects are generally the responsibility of authors. Aspects of interaction and orientation within applications, on the other hand, are the responsibility of their developer teams, which are typically software companies or IT-teams at universities. This includes navigation concepts, forms, widgets such as overlays or accordions, etc., and feedback concepts. Do all interactive elements also work with screen readers or with keyboard only, are the different areas of views also well distinguishable by screen reader users, etc.? It is also the responsibility of software creators to ensure that authors can create accessible content at all. Can correct heading levels be specifically assigned to headings? Can illustrations be provided with alternative texts? Can tables be provided with table headings?

In universities, the procurement departments for the technical infrastructure are responsible for this. Systems to be purchased must be carefully checked for accessibility and vendors must be held accountable in the event of problems. Furthermore, in terms of accessibility, less is more: it is advisable to concentrate the technical infrastructure on a few high-quality products. This also minimises complications caused by tedious searching for learning content – a hurdle not to be underestimated for all students, but a high hurdle for people with disabilities.

Software

Universities not only impart pure knowledge, but increasingly also application skills. Especially in higher education, these are often connected with the use of special software and user interfaces of special devices. We would like to urge the responsible bodies to take accessibility aspects into account when procuring or developing their own software.

E-Assessment / Distance Testing / Online Testing

Teaching does not end with the imparting of knowledge and competences, but also centrally involves the regular and final verification and assurance of what has been learned within the framework of performance and competence assessments. Quite independently of special needs and disabilities, complex regulatory and technical challenges arise where examinations take place on computers, e.g., because application competences in programming or computer-based statistical analysis want to be measured. People with disabilities are often fundamentally dependent on the possibility of computer-based examinations; paper-and-pencil exams are not possible for many people with disabilities. What is needed, therefore, are possibilities and approaches for conducting examinations in a computer-based, secure, legally watertight, and accessible manner.

Institutional aspects of accessible teaching

Under "Digital interfaces between higher education institutions and students" in the previous section, it was shown where possible problems of digital access might exist. Teaching, as its central element, is closely linked to practically all areas of a higher education institution. Involved are the areas of central infrastructure and IT, areas of university communication, the library, student services and especially the departments and chairs where the actual teaching is taking place.

In this environment, developing a strategy to ensure the accessibility of teaching presents all universities with challenges that must not be underestimated. The greatest challenge is to ensure the accessibility of teaching across the board, while at the same time leaving the freedom of the departments and chairs as untouched as possible.

Motivation and awareness building

All parties involved in the selection, procurement and production of teaching materials must be convinced of the goal of accessible teaching and intrinsically motivated to make their respective contributions. A gentle but profound cultural change is desired, whereby accessibility and inclusivity become a matter of course and an everyday normality at the university; without the active commitment of everyone, inclusive teaching remains wishful thinking. People should develop an interest and curiosity in the topic through good awareness campaigns. They should be informed transparently at an early stage what planned measures mean for each individual person, and it must be ensured that they receive the necessary support in all areas.

Nevertheless, it will not hurt any university to explicitly incorporate accessibility in its development strategy, and to have this goal strongly supported and promoted by the university executive board.

Knowledge and competence building

A comprehensive range of support services and training requires the availability of relevant knowledge and application skills within the university. At ETH Zurich, the information platform on accessible teaching (Bolfing 2021a) offers a comprehensive selection of good online tutorials and resources under the heading Resources. Currently, several promising initiatives

are emerging to promote inclusive higher education in Switzerland, which aim to make this knowledge and the corresponding application skills available to a wider public.

The aim of training is to enable all stakeholders. It is important that the right know-how and competences are built up specifically where they are needed. Authors do not need training in accessible web development, but they do need to know how to use their authoring tools correctly to create accessible content, how to structure content semantically correctly and what to look for when writing alternative texts. Procurement managers need to know how contracts must be tendered, that contractors and suppliers can be held to the assured accessibility of their products. Within most individual areas of responsibility, the key accessibility requirements are usually easy to learn. And, once they are learned, they hardly cause any significant additional effort.

Accessibility offices

Awareness-raising and information campaigns, support, and training services, as well as the interaction of the many stakeholders, certainly need to be coordinated. As explained under "Learning materials", accessible teaching concerns not only the departments but also the central digital infrastructure for e-learning, information and video platforms, and other relevant teaching applications, including, for example, the university's library or student services.

In the USA, where digital accessibility in education is widespread and established, university departments have proven themselves to be able to carry out this organisational coordination effort. Today, practically every educational institution there has an accessibility office, which, in addition to assisting students with disabilities, also supports and trains faculty members. Where still necessary, these offices initiate the cultural change. They develop visible strategies and policies, such as an HTML-first strategy, when it comes to making content available in the most suitable format for digital accessibility. They develop concepts for the necessary knowledge development and retention. For example, when uploading video and audio files to media or e-learning platforms, they can link directly to automatic text transcription services, so that all uploaded videos and audio files are automatically added with closed caption or text transcripts respectively. If higher quality text transcriptions are needed, it is their specialised service that can handle such orders. Specialised agencies advise on new challenges and develop new solutions to new problems.

Accessibility offices are contact points for people with disabilities and offer short-term ad-hoc support with various problems concerning access to digital content.

Conclusions: accessibility as a process

From what has been said so far, it should be clear that the state of accessibility at a university cannot simply be decreed, but that accessibility is a constant process of improvement and optimisation.

Once this process has been initiated, it is the new, talented, and innovative students themselves who help to improve the quality of accessibility with their concerns and suggestions for solutions. We look forward to this day.

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