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integration of web accessibility courses

Recommendations on Integrating Web Accessibility Courses into Higher Education ICT Programmes

This report has been produced as part of the Erasmus + Key Action 2 Strategic Partnership project:

Integration of Web Accessibility Courses in ICT programmes (IWAC)

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Authors:

Sara Kjellstrand – Funka

Christophe Strobbe – Hochschule der Medien, Stuttgart

Susanna Laurin – International Association of Accessibility Professionals (IAAP)

Lisa Sällvin, Jimmy Åhlander – Mittuniversitetet, Sundsvall

Federica Imperiale, Marina Ribaudo – Università degli Studi di Genova

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Introduction

As more and more services both in the public and private sector become digital, it is increasingly important to ensure that everyone can access and use online content and services, regardless of individual abilities.

To make sure that digital content is accessible, the next generation of developers, designers, and content creators need to learn the basics of accessibility during their university training. However, this is currently rarely happening. There is a general lack of knowledge about web accessibility among teachers on ICT courses at university level, and therefore it is still most often seen as a specialist subject rather than as an essential part of the training for all future ICT professionals.

This is the challenge that the IWAC project has taken on. The aim of the project is to introduce web accessibility for university teachers that are new to the subject, and to provide concrete tools and examples that will help teachers get started

The project provides:

- Good practice examples
- Handbook
- MOOCs
- Cases

All the outputs of the project are available at the [IWAC project page on the IAAP Nordic website](#)

In this final output of the project, we are collecting the learnings and insights from the project and from the different outputs into a series of recommendations on how to integrate web accessibility in ICT courses and programmes on university level.

Target audience

In line with the objectives of the project and the accompanying outputs, the guide has been primarily conceived for teachers and programme managers who design and or deliver education and training in IT-related subjects at the higher education level.

However, many of the recommendations can also be applied in other educational contexts for professional ICT training, such as in vocational education and training (VET) courses and life-long learning processes. The overall aim is to make it easier to start making the

connection to accessibility in all ICT related courses, and to include the basics of web accessibility in courses made available for all students.

The project partners therefore hope that the recommendations will be of interest to anyone interested in IT training and education in the broad sense.

Structure of the report

The recommendations have been structured into 4 main sections:

1.   Motivations for getting started with web accessibility teaching

2.   Recommendations for curriculum development

3.   Teacher strategies and methodologies

4.   How to assess and strengthen the capacity for delivery of courses

For teachers that are completely new to the subject, we would recommend starting with the first section to get some inspiration. All recommendations can be read independently from each other.

The table of contents allows the reader to select and go directly to parts that interest them.

1 Motivations for getting started with web accessibility teaching

1.1 Benefits for students.

Recommendation: make students aware of employment opportunities

The European Union's Web Accessibility Directive (Directive (EU) 2016/2102), adopted in 2016, and the European Accessibility Act, adopted in 2019, have increased the demand for accessibility-related knowledge and skills. These legal requirements came into force just before the Covid-19 pandemic gave an extra impetus to the digital transformation of work, healthcare and other aspects of our lives. For most ICT products and services sold in the European Union, accessibility will no longer be optional but required. Learning about web accessibility will make students better equipped to develop accessible ICT products. ICT products will be required to conform to the European standard EN 301 549. This standard references the Web Content Accessibility Guidelines 2.1 to define accessibility requirements for webpages (Chapter 9). However, the requirements for non-web documents (Chapter 10) and software (Chapter 11) also reference the Web Content Accessibility Guidelines 2.1 where applicable. For this reason, learning about web accessibility has benefits that carry over to other areas of ICT, even though the implementation details differ.

According to LinkedIn, the number of vacancies with "accessibility" in the title increased by 78% between August 2020 and July 2021. "The rise in accessibility jobs is fuelled by a number of factors, including effects of the Covid-19 pandemic, disability lawsuits, and diversity and inclusion efforts, advocates and hiring managers said." (Source: [More Companies Are Looking to Hire Accessibility Specialists](#), Wall Street Journal, 1 September 2021.)

Recommendation: explain that designing for "extreme users" creates benefits for all

In the context of software development and web development, people with disabilities have sometimes been categorised as "edge cases" or "extreme users". The implication is that people with disabilities are outliers from a statistical point of view and that their needs are therefore not a business priority. On one hand, this implicitly justifies the exclusion of people with disabilities, which is objectionable in itself. It excludes what the United Nations calls "the world's largest minority", representing around 15% of the world's population. (Not every type of impairment is directly relevant to digital accessibility. For example, an

impairment in the lower limbs does not usually impact your ability to use a computer. But the impairment becomes relevant when, for example, you are an IT student in a wheelchair who needs access to a computer in a computer room that is not accessible to wheelchair users.)

On the other hand, this attitude also overlooks that many products that were developed for people with disabilities or older users turned out to benefit people without disabilities. Several of the inventors who contributed to the development of the typewriter, such as the Italian Agostino Fantoni, the Italian Pellegrino Turri and the American Charles Thurber, aimed to develop a machine that would allow a blind person to write. Audio books for the blind was one of the applications that Thomas Edison that envisioned as an application of this phonograph. The Segway is based on Dean Kamen's work on the iBOT, a self-balancing powered wheelchair. OXO's Good Grips product line of kitchen utensils were designed to accommodate the needs of a wide range of users, including those with arthritis and low vision, and have also appealed to many other people.

Similar benefits also exist in the digital realm. The multi-touch technology that became mainstream with Apple's iPhone in 2007 are to some extent based on research on multi-touch keyboards and gesture pads developed by FingerWorks, which Apple acquired in 2005, and which were particularly helpful for people with repetitive strain injury (RSI). In 2015, a survey found out that more than 50% of students without a disability use closed captions on course videos (when available) sometimes or more often, i.e. around 10 percentage points less than students who reported disabilities. The main reason for using closed captions was that they served as a learning aid.

There is a clear business case for web accessibility, as the Click-Away Pound survey found in the UK found in 2016 and 2019. However, in the contexts of IT education and design education, this business case is not the only argument for teaching inclusive design. Learning inclusive design teaches students to deal with conflicting priorities such as "exploring and solving, simplicity and universality, provoking and respecting, feeling and testing, expression and meaning" (Graham Pullin: Design Meets Disability. MIT Press, 2009). As Pullin points out, "these conflicting priorities might seem to work against each other, but together they afford control of force, position, and direction". Jutta Treviranus of the Inclusive Design Research Centre in Toronto, Canada, has written several articles that are worth reading in this context, for example, "Preparing a next generation that understands the value of human diversity and can navigate complexity" (16 July 2019) and "Inclusive Design: The Bell Curve, the Starburst and the Virtuous Tornado" (22. April 2019).

Recommendation: explain that accessible design is design for our future selves

As we get older, we all develop age-related functional limitations: contrast sensitivity declines from the age of 40, hearing loss becomes much more common after the age of 50 and motor skills may diminish after the age of 50 due to conditions such as arthritis and Parkinson's Disease ("Web Accessibility for Older Users: A Literature Review", World Wide Web Consortium, May 2008). If we get old enough, we all end up with one or more impairments, even though older people would not therefore classify themselves as "disabled" or "people with disabilities".

The above data also show that accessibility does not only impact people with disabilities and retirees, but also a significant percentage of the workforce. This percentage tends to grow in societies where the traditional population pyramid has evolved to look more like a kebab and in countries where governments have increased the retirement age. As a consequence, even people without disabilities are likely to encounter accessibility issues at a later age; practising inclusive design has therefore rightly be said to be "designing for our future selves" (Inclusive Design Toolkit: Why do inclusive design?; M. Benktzon, "Designing for our future selves: the Swedish experience", Applied Ergonomics, 1993).

1.2 Benefits for lecturers
Recommendation: Read up on accessibility as a "must"

Due to the European Union's adoption of the Web Accessibility Directive (Directive (EU) 2016/2102) in 2016 and the European Accessibility Act in 2019, the range of products and services that must meet accessibility standards now or starting in 2025 has markedly increased. Companies selling products on the European market will be at a disadvantage. They will need designers and developers who can practise inclusive design in order to develop products that can be sold in the EU. Demand for accessibility knowledge and skills is already increasing, so universities and other higher-education institutions need to adapt their IT curricula in response to this change in the labour market. The IWAC project's guide to "Good practices for integrating web accessibility in ICT education and training at university level" contains many examples from universities who have already done this.

The certification exams offered by the International Association of Accessibility Professionals (IAAP) were created in parallel with legal development in the European Union, the USA (the update of the standards for Section 508 of the Rehabilitation Act and Section 255 of the Communications Act) and elsewhere. The certification exams related to digital accessibility include Certified Professional in Accessibility Core Competencies

(CPACC), launched in 2016, Web Accessibility Specialist (WAS), launched in 2017, and Accessible Documents Specialist (ADS), launched in 2020.

Recommendation: Use available Creative Commons materials

Lecturers who want to start teaching web accessibility, mobile accessibility or inclusive design don't need to start from scratch. A number of projects and organisations have published materials that can be used under the terms of a Creative Commons licence or under other terms that allow reuse in an educational context. These include the following:

– the open educational resources created by IWAC, available from IAAP Nordic website
– the open educational resources created by MOOCAP (MOOC Accessibility Partnership, project funded by Erasmus +), available from MOOCAP project website
– a number of resources (though not necessarily all) from the World Web Consortium's Web Accessibility Initiative; see Using WAI Material: Permission to Use with Attribution;
– resources provided IAAP in preparation of the certification exams, available from IAAP certification preparation
– the online book Best Practices in Accessible Online Design by Heather Caprette.

2 Recommendations for curriculum development

2.1 Online learning

Recommendation: use MOOCs to complement course curricula

You have probably heard the claim that online learning is the future of teaching. For many learners online learning is already a reality: the last decade has seen a rise in popularity in so-called MOOCs (or massive open online courses), and more recently we learnt that large-scale epidemics can force higher education to go online for several semesters in a row.

Online learning spans a rather wide variety of practices. It may be synchronous, for example, when a lecturer streams a lecture online. Or it may be asynchronous or self-paced. Lecture capture systems and similar functionality built into web conferencing software even allow a combination of both, since students who have missed the live lecture can catch up later, when the recording has been added in the learning management system.

Online learning also needs to support diverse learners. Students may have different learning preferences, but they may also have different needs due to a disability or a temporary impairment. You will learn about various disabilities throughout the course.

In the digital world, the goal of accessibility is to ensure that people with disabilities can communicate, learn and use computers as effectively as people without disabilities. The types of changes that are needed to make using computers accessible range from simple tweaks to settings to the installation of assistive technologies. For digital content there are a number of good practices and guidelines that are usually not too difficult to follow.

Recommendation: utilize pre-packaged MOOCs to save time

There exists a plethora of material online, including MOOCs such as the two created in this project. Creating a MOOC is very time consuming and necessitates a different line of thinking when compared to creating non-MOOC course material. In part due to MOOCs requiring the student to study independently without much supervision. This project presents two MOOCs: one intended for teachers wishing to improve their accessible teaching skills, and one for students wishing to improve their knowledge of accessibility. The MOOCS have been successfully tested in the IWAC project. According to the evaluation, the students found it motivating to do the online course as a self-study activity. However, most students wished for some face-to-face teaching, at least in a hybrid form mixing online and physical presence. Some students also wished for opportunities to

discuss the material. The students appreciated the content, in particular the practical exercises. They felt that it increased their understanding of what it means to live with a disability.

The MOOCs have been developed with constructive alignment in mind, see below.

1. Course: Introduction to web accessibility from a user perspective

Learning objective: Understand the needs for different users with disabilities and what web accessibility means in practice for these users.

Learning and teaching activities: Online self-study with reading material and practical exercises. Approximately 3 hours.

Assessment: Quizzes at the end of each course module including a final quiz at the end of the course.

2. Course: Accessible teaching

Learning objective: Understand what it takes to create accessible teaching material

Learning and teaching activities: Online self-study with reading material and practical exercises. Peer-to-peer discussions with other course participants. Approximately 8 hours.

Assessment: Quizzes at the end of each course module including a final quiz at the end of the course.

Fig. 1 Illustration of student enrolled in a MOOC

2.2 Problem-based learning

Recommendation: Use case studies to provide practical experience and complement course curricula.

Theoretical knowledge can be complemented with practical cases in order to increase the competence of learners. With cases the objective is to give the students an opportunity to put the theory into practice and to stimulate reflection and discussion around complex real-life cases they may face in their professional lives.

This project presents several cases adapted to different strands of ICT education programmes and are constructed to create interest and empathy, as well as to encourage personal decision making. All cases presented in this project are based around collaborative learning and require interaction and discussion among learners. They can complement course curricula and are best applied after learners have already completed an introductory lecture or course on the theories of web accessibility. The aforementioned MOOC Introduction to web accessibility from a user perspective can be used for this purpose. The cases have been successfully tested in the IWAC project. The students found that the cases provided the necessary exercise for contextualizing web accessibility knowledge in practice. Various cases were tested for and within different strands of ICT education programmes. In the questionnaires that followed the cases, students stated that they believed satisfactory web accessibility to be crucial in order to develop reliable, inclusive and sustainable services. Furthermore, several students cite the cases as being eye-opening seeing as they had very little previous experience of the subject. This reinforces the belief that web accessibility knowledge and practical exercises are a necessary part of curricula within ICT education programmes.

Case 1: Accessible customer journey for getting a new passport

Learning objective: understanding how to design services and products that meet the needs of users with different abilities. The case can for example be used in a course for UX designers. Approximately 2 hours.

Case 2: Make complex images and mathematical formulas accessible

Learning goals: Starting from a basic knowledge of web accessibility for the images, students will

1. learn how to write descriptions for STEM images to make them accessible,
2. learn some basic tools to make mathematical formula accessible.

Approximately 3 hours

Case 3: Setting up a computer for two users with different disabilities

Learning objective: Understand the needs for different users with disabilities and what web accessibility means in practice for these users. Approximately 3 hours

Case 4: Mini cases

Learning objective: Quick exercises to help understand the needs for different users with disabilities and what web accessibility means in practice for these users. Maximum of 30 minutes per exercise.

3 Teacher strategies and methodologies

Fig. 2 Illustration of multimodal elements in Universal Design for Learning

3.1   Accessible Teaching Methods
Recommendation: take inspiration from Universal Design for Learning

Integrating web accessibility or inclusive design into a curriculum may seem like a burden, but it also offers opportunities to improve teaching practices. Universal Design for Learning (UDL) provides a framework for improving teaching and learning for all people, regardless of domain or discipline. In the context of teaching web accessibility or inclusive design, it offers lecturers the opportunity to practise what they teach. However, it may be difficult to decide how to start with Universal Design for Learning.

UDL practitioners such as Thomas Tobin recommend "plus one thinking": take one existing interaction with learners and create one more way for this interaction to happen. The existing interaction may be with yourself as a lecturer or teacher, with specific learning materials or with other learners. When you offer students even minimal choices and control, they are more likely to persist in their studies.

Below are a few examples of "plus one" applied to learning materials:

- If you have specific learning materials formatted as text (possibly including images), add a video in which you discuss the text's main points.

- If you have specific learning materials in video format, add a text summary with the most important points from the video. Alternatively, add captions or subtitles to the video; this can to some extent be automated.
- If you authored specific content in your learning management system, add a downloadable file with the same content, so it can be read offline.

With which interactions should you start? Ask yourself the following questions:

- Where do students always have the same questions?
- Where do students get things wrong in quizzes and assessments?
- Where do students ask for explanations in other words or a different way?

This way, "plus one thinking" directs your efforts towards those areas where they have the greatest effect. As mentioned above, accessible design does not only benefit people with disabilities. For example, the audio version of a paper helps both students with dyslexia and those who like to listen to audio materials while commuting. And students without a hearing impairment also use subtitles or captions if they are available.

3.2 Include activities to better understand user needs

Recommendation: Engage in learning activities that courage students to develop a broad understanding of the variety of users and user needs

To be able to develop and design accessible products and services, ICT professionals need to consider the varying needs of different users. This means challenging preconceptions about who is the user and what are the user needs. A central part of developing both an understanding of accessibility and the ability to implement accessibility in design and development is therefore to learn about a wide variety of users and user needs. This can be done in several ways, ranging from working with personas to meeting and working together with persons with different abilities.

For inspiration, have a look at the IWAC Good Practice Guide which contains several examples of universities working with users in their courses.

Recommendation: Invite persons with disabilities to collaborate on the course and engage with the students

Web accessibility is about people, and more specifically about how people with different abilities can interact with digital content on equal terms. The best way to get an understanding of how accessibility works in practice is to learn from people that know about accessibility challenges from their own experience and who can show what works and what doesn't work for them in different digital interfaces. Depending on the level of

ambition, the interaction can be everything from a lecture to assignments where the students are working in teams together with persons with disabilities.

For more inspiration on how this can be applied in practice, see examples in the IWAC Good Practice Guide.

3.3   Combine theory with practice
Recommendation: Integrate practical assignments at different levels in the courses

Web accessibility is not a purely theoretical subject. It involves both understanding the rationale for and the principles behind accessibility, as well as the ability to apply these principles in practice. Theory and practice go hand in hand, and teaching both together reinforces the learnings and helps to develop application strategies that will be useful for the students in their professional life. There is material freely available for cases and practical assignments at different levels.

For inspiration, have a look at the IWAC Case Study compendium which contains examples of case studies and smaller practical assignments for undergraduate students.

Recommendation: Connect web accessibility teaching to the student's other courses to ensure that the accessibility courses prepare students to practice accessibility in their professional role.

Web accessibility is always practiced within specific professional contexts. While there are core competencies common base of learning, connect learning activities to the students' concrete ability to implement techniques for accessibility in interfaces. The practical ability can be defined differently according to the subject of the course. It could for example concern to develop and design products that are accessible, or to apply criteria of accessibility in procurement procedures. The important factor here is that accessibility needs to be practiced to make an impact. Concretely, this means that the content of the lessons in web accessibility should include examples and exercises that relate to the specific study programme followed by the students.

4 Assessing and strengthening capacity for delivery of courses

4.1 Preparing the level and delivery of courses

Recommendation: When developing and delivering a module on accessibility, incorporate accessibility in the teaching material and delivery

Students learn by example and practicing what you preach is the best way to get the message across. Accessibility is to its nature a practical concept, and a skill to be applied also in educational situations. It does not only concern the digital materials used in the courses, but also in general the way in which information is packaged and provided to students. This impacts everything from digital presentations to handouts and material.

The IWAC Handbook describes components of accessible teaching in more detail.

The project has also produced a MOOC where you can learn the basics of accessible teaching.

Recommendation: Use student surveys to assess and fine-tune the web accessibility modules and courses

Student surveys are useful to gather information for the development and fine-tuning of courses and modules. Handing out a survey in preparation of the course to assess the level of knowledge among students will help you set the right level of the course for this particular group. The information can also be compared with a survey after the course was completed, to evaluate how much the students learned.

4.2 Web accessibility in relation to other courses

Recommendation: Make the connection to accessibility in all relevant teaching topics

Accessibility is important to all users of digital interfaces and IT, which means that whatever your students will end up working with in the future, they will need basic knowledge of how user needs interact with accessibility issues.

In addition, it is easier to learn and remember new concepts when they connect to issues that are familiar and recurring. Therefore, introducing basic accessibility principles and concepts in the context of general teaching on subjects such as interface design, service

design or development techniques will both facilitate the student's assimilation of the topic, and also make the learnings easier to remember and use in practice.

Recommendation: When asking students to assess the course or module on accessibility, be sure to connect the course or module to the objectives of the overall ICT programme that the students follow

The assessment of the courses is best done using the same means that are applied to all courses and programmes. This is to be able to compare the assessment with evaluations of other modules that are included in the ICT programme or course. From a didactic point of view, it is important to send a signal to both teachers and students that web accessibility is not a specialist subject, but a normal part of all ICT education. Using the same evaluation methods, for example surveys, across all subjects ensures that the results of the evaluation can be taken into account in the context of further developing the broader ICT programmes, together with other courses and modules.

4.3   Networking with colleagues and external contacts

Fig.3 Illustration of persons networking

Recommendation: Join forces with colleagues to create a working group on accessibility

Implementing accessibility is always teamwork – all web professionals that work with a specific interface need to apply accessibility principles that are relevant to their expertise, whether it has to do with design, development or content. The equal repartition of responsibilities is also a strength, as a team can provide both more incentives and support to work with accessibility. The same principle can be applied to teaching. Web accessibility should be included in all subjects that are core to ICT students, whether they are studying

design, development or communication. In this context, teachers within different disciplines can benefit from cooperating on developing courses and modules.

Within the IWAC project, partner organisations successfully tried joint workshops where teachers responsible for different courses colleagues met up to learn more about accessibility through the MOOCs created in the project. These kinds of workshops could be expanded to regular meetings for mutual support and inspiration.

Recommendation: Connect with the global accessibility community through the International Association of Accessibility Professionals

The International Association of Accessibility Professionals (IAAP) is the global organisation for accessibility professionals worldwide. IAAP members include individuals and organisations from educational institutions, the private sector, government and the non-profit sector. IAAP promotes accessibility through a broad range of activities, including educational webinars, networking, provision of educational resources and certification. The organisation is a good place to network and for teachers to get inspiration and tips on material for their courses.

IAAP also has a certification scheme for accessibility professionals, for students and teachers that would like to specialise in subjects of accessibility. In connection with the certification scheme, IAAP provides information on resources on accessibility in general and web accessibility in particular that can be used as background material in teaching. For more information on the activities of IAAP in Europe, see the websites of the European chapters:

IAAP Nordic

IAAP DACH (Germany, Austria, Switzerland)

IAAP UK

4.4   Example of internal resources: Web Accessibility Laboratory at Unige

The Web Accessibility Laboratory – WAL set up at the SIMAV, the Simulation and Advanced Training Service Centre of the University of Genoa addresses the issue of accessibility in order to define and promote a new culture of accessibility, emphasising its value for the well-being of the individual and society as a whole, as well as its role as a potential resource.

The Laboratory aims to promote the conditions for independent living for people with disabilities through the study, research and testing of measures and strategies that allow them to live their lives like any other person. In this context, the Laboratory carries out research and teaching activities, through seminars and conferences, training and research projects, publications, with an interdisciplinary approach, in order to be able to examine the most significant number of aspects related to the topic of accessibility.

The idea of the Laboratory is a response to the demand for an increasingly inclusive digital society, starting from compliance with international standards, European legislation, and Italian regulations on web accessibility (Legislative Decree no. 106/2018).

The target of these actions is not only the academic world but also the whole society to contribute to its social, cultural, and economic development.

The main objectives are:

- to develop the technical skills necessary to have accessible services concerning the transversality of the roles of the people involved: on the one hand, accessibility experts with ICT skills (developer, design expert) and for the creation of content (information pages, courses) and on the other hand end users experienced in testing,
- to create a place of reference for the dissemination of assistive technologies and digital facilitation tools, to provide a state-of-the-art equipped space offering educational and research tools,
- to disseminate and support a new culture of inclusion that starts from the respect of the rights of people with disabilities or simply more fragile through, for instance, the organisation of training activities and dissemination events,
- to consolidate a stakeholder network of public bodies, local businesses, and associations of people with disabilities to discuss and develop synergies for the area's social, cultural, and economic development.

For testing the Laboratory uses some stations equipped with instruments and assistive technologies to carry out accessibility checks according to a methodology that sees the support of automatic tests on the code with panel tests, carried out by groups of dedicated users. Addressing the issue of digital accessibility from different points of view requires the establishment of a multidisciplinary research structure, which involves the users. In this context, the involvement of accessibility experts, as well as target users, such as people with disabilities, is fundamental for the semi-automatic and manual test phases, precisely

to intercept the difficulties that the automatic analysis tools currently on the market fail to highlight.

4.5   Example of how UNIGE is making use of external contacts and resources

Within the framework of the activities on web accessibility, the Laboratory has started collaborations with association for people with disability, public and private sector.

The main idea is that the Laboratory is an unique place where all of them, public, private and associations, confront each other and work on the same plan to develop services and break down barriers to full and effective participation in the digital life of all people who have difficulties, are disadvantaged or fragile (culturally, temporarily, ...).

The activities are carried on the so call "third Mission" consists in fostering the social, economic and cultural development of the territory.

Several events have been organized to talk about web accessibility, about new tools to respect the rights of people with disabilities and about policies to face the current Italian situation, characterized by not accessible websites, despite the regulatory compliance of what is required by the EU. Main event: IGF 2019