

# BRIDGING THE GAP BETWEEN GRAPHIC DESIGN AND DIGITAL ACCESSIBILITY IN DESIGN EDUCATION

Solvita Zarina<sup>1</sup>

<sup>1</sup> University of Latvia, Latvia

## ABSTRACT

Graphic design courses are usually a familiar topic in design curricula. However, knowledge of digital accessibility, including visual accessibility is not always emphasised when teaching students. When the World Wide Web Consortium launched an accessibility initiative in 1997, it included a set of guidelines for achieving web functionality for people with disabilities. Today, accessibility is recognised as important for all and plays a crucial role in the development of sustainable digital product and service design. The rules for compliance with the principles of accessibility in the digital environment have already been incorporated into the legislation of the European Union and the Republic of Latvia. In view of all this, teaching the principles of visual accessibility in design education has become topical. However, it can be a pedagogical challenge to integrate these specific practises into graphic design education, as it requires looking at familiar design concepts from a different perspective. This article aims to demonstrate that the principles of visual accessibility can be integrated into the content of graphic design assignments to enable students to consider design problems more broadly. Using qualitative research methods, a case study of the implementation of the topic of visual accessibility in the course “Introduction to Web Design” offered as part of the Bachelor of Computer Science programme at the University of Latvia is examined. As a result, the author suggests how both visual accessibility and graphic design can support each other in the learning process. In conclusion, the author points out that the systematic inclusion of accessibility design concepts in teaching is an important part of sustainable design education and recommends how the topic of visual accessibility can be better integrated into other relevant design curricula in the future.

**Keywords:** *curriculum development, graphic design, pedagogical challenge, sustainable design education, visual accessibility.*

## Introduction

For the author, the idea of teaching visually accessible graphic design began in 2020 during the online conference “Digital Accessibility. Practise. Examples” organised by

the Latvian School of Public Administration. There, Ms Daina Podziņa from “Apeirons” – Association of Disabled People and Their Friends spoke about how the accessibility of the digital environment should look like. Among other aspects, Ms Podziņa mentioned such basic principles of graphic design as colour contrasts, typographic and information hierarchy and communication of images (2020a, 2020b). At the time, the author felt like she was listening to an introductory design lecture while realising that in practise these basic principles were probably not always considered in the digital environment.

Since 2011, the author has gained experience in teaching graphic design for web and visual communication to computer science students at the University of Latvia (UL, later in the article). In 2020, the growing demand for accessible design meant that it was time to enrich the courses and teach students aspects of accessibility and emphasize why the basic design principles are so important. After reading the Visual Accessibility Guidelines (World Wide Web Consortium [W3C], 2022) in more detail, the author realised that this goal turned out to be a pedagogical challenge, as graphic design and accessibility are usually considered different fields of study. Initially, the author started with a brief overview lecture on accessibility in the web design course. She gradually developed a better understanding of how accessibility can be taught in the context of graphic design and visual communication by adding practical design tasks to theory and using an active learning methodology in lectures and design classes.

The aim of this article is to share experiences on how the topic of visual accessibility can be integrated into the content of a graphic design course to give students the opportunity to consider design principles in a broader context. The author first provides an overview of the concepts of visual accessibility and the relevant guidelines and then identifies what changes are needed in graphic design education. The author then presents a methodology that addresses the teaching practise of visual accessibility. Three design exercises are offered as a supplement to the existing assignments of the web graphic design course. The research findings help to better address the pedagogical challenge of teaching accessible graphic design.

## Background and Context

In 1997, the World Wide Web Consortium (W3C) launched a Web Accessibility Initiative (WAI, later in the article) to make it easier for people with disabilities to use the Internet. “Endorsed by The White House and W3C Members, the WAI will involve the establishment of an International Program Office (IPO) responsible for developing software protocols and technologies, creating guidelines for the use of technologies ...” (World Wide Web Consortium [W3C], 1997).

Today, the concept of accessibility comprises four main aspects. To be more suitable for all user groups, the digital environment should be perceivable, operable, understandable and robust. There are three levels of conformance from “A” (the lowest) to “AAA” (the highest). (W3C, 2023b). Nowadays, digital accessibility is also a fundamental part of various broader concepts such as Design for All (Stephanidis, 2014) and Inclusive

Design (Joyce, 2022; W3C, 2016). In this article, the author looks at the principles of visual accessibility, which depends on the choice of graphic design.

## Visual Accessibility

As mentioned in the introductory section, the basic principles of graphic design and visual accessibility are the same or very similar. By “similar” the author means that familiar principles, such as colour contrast and typographic hierarchy, are viewed from a different perspective or with an additional goal (Zarina, in press). The obvious similarity was the starting point for overcoming the pedagogical challenge of talking about the laws of graphic design from an accessibility perspective. In this article, the author looks at three selected aspects of accessible graphic design. They are discussed in order of complexity of educational task fulfilment.

1. First, a sufficient contrast ratio of dark and light colours between the background and text is ensured and tested. The test concept is based on measuring the relative luminance of colours, taking into account the shapes and sizes of the glyphs (W3C, 2023a). This allows to control the legibility of the text.
2. The second aspect of visual accessibility concerns the concept of textual description of images, including graphical elements such as icons and buttons, to provide information or describe the function they represent. The accessibility guidelines strongly advise that different types of images be accompanied by so-called Alternative texts (Alt text, later in this article). These descriptions are necessary so that they can be used by screen reader technologies (IxDF, 2016; W3C, 2022).
3. Third, a well-established visual hierarchy of the text layout on a website or user interface (a) gives us visual cues to the level of importance of the information, (b) helps us interact and achieve our goals, and (c) reduces unnecessary cognitive load (Johnson, 2020, pp. 79–100; Lynch & Horton, 2016, pp. 255–283). This aspect of accessibility concerns not only the visual but also the cognitive parts of a perceptible, operable and understandable digital environment.

## Government Policy and the Topicality of Accessibility Design Knowledge

In the United States (US) and the European Union (EU), including the United Kingdom (UK) and 17 other countries, government policies on web accessibility have gradually been adopted as binding laws and guidelines to varying degrees (W3C, 2023c). In 2016, the EU Regulation on Accessibility of the Websites and Mobile Applications of Public Sector Bodies was adopted (Directive EU, 2016). Latvia, as a member of the EU, has made the digital accessibility of the websites of state and municipal institutions mandatory from 2021 (Ministru kabinets [Cabinet of Ministers], 2023). With the legal provisions resulting from the European Parliament and Council Directive, the next target group for the implementation of accessibility requirements is digital products, services and infrastructure (EU Directive, 2019; Saeima [Parliament of the Republic of Latvia], 2023).

In Latvia, intensive preparations are currently underway in the financial and information technology sector to develop and implement accessibility guidelines in the digital environment. Guidelines already exist in the financial industry (Finanšu nozares asociācija [Financial Industry Association], 2023). The Information and Communication Technology Association (LIKTA) has established a working group for the development of best practises and guidelines for the industry, of which the author of this article is a member. This general trend in government policy could lead to visually accessible design becoming a natural professional graphic design skill in the relevant labour market.

## Design Education in Transition

Today, design is increasingly seen as a process-orientated discipline. This means that design education must constantly apply new methods to keep pace with changing conditions dictated by both technology and national policy, as well as humanity's general understanding of how the physical and digital environment must be designed (Elcioglu, 2022; Norman 2010, 2016).

The idea that design is shifting from artefacts to experiences has also been explored in relation to visual communication design. Davis and Hunt acknowledge that “new design approaches, technology, and software changed the role of communication design in society ... Participatory design, user-centered design, and ergonomics brought designers' attention to the experiences ... rather than the design of an object”. At the same time, these authors speak of contrast, colour and visual hierarchy as “formal strategies to capture the audience's attention” (2017, pp. 8, 91). This approach reveals a certain gap between the concepts of visual communication and visual accessibility.

However, the author suggests that this gap can be bridged by practically showing students how visual accessibility can help to reach a wider audience and secure the attention of users in the long term. Already in 2015, a group of authors from the Engineering Design Centre at the University of Cambridge in the UK acknowledged that visual accessibility is a key element that determines the overall inclusivity of printed graphic design. At the same time, the authors concluded that, according to their survey of 122 graphic designers and clients from the UK, improvements should be made both in the collaboration between designers and clients and in the development of tools to support designers in visual accessibility (Cornish et. al., 2015, pp. 176–195).

## Methods for Teaching Visual Accessibility

In this section, the author provides an insight into the development of the methodology for teaching visual accessibility in the course “Introduction to Web Design”, which is offered as part of the Bachelor's degree programme in Computer Science at the UL. Firstly, the learning environment is described. Then the author talks about practical examples of how the principles of visual accessibility can be taught by applying the active learning methods. Finally, recommendations are given on guidelines and tools that can be used to provide students with more information on visual accessibility.

## Learning Environment

The “Introduction to Web Design” created and taught by the author of the article is offered as an elective course for 60 to 80 sixth-semester students. The total number of contact hours is 64, including 32 lecture hours and 32 practical class hours. In the practical design classes, students are divided into groups of up to 25 participants each. In addition, 96 hours are allocated for independent studies. The aim of this study course is to provide theoretical knowledge and practical skills in the field of graphic design for the web. No prior knowledge is required for this course, but all students have already taken the compulsory courses “Web Technologies I” and “Web Technologies II” in their previous years of study and are therefore able to develop front-end and back-end web solutions. This course should fulfil the standards of the European Quality Assurance Network for Informatics Education (EQANIE) with the following learning outcomes:

Knowledge: 1. Understand basic visual concepts in web design and comprehension of their application methods (EB12); 2. Demonstrate specialized knowledge of designing various visual components for web (EB12). Skills: 3. Work with various computer graphics software, choosing the optimal technical solution for particular visual design (EB34); 4. Independently create various graphic elements in web design projects (EB34). Competence: 5. Create and manage Web design projects (EB64). 6. Competently collaborate with visual designers in custom web design projects (EB65) (University of Latvia. Computer Science – Bachelor’s Study Programme, 2024).

To achieve the learning outcomes, a constructivist framework through the active participation of the learners themselves (Newstetter & Svinicki, 2014, pp. 29–46) is chosen as the teaching method for active learning. The practical design exercises described in the next section create the basis for an “interactive mode of engagement” (Chi & Wylie, 2014, p. 220).

The lectures are thematically linked to the design classes. By talking about relevant topics, the professor covers the theory and practise of accessible graphic design. Students are familiarised with guidelines and tools to test and measure accessibility compliance. The multimedia material provided during the lectures, which recapitulates what has been said, helps to consolidate the knowledge.

In the course requirements, adherence to accessible design principles such as sufficient colour contrast and text hierarchy is mentioned as an assessment criterion for the students’ independent study assignment – the development of a website. This assignment accounts for 50% of the final grade. In two seminars, students must present the results of their website development to their peers and receive feedback from them and the professor.

The other 50% of the course assessment are covered by design assignments to be completed during the practical design classes. From the Spring Term of the 2023/2024 academic year, part of the design assignments relate to visual accessibility, including colour contrasts, informational attributes for images and graphic elements and the creation of typographic hierarchy.

Visual accessibility is formulated as a problem for students to solve. For the design assignments, students can use graphic design software of their choice and select their own images or find them from free online image libraries. Students should write a description for each assignment reflecting on how they carried out the task, provide the image references, and also justify the choice of guidelines and testing tool they used to implement visual accessibility. At the end of the course, students must give feedback on the design classes by analysing the design task from which they have learned the most.

## Exercises on Visual Accessibility

The examples in this subsection are part of exercises of design class assignments. The exercises are intended to encourage students to conduct practical research by first familiarising themselves with the guidelines for visually accessible design suggested by the professor and chosen by themselves, and then comparing the information gained with their own previous assumptions. After completing the design tasks, students should use accessibility testing tools to get immediate feedback on their results and correct the errors if necessary.

The classroom is equipped with computers and a projector. During design lessons, students are encouraged to show the results of their work via a projection system on a large screen. This creates an awareness of the different screen sizes and their impact on the overall accessibility of graphic design. To test their design, students should also use their smartphones or emulate different device parameters using the tools provided by the browsers.

The tasks are designed so that students (a) clearly understand the purpose of learning visual accessibility and (b) ensure that the results of the design can be tested, as in many other areas of computing.

1. Colour Contrasts for Accessibility.

*Problem definition.* How to develop sufficient text and background contrast ratio?

*Description of the exercise.* Search the websites of three to five universities and find the web pages with similar content. Select two pages that you think have a sufficient and an insufficient contrast ratio between text and background. Look at the contrast measurement tools provided or find additional tools and test these web pages. Compare your assumptions with the test results. Show how you can correct the insufficient contrasts. Then select the text and background colours for your independent study task and test their contrasts. Reflect on the process of carrying out the exercise in the description.

2. Text Alternatives for Images.

*Problem definition.* How can images be made accessible to all?

*Description of the exercise.* Read the relevant accessibility guidelines and familiarise yourself with the categories for images, such as Informative Images, Decorative Images, Functional Images, Images with Text, Complex Images, Groups of Images and Image Maps. Search the websites of three to five universities and find two web pages with similar content from different universities. Look at the accessibility

measurement tools and select one to check if there are text alternatives for functional and informative images on the selected pages. Then manually check the quality of the Alt text descriptions for compliance with accessibility guidelines. Provide one good and one bad example. Finally, create Alt texts for three images of your choice. You may use images from the materials for independent study assignment. For writing the Alt texts, you can practise creating image descriptions using the web-based resource “Poet Training Tool” (The DIAGRAM Center, 2020).

3. Typographic Hierarchy.

*Problem definition.* How to design texts that are easy to read?

*Description of the exercise.* Read the guidelines for accessible design and recommendations for the layout and font size of headings and body text, as well as other text attributes such as capitalisation, italics, boldface and others. Select websites from three to five universities and choose two web pages with similar content that you think are (a) well formatted and (b) poorly formatted. Look at the accessibility test tools and select one to check the heading hierarchy. Then manually check the overall layout (length of text lines, grouping of information in blocks and proximity) and typographic hierarchy. Give a good and a bad example. Then format a short text (up to 400 words) according to the accessibility recommendations.

You can use the text from your independent study assignment.

After completing the exercises, participants are encouraged to apply the knowledge of sufficient text and background contrast, Alt text descriptions and typographic hierarchy throughout the development of their own website.

### Recommendations on Visual Accessibility Guidelines and Tools

The W3C Web Content Accessibility Guidelines (WCAG) provide a comprehensive set of recommendations for the accessibility of digital environments and can be considered a reliable and regularly updated first point of reference. However, there are a number of other guidelines developed by national governments, universities and companies that can be used as an additional source of information. See Table 1.

**Table 1** A list of guidelines and tools recommended as optional learning materials for visual accessibility design tasks. (Organisations providing guidelines are listed in alphabetical order).

Organisation	The title and address of the website
Harvard University, US	Write Helpful Alt Text to Describe Images. <a href="https://accessibility.huit.harvard.edu/describe-content-images">https://accessibility.huit.harvard.edu/describe-content-images</a>
Kent University, UK	Make Images, Graphics and Photos Accessible. <a href="https://www.kent.ac.uk/guides/accessible-content/accessible-images">https://www.kent.ac.uk/guides/accessible-content/accessible-images</a>
Nielsen Norman Group	Usability Guidelines for Accessible Web Design. <a href="https://media.nngroup.com/media/reports/free/Usability_Guidelines_for_Accessible_Web_Design.pdf">https://media.nngroup.com/media/reports/free/Usability_Guidelines_for_Accessible_Web_Design.pdf</a>
The DIAGRAM Center	Poet Training Tool. Introduction to Accessible Images. <a href="https://poet.diagramcenter.org/">https://poet.diagramcenter.org/</a>

Organisation	The title and address of the website
The Ministry of Smart Administration and Regional Development of the Republic of Latvia [Latvijas Republikas Viedās administrācijas un reģionālās attīstības ministrija]	Evaluation of the website according to the accessibility requirements of the digital environment (WCAG 2.1 AA) [Tīmekļvietnes izvērtējums atbilstoši digitālās vides piekļūstamības prasībām (WCAG 2.1 AA)]. <a href="https://pieklustamiba.varam.gov.lv/">https://pieklustamiba.varam.gov.lv/</a>
UK Government	Accessibility in Government. <a href="https://accessibility.blog.gov.uk/2016/09/02/dos-and-donts-on-designing-for-accessibility/">https://accessibility.blog.gov.uk/2016/09/02/dos-and-donts-on-designing-for-accessibility/</a>
US Government	Accessibility for Visual Designers. <a href="https://digital.gov/guides/accessibility-for-teams/visual-design/">https://digital.gov/guides/accessibility-for-teams/visual-design/</a>
Utah State University, US	WAVE Web Accessibility Evaluation Tools. <a href="https://webaim.org/resources/contrastchecker/">https://webaim.org/resources/contrastchecker/</a>
W3C	Images Tutorial. <a href="https://www.w3.org/WAI/tutorials/images/">https://www.w3.org/WAI/tutorials/images/</a>

*Note.* The availability of resources must be checked before the assignment is given to the students.

## Results

As a result, in the course “Introduction to Web Design”, students learn how to better understand the basic principles of creating visually accessible web design. During the design classes, students test how well they have understood the theory and this helps them to recognise and correct their knowledge. By completing these assignments, students gain practical knowledge and develop their design skills. By being able to review the outcome of their design immediately, they can iterate better and accelerate the successful end result.

By describing the progress of the design tasks, students can systematise and deepen their knowledge. By receiving feedback actively (by showing their own results) or passively (by viewing peer results) and also discussing examples of design exercises, students expand their understanding of visual accessibility.

1. Students identify problems with colour contrast in relation to text size and the relative luminance of colours. They test and correct the design using contrast measuring tools. Students build their knowledge by comparing the measurements with their own suggestions. As everyone’s perception of colour is different (Goldstein, 2010, pp. 202–226), this approach allows students to gain confidence in the objectivity of the knowledge, skills and competences they have acquired. In addition, students learn about the properties of colours from a different perspective.
2. The exercises with Alt texts are designed to train visual thinking and contextual understanding of the image, which not only ensures visual accessibility but also promotes clarity of visual communication. Based on the knowledge they have gained from comparing the guidelines and through the experience of assessing the quality of image descriptions on other websites, they learn how to write Alt texts. Students develop and test their ability to combine text and image by describing



their own examples. Through these exercises they also learn to think about the communication of the images they have used in their designs.

3. Students learn about layout and typographic hierarchy as a complex task, especially for responsive websites. In the web page tests, students can better understand the hierarchy of headings and text attributes specified by the accessibility guidelines and combine the results with their programming skills in web development. This paves the way for a more successful creation of their own website design and also ensures students' competence in working with visual designers.

**Table 2** Meeting the learning outcomes for three visual design exercises related to accessibility

Task	Knowledge		Skills		Competence	
	1.	2.	3.	4.	5.	6.
Contrast	+		+			+
Attributes	+	+	+			+
Hierarchy	+	+	+	+	+	+

*Note.* **Knowledge** 1. Understand basic visual concepts in web design. 2. Demonstrate knowledge of designing visual components for web. **Skills** 3. Chose the optimal technical solution for particular visual design. 4. Independently create graphic elements in web design projects. **Competence** 5. Create and manage web design projects. 6. Collaborate with visual designers

Table 2 shows the learning outcomes that students achieve by completing the visual accessibility exercises in the course “Introduction to Web Design”. The table has been adapted from the UL’s standard course description template.

## Conclusions

Visual accessibility tasks can help to make web design perceptible and understandable. The ability to measure the relevance of various design attributes offers a new perspective for creating a better digital environment.

The author of this article sees an opportunity to complement the relevant graphic design and visual communication courses at the UL with topics on visual accessibility. The author’s further plans include implementing several specialised design tasks in the course “Graphic Design for User Interface” for the Bachelor of Computer Science programme and also in two visual communication courses: (a) “Selected Topics of Visual Communication Design” in the Master of Computer Science programme and (b) “Visual Communication in Design” in the professional Bachelor of Art programme. The curriculum for accessible design can also be expanded to include aspects of cognitive accessibility that depend on the performance of visual design, such as the reduction of “visual noise” and the resulting cognitive load on users.

The teaching of visual accessibility can open up opportunities to enrich and complement knowledge of graphic design and visual communication development principles.

This promotes inclusive design and also better prepares students for the labour market. Furthermore, the aspects of visual accessibility may in future be included as part of the skills, knowledge and competences to achieve visual literacy. Society as a whole, including students as users, would benefit from a more accessible digital environment.

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### About Author

Dr Solvita Zarina is a professor at the Faculty of Science and Technology, University of Latvia. She holds a PhD in Art History and a Master's degree in Fine Arts from the Art Academy of Latvia. Her teaching focus is on visual communication and graphic design for user interfaces. Her research is related to visual communication, design, media art and aesthetics.

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