

# Real-Time Accessibility Dashboards for Higher Education

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**Abstract. Introduction:** *This work explores the challenges faced by students with disabilities in higher education, focusing on the accessibility of digital learning resources provided through Learning Management Systems (LMS). While inclusive education is a growing priority, many institutions still fall short of fully meeting accessibility standards. This lack of accessibility limits the participation and academic success of students with disabilities. Objective:* *This work aims to develop tools to help educators evaluate and improve the accessibility of content within LMS. Methodology:* *To support this goal, the project includes the development of a real-time accessibility dashboard, providing institutions with a centralized platform to monitor and address accessibility issues across their digital learning environments. Expected Results:* *By implementing these solutions, the project seeks to promote educational inclusion and enhance the academic success of students with disabilities.*

**Keywords** *Web Accessibility, Learning Management Systems, Higher Education, Disability, Inclusive Education.*

## 1. Introduction

This work focuses on the challenges faced by students with disabilities in Higher Education, particularly in accessing digital learning resources provided on Learning Management Systems (LMS) platforms. Although the importance of inclusive education is growing, many institutions still struggle to meet accessibility standards fully [Chen 2021], which can impact the participation and success of students with disabilities. Barriers to accessing educational content reduce these students' opportunities for equal participation in learning, impacting their academic success and overall university experience [Fernández-Batanero et al. 2022]. One of the key reasons for these barriers is the lack of knowledge and resources among educators to adapt digital content in an accessible manner. This gap often results in digital materials that are difficult or impossible for students with disabilities to use effectively [Fernández-Batanero et al. 2022], perpetuating inequalities in access and participation.

Accessibility in Learning Management Systems (LMS) is therefore essential to provide equal educational opportunities for all students, especially those with disabilities. When digital content is not accessible, it creates barriers that stop students from fully participating in learning activities. This can lead to disparities in academic outcomes; for instance, students with visual impairments often require significantly more time to complete their degrees than their peers due to inaccessible materials [Reed e Curtis 2012]. While some efforts have been made to address accessibility in digital education, many current approaches are fragmented, focusing on isolated courses or providing limited

tools for educators. Existing solutions often lack real-time feedback and fail to provide institutions with comprehensive mechanisms for monitoring accessibility on a larger scale. This work stands apart by adopting an institutional-wide perspective, combining automated tools for real-time accessibility evaluation with centralized dashboards that provide actionable insights. By addressing these gaps, this project not only enhances accessibility at the course level but also equips institutions to systematically monitor and improve the inclusiveness of their entire digital learning ecosystem.

The primary goal of this project is to develop tools that support both educators and institutions in identifying and addressing accessibility issues in LMS content. This will be achieved through automated tools that evaluate digital content in real-time, highlighting common accessibility problems. This tool is designed to evaluate some types of digital content, including PDF files, PowerPoint presentations, images, and tables. In addition, a centralized dashboard will be created to allow institutions to monitor and improve accessibility on their learning platforms. This dashboard also aims to guide users by referencing existing documentation and resources to address accessibility issues. By implementing these solutions, we aim to ensure all students, regardless of their disabilities, can fully engage with educational content.

## **2. Background and Related Work**

### **2.1. Web Accessibility**

Web accessibility refers to developing websites that are easy to navigate and use for all users, particularly those with disabilities who often encounter challenges when interacting with digital content [Abuaddous et al. 2016a]. This ensures that people with disabilities have a barrier-free experience, allowing them to use and contribute to the Web more effectively [Abuaddous et al. 2016b]. To support this goal, the Web Content Accessibility Guidelines (WCAG)[W3C Web Accessibility Initiative (WAI) 2025], developed by the World Wide Web Consortium (W3C), provide an internationally recognized framework for improving digital accessibility. These guidelines address a wide range of disabilities like visual, auditory, motor, and cognitive offering concrete recommendations for making web content more perceivable, operable, understandable, and robust[Abou-Zahra e Brewer 2019, Donnelly e Magennis 2003]. Evaluating web accessibility is a fundamental step in identifying and addressing potential barriers that may hinder user interaction [Vigo et al. 2013]. Evaluation methods are commonly categorized into two main approaches: technical evaluation and user experience evaluation. The technical evaluation can be further divided into automatic and manual assessments [Hassanzadeh e Navidi 2010]. Automated tools are frequently used due to their efficiency and low cost. These tools are best used for identifying straightforward, guideline-based issues but may miss more complex accessibility barriers that require human judgment [Mateus et al. 2021] [Acosta-Vargas et al. 2019].

### **2.2. PDF Accessibility**

In higher education, PDF documents are widely used for sharing course materials, assignments, and other resources [Çakir 2016]. However, these documents often present significant barriers for individuals with disabilities, particularly when they are created without accessibility in mind. Ensuring the accessibility of PDF documents is crucial

for promoting inclusivity, as these files can create substantial challenges for users with disabilities. [Devine et al. 2011]. Common issues include inadequate tagging, missing alternative text for images, insufficient contrast, and unstructured navigation [Nganji 2018].

### **2.3. Limitations of Current Monitoring Tools**

Two widely used tools for assessing accessibility in LMS platforms are Blackboard Ally and the Moodle Accessibility Toolkit, both of which present relevant limitations. Blackboard Ally offers automated accessibility checks, generates alternative content formats (such as tagged PDFs, audio, and ePub), and provides step-by-step feedback to instructors. It integrates with major LMS platforms and includes institutional-level reporting [Blackboard Inc. 2025]. However, Blackboard Ally is a paid service and lacks support for video accessibility, such as captions or audio descriptions. The Moodle Accessibility Toolkit, on the other hand, is free and integrated directly into the Moodle environment. It highlights accessibility issues via graphical indicators and generates summary reports. However, it does not support alternative formats, offers no corrective guidance to instructors, and has limited institutional oversight capabilities. It also lacks verification for video content accessibility [Moodle.org 2025].

## **3. Proposed Work and Contribution**

The primary objective of this work is to develop a centralized dashboard for evaluating and monitoring accessibility in Learning Management Systems (LMS). By addressing the fragmented nature of existing solutions, this dashboard will provide a comprehensive approach to assess accessibility, offering actionable insights that empower educators and institutions to identify barriers and foster more inclusive digital learning environments for students with disabilities. The specific goals are outlined below:

### **1. Evaluate the Accessibility of LMS Content**

- Develop a fully automated evaluation framework integrated directly into Moodle, as it is the platform currently used by our institution, allowing for better integration with existing workflows and offering greater control over deployment to address institutional needs.
- Use automated methods to identify barriers, such as non-compliance with WCAG guidelines, inaccessible multimedia content, or poorly structured documents.
- Provide quantitative metrics such as compliance rates, the number of detected accessibility issues, and suggested fixes, ensuring immediate actionable insights.

### **2. Enable Institutions to Monitor Accessibility at a Broader Scale**

- Design a centralized, real-time monitoring dashboard that aggregates accessibility metrics across courses and departments.
- Provide institutions with clear compliance metrics, highlighting trends over time and areas for improvement.

### **3. Support Educators in Evaluating and Improving Accessibility**

- Equip educators with tools to evaluate the accessibility of their own course content, making it easier to identify and address barriers.
- Guidance for creating accessible materials.

By achieving these objectives, this work seeks to bridge the gap between accessibility standards and practical implementation in higher education. The ultimate goal is to create a user-centered, data-driven approach to LMS accessibility, benefiting students, educators, and institutions alike.

#### 4. System Architecture and Current Implementation

The dashboard is currently in an operational stage, with key components already functional and integrated into Moodle. A custom Python script has been developed to evaluate PDF accessibility. The script analyzes the presence of alternative text for images, use of table headers, existence of document title metadata, use of properly marked lists, and verification that the detected language matches the defined document language.

Within Moodle, a custom dashboard block has been implemented as shown in Figure 1. This block automatically retrieves all PDFs present on the course page and displays an aggregated accessibility score for the entire course. This allows teachers to gain immediate insight into the accessibility level of their course materials. In addition, development is underway of a new Moodle block that generates a detailed accessibility report immediately after a PDF is uploaded. A third type of block is also planned, which will be embedded within each course page, providing page-specific accessibility information that reflects the content and resources available on that particular page.

The accessibility score shown in the dashboard (e.g., 35%) is presented as an example and represents the average accessibility level of a course page. This value is calculated based on two main components: (1) the average accessibility score of all PDF files available in the course; and (2) the accessibility score of the course page itself, obtained through the QualWeb tool, which performs an external evaluation based on WCAG guidelines. By combining these two metrics, the dashboard provides a more comprehensive and realistic overview of the digital accessibility of the course environment.

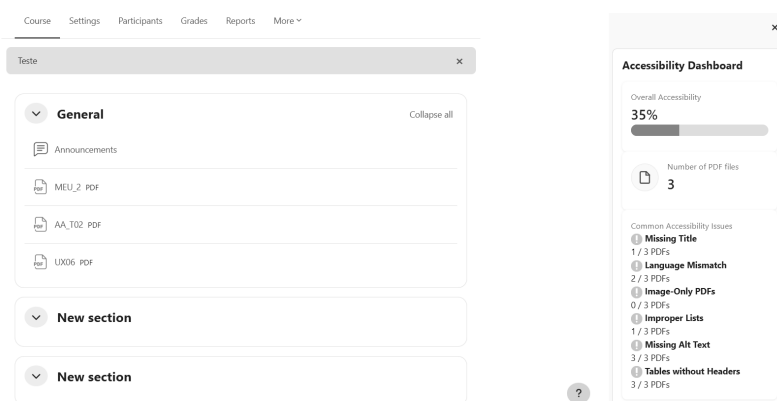


Figure 1. Accessibility dashboard embedded in the Moodle course page.

The detailed workflow of the accessibility evaluation process is available at OSF flow diagram.

#### 5. Forthcoming Work

The next stage of development will focus on enhancing the feedback experience for educators by finalizing the module that generates detailed accessibility reports at the point

of content upload. Future development will also address the institutional perspective, including the creation of a centralized dashboard to monitor accessibility metrics across departments and courses. These improvements aim to promote broader adoption and facilitate long-term accessibility planning.

Additionally, we plan to extend the dashboard's evaluation capabilities beyond PDFs to other content types such as PowerPoint presentations, videos, and Word documents. Integration of web accessibility evaluation is another key focus, with automated assessment tools embedded in the platform to distinguish between accessibility issues caused by the LMS itself and those stemming from instructor-provided content. Dedicated interface blocks will present these evaluation results clearly.

Finally, educators and students with diverse disabilities will be engaged through co-design sessions and user testing. These participatory approaches will help refine platform features and feedback mechanisms, ensuring that the tools are practical, relevant, and effectively support inclusive teaching and learning.

## 6. Ethical Considerations

This work does not involve human participants or the collection of personal data at the current stage. Any future user studies involving students or instructors will be conducted in compliance with institutional ethical guidelines, ensuring informed consent, anonymization of data, and approval from the relevant ethics committee when applicable.

## 7. Conclusion

Ensuring accessibility in digital education is not only a matter of compliance but a fundamental aspect of educational equity. This work presents an ongoing effort to bridge the gap between accessibility standards and everyday practice in higher education. By combining real-time evaluation, institutional oversight, and educator empowerment, the proposed dashboard aims to foster more inclusive learning environments.

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