



User Accessibility Evaluation of Platform Merdeka Mengajar Using the Web Content Accessibility Guideline 2.2

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Article Information

Received : 27 Dec 2024

Revised : 29 Jan 2025

Accepted : 28 Feb 2025

Keywords

Inclusive, WCAG,
Accessibility Evaluation

Abstract

Web accessibility evaluation of government platforms is crucial for inclusivity. This study assesses the accessibility of Platform Merdeka Mengajar (PMM), a digital platform developed by Indonesia's Ministry of Education for teachers and educational staff. The focus is on evaluating PMM's compliance with web accessibility standards, considering the importance of inclusivity in digital education, especially for visually impaired users. Methodology involves evaluation based on Web Content Accessibility Guidelines (WCAG). Results reveal 450 accessibility issues across 94 PMM pages, including problems with non-text content, information relationships, color contrast, link purpose, headings, labels, and element naming. Recommendations for fixing accessibility issues are provided for 43 pages meeting A and AA conformance levels. In conclusion, PMM requires significant improvements to become more inclusive, and this research presents recommendations based on WCAG standards to enhance the platform's accessibility.

A. Introduction

The crucial role of digital technology in education has led to its increased use in providing resources for teachers and educational staff in Indonesia. In 2022, the Ministry of Education, Culture, Research, and Technology (Kemendikbudristek) developed a platform called Platform Merdeka Mengajar (PMM) to enhance the quality of education in the country [1]. This digital platform, designed specifically for teachers and educational staff, offers various resources and features to support professional development. Internet-based government systems for education are crucial to educational reform in Indonesia for improving the quality of learning [2]. As of November 2024, the platform has been used by 3,609,482 teachers and school principals.

With the increasing use of the internet in education, inclusivity has become an inseparable aspect. As stated in Law No. 20 of 2003 on the National Education System, Article 4(1): "Education is conducted democratically, equitably, and non-discriminatorily by upholding human rights, religious values, cultural values, and national pluralism." [3]. Inclusive education ensures that every individual, regardless of physical, mental, or social limitations, can access and utilize available educational facilities.

Governments have a responsibility to ensure that all citizens can access information and services on public websites. They must prioritize universal access, allowing everyone to exercise their rights equally [4][5]. To support the inclusivity of government-provided educational web services, website accessibility is a key factor. Educational websites must be designed to be usable by all users, including individuals with special needs. It is crucial to conduct website accessibility evaluations to ensure that everyone can access them by identifying and addressing issues that hinder accessibility [6].

Educational platforms must address the diverse accessibility needs of users, accommodating individuals with varying abilities to ensure inclusive and equitable access to learning resources [7]. Platform Merdeka Mengajar has received feedback regarding accessibility challenges through reviews of its application on Google Play. The frequently reported accessibility issues are associated with hearing impairments, visual limitations, and intellectual disabilities related to technology use. These challenges can hinder users from effectively utilizing the educational services available on Platform Merdeka Mengajar. Consequently, the problem addressed in this research is that PMM has not yet become an educational service that can be used by all teachers and educational staff across various backgrounds and abilities.

During the root cause analysis, it was discovered that the design of Platform Merdeka Mengajar has not prioritized inclusive design principles. Furthermore, its design and development process has not yet adhered to accessibility standards that could serve as a reference for resolving accessibility issues within the platform. Therefore, this research aims to address the following research question (RQ):

1. What are the results of the accessibility evaluation of Platform Merdeka Mengajar, and what are the recommended improvements based on accessibility standards?

The aim of this research is to ensure that all users, regardless of their technological proficiency or physical limitations, can effectively access and utilize

PMM. Consequently, this study is expected to provide recommendations for improving PMM's accessibility in the future. Additionally, it aims to benefit institutions by promoting the assurance of inclusive education.

B. Research Method

In this study, researchers starting with understanding the web accessibility standard, Web Content Accessibility Guideline (WCAG) 2.2. To ensure comprehensive accessibility, international standards for accessible design should be adopted and implemented. Precise testing should be conducted using a combination of automated tools and manual evaluations [8][9].

a. Web Content Accessibility Guidelines 2.2

Web Accessibility Standards are guidelines and criteria developed to ensure that web content can be accessed and used by everyone, including people with disabilities. These standards aim to eliminate digital barriers and enhance social inclusion for individuals with disabilities, as well as provide an equal user experience for all people, regardless of their abilities or the devices they use [10].

The World Wide Web Consortium (W3C) developed the Web Content Accessibility Guidelines (WCAG) as a standard for measuring website accessibility. Created by experts and organizations under W3C, WCAG provides clear guidance on making web content accessible to all users, including those with disabilities. These guidelines outline what to do and avoid when creating web content, ensuring inclusivity and accessibility for a diverse user base [11].

WCAG 2.2 consists of 4 POUR principles (Perceivable, Operable, Understandable, Robust) with a total of 87 success criteria. Each success criterion has a different conformance level ranging from A, AA to AAA. Conformance level A means web pages must meet all Level A Success Criteria or provide an alternative version to meet Level A compliance as the minimum compliance level. Conformance level AA means web pages must meet all Level A and Level AA Success Criteria or provide an alternative version conforming to Level AA to meet Level AA compliance. Conformance level AAA means web pages must meet all Level A, Level AA, and Level AAA Success Criteria, or provide an alternative version that meets Level AAA Success Criteria. In this study, the researchers focus only on conformance levels A and AA.

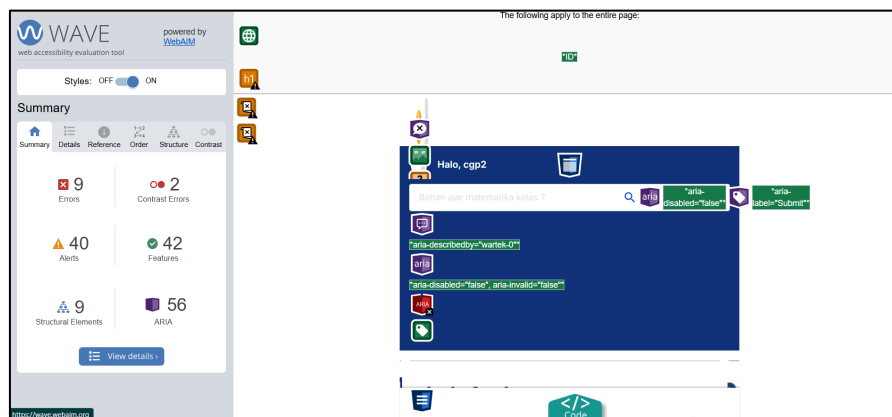
b. Automated Accessibility Evaluation

Web accessibility evaluation tools are software programs that help determine whether website content meets accessibility guidelines. The World Wide Web Consortium (W3C) has provided a list of web accessibility evaluation tools that can be used in this research [12]. Seven of these tools were selected: Access Assistant Community Edition, Button Contrast Checker Tool, Siteimprove, TAW, Utilia Validator, WAVE Web Accessibility Evaluation Tool, Lighthouse. These tools offer various features to assess different aspects of web accessibility, from color contrast to WCAG compliance, helping researchers and developers identify and address accessibility issues on websites.

Table 1. Accessibility Evaluation Automated Tools

#	Automated Tools	Access	Accessibility Standard
1	Access Assistant Community Edition	https://www.webaccessibility.com/	WCAG 2.0
2	Button Contrast Checker Tool	https://www.aditus.io/button-contrast-checker/	WCAG 2.1
3	Siteimprove	https://www.siteimprove.com/	WCAG 2.2
4	TAW	https://www.tawdis.net/	WCAG 2.1
5	Utilia Validator	https://validator.utilitia.pl/analyses/new	WCAG 2.0
6	WAVE	https://wave.webaim.org/	WCAG 2.2
7	Lighthouse	Chrome DevTools	WCAG Principal

Of the seven accessibility evaluation tools, two of them adhere to the latest web accessibility standard, WCAG 2.2. However, among these two tools, only WAVE has been widely used in most previous research studies. This factor encourages the use of the WAVE Web Accessibility Evaluation Tool in this research.

**Figure 1.** WAVE automated tool interface

The WAVE tool provides a comprehensive interface for accessibility evaluation. It displays a list of findings on the left, showing both potential issues and implemented success criteria. Users can examine each issue individually, relating them to WCAG 2.2 criteria and viewing their exact location in the source code. The tool also visually highlights issues on the webpage itself. This approach enables thorough accessibility evaluation, allowing users to identify problems, recognize successes, and pinpoint areas for improvement within the platform's structure.

c. Manual Evaluation

To ensure a comprehensive check of all success criteria, the researchers also employed manual review and code review methods. This approach allows for the evaluation of success criteria that may not be detected by the WAVE Web Accessibility Evaluation Tool alone. The combined use of automated tools and manual review methods provides a more thorough and accurate assessment of web accessibility, covering aspects that might be missed by automated testing alone.

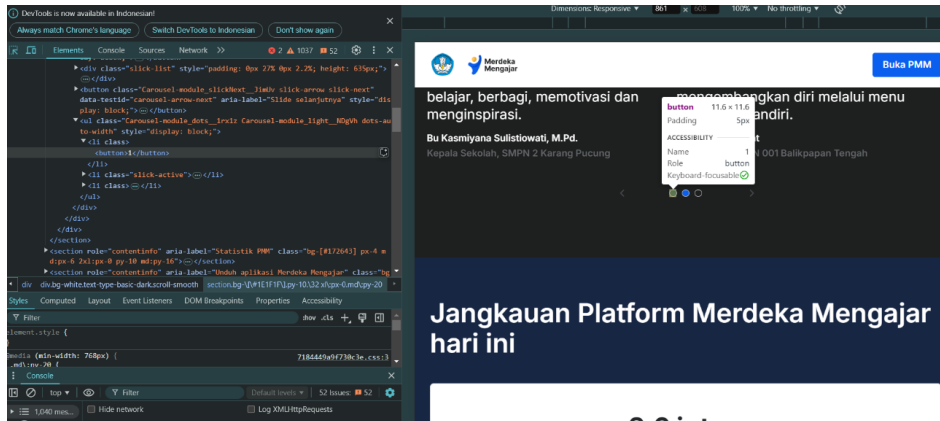


Figure2. Google DevTool for Manual Evaluation

Chrome DevTools is a set of web developer tools built directly into the Google Chrome browser [13]. DevTools allows for quick viewing of a page's HTML code, helping to check the completeness of elements according to the WCAG 2.2 criteria list. Each page on PMM will be checked for elements such as the completeness of lang attributes, the appropriateness of alt text, and the use of ARIA. This tool enables developers to thoroughly inspect and evaluate the accessibility features of web pages, ensuring compliance with WCAG 2.2 standards and improving overall accessibility.

C. Result and Discussion

In this research, nine products were identified that could be tested, comprising a total of 94 pages. All pages were then evaluated using the WAVE automated tool and manual evaluation, adhering to the WCAG 2.2 web accessibility standards.

Table 2. PMM Products and Pages

No	Product	Number of Page	URL
1	Core Platform	23	https://guru.kemdikbud.go.id/
2	Pelatihan Mandiri	17	https://guru.kemdikbud.go.id/pelatihan-mandiri
3	Komunitas	5	https://guru.kemdikbud.go.id/komunitas
4	CP/ATP	5	https://guru.kemdikbud.go.id/kurikulum/referensi-penerapan/capaian-pembelajaran/
5	Perangkat Ajar	19	https://guru.kemdikbud.go.id/perangkat-ajar/
6	Asesmen Murid	6	https://guru.kemdikbud.go.id/assessment
7	Video Inspirasi	3	https://guru.kemdikbud.go.id/video-inspirasi
8	Bukti Karya	12	https://guru.kemdikbud.go.id/bukti-karya
9	Ide Praktik	4	https://guru.kemdikbud.go.id/ide-praktik
Total		94	

Based on the accessibility testing results using WCAG 2.2 standards on 94 pages of Platform Merdeka Mengajar, a total of 450 accessibility issues were identified. The accessibility issues are categorized across nine products that are the focus of this research, allowing for issue grouping to concentrate on the development of each product. The product with the fewest issues is CP/ATP, with only 6 issues. This product also has the lowest average number of accessibility issues, at 1.20 issues per

page. The product with the highest average number of issues per page is the Community product, with 6.40 issues per page.

Table 3. Number of Issue Based On Product and Page

No	Product	Number of Page	Number of SC Pass	Avg of SC Pass	Numb of SC Fail	Avg of SC Fail
1	CP/ATP	5	130	26,00	6	1,20
2	Video Inspirasi	3	85	28,33	9	3,00
3	Pelatihan Mandiri	17	396	23,29	67	3,94
4	Core Platform	23	541	23,52	101	4,39
5	Ide Praktik	4	95	23,75	19	4,75
6	Asesmen Murid	6	141	23,50	32	5,33
7	Bukti Karya	12	280	23,33	70	5,83
8	Perangkat Ajar	19	454	23,89	114	6,00
9	Komunitas	5	98	19,60	32	6,40
Total / Avg		94	2220	23,62	450	4,79

From the nine products studied, researchers mapped 20 user flows to track accessibility issues as users navigated through pages. Comparing accessibility violations with successful criteria, all flows showed more passed criteria than violations.

Table 4. Number of Issue Based On User Flow

#	Product	User Flow	Number of Page	Number of SC Fail	Number of SC Pass	
1	Core Platform	A	7	37	162	
2		B	2	6	47	
3		C	5	31	100	
4		D	2	6	62	
5	Pelatihan Mandiri	E	7	29	161	
6		F	3	13	69	
7	Komunitas	G	3	19	56	
8		H	2	13	42	
9		CP/ATP	I	5	6	130
10		Perangkat Ajar	J	7	42	164
11	K		3	18	71	
12	L		3	18	71	
13	M		3	18	71	
14	N		2	13	51	
15	Asesmen Murid	O	4	17	97	
16		P	3	19	66	
17	Video Inspirasi	Q	3	9	85	
18	Bukti Karya	R	6	38	141	
19		S	5	32	115	
20		Ide Praktik	T	4	19	95

From the total of 20 user flows, a review of user difficulty levels for each stage of the user flow was conducted. In summary, there are several findings, including:

1. Category A: There are five flows (E, F, I, Q, and T) with a tendency that as users progress through the page flow, accessibility issues decrease, and the number of successful criteria increases. The green dashed line indicates the

number of success criteria passed, while the red dashed line represents the number of success criteria failed on each page within that user flow.

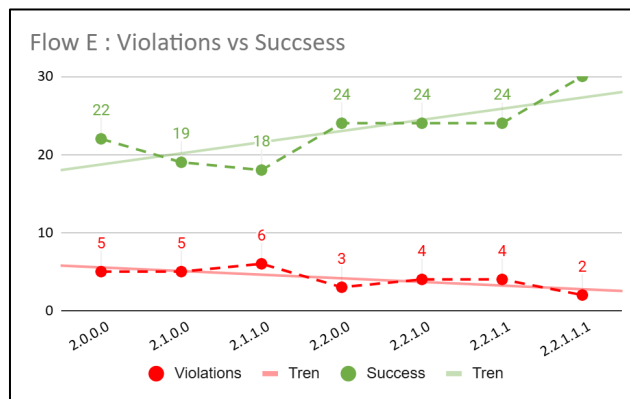


Figure 3. User Flow Category A

- Category B: There are 11 flows (C, G, H, J, K, L, M, N, P, R, and S) with a tendency that as users progress through the page flow, accessibility issues increase, and the number of successful criteria decreases. These lines provide a visual representation of accessibility compliance across each page in the user journey, with green dashed lines track the number of successfully met success criteria and red dashed lines show the count of failed success criteria.

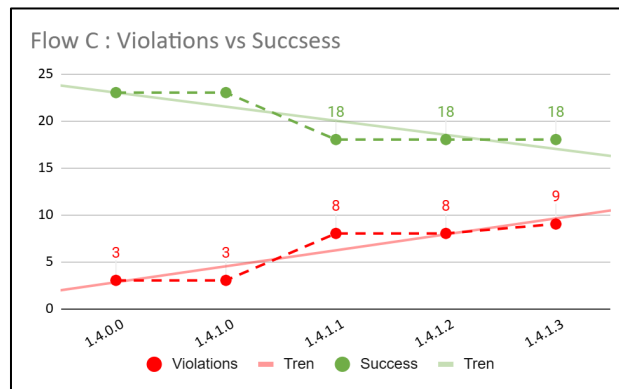


Figure 4. User Flow Category B

- Category C: There are four flows (A, B, D, and O) where the trend values tend to remain constant between the number of accessibility issues and the number of successful criteria. Red dashed lines show the count of failed success criteria.

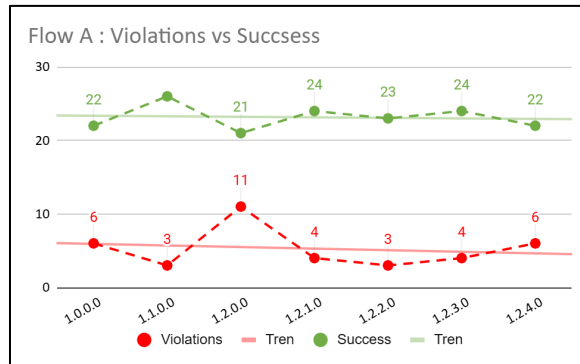


Figure 5. User Flow Category C

From all accessibility issues identified, an analysis was conducted based on WCAG 2.2 accessibility standards. Violations were found in 25 success criteria across the 94 pages studied, with a total of 450 issues discovered, averaging 4.79 issues per page.

Table 5. Number of Issue Based On User Flow

Success Criteria	Conformance Level	Number of Issues	Disabilities Classification
1.3.1: Info and Relationships	A	85	Vision, Motor, Cognitive
2.4.1: Bypass Blocks	A	51	Motor, Cognitive, Syaraf
1.1.1: Non-text Content	A	36	Vision, Cognitive
3.1.1: Language of Page	A	34	Vision, Speech, Cognitive
2.4.2: Page Titled	A	33	Vision, Hearing, Cognitive
3.3.2: Labels or Instructions	A	14	Vision, Motor, Cognitive
4.1.2: Name, Role, Value	A	11	Motor, Cognitive
2.4.4: Link Purpose (In Context)	A	3	Vision, Motor, Cognitive
1.3.3: Sensory Characteristics	A	2	Vision, Cognitive
2.5.3: Label in Name	A	2	Motor, Speech, Cognitive
2.1.1: Keyboard	A	1	Motor, Cognitive
3.2.1: On Focus	A	1	Vision, Motor, Cognitive
3.2.2: On Input	A	1	Motor, Cognitive
2.4.6: Headings and Labels	AA	87	Vision, Motor, Cognitive
1.4.3: Contrast (Minimum)	AA	35	Vision, Cognitive
1.4.11: Non-text Contrast	AA	13	Vision, Cognitive
1.3.5: Identify Input Purpose	AA	7	Vision, Motor, Cognitive
2.4.11 Focus Not Obscured (Minimum)	AA	7	Vision, Motor, Cognitive
2.4.7: Focus Visible	AA	7	Vision, Motor, Cognitive
1.4.10: Reflow	AA	5	Vision, Motor, Cognitive
1.4.12: Text Spacing	AA	4	Vision, Cognitive
1.4.5: Images of Text	AA	4	Vision, Motor, Cognitive
3.2.3: Consistent Navigation	AA	3	Motor, Cognitive
2.5.8 Target Size (Minimum)	AA	2	Vision, Motor
3.2.4: Consistent Identification	AA	2	Motor, Cognitive
Total		450	

From all identified accessibility issues, priority can be given to the success criteria with the most frequent violations to implement more comprehensive improvements that impact the majority of accessibility issues. Based on the pattern

of accessibility issues identified in products that influence the user flow of Platform Merdeka Mengajar, priority recommendations can be developed for the product flows B, C, G, H, J, K, L, M, N, P, R, and S.

Table 6. Number of Issue based on User Flow

#	Product	User Flow	Number of Issues	Page ID
1	Perangkat Ajar	J	42	5.0.0.0, 5.1.0.0, 5.1.1.0, 5.1.2.0, 5.1.3.0, 5.1.4.0, 5.1.4.1
2	Bukti Karya	R	38	8.0.0.0, 8.1.0.0, 8.1.0.0, 8.1.1.0, 8.1.2.0, 8.1.3.0
3	Bukti Karya	S	32	8.3.0.0, 8.3.1.0, 8.3.0.1, 8.3.0.2, 8.4.0.0
4	Core Platform	C	31	1.4.0.0, 1.4.1.0, 1.4.1.1, 1.4.1.2, 1.4.1.3
5	Komunitas	G	19	3.0.0.0, 3.1.0.0, 3.1.1.0
6	Asesmen Murid	P	19	6.0.0.0, 6.2.0.0, 6.2.1.0
7	Perangkat Ajar	K	18	5.2.0.0, 5.2.1.0, 5.2.1.1
8	Perangkat Ajar	L	18	5.3.0.0, 5.3.1.0, 5.3.1.1
9	Perangkat Ajar	M	18	5.4.0.0, 5.4.1.0, 5.4.1.1
10	Komunitas	H	13	3.2.0.0, 3.2.1.0
11	Perangkat Ajar	N	13	5.5.0.0, 5.5.1.0
12	Core Platform	B	6	1.3.0.0, 1.3.1.0
Total		12	267	44

From all identified accessibility issues, priority can be given to the success criteria with the most frequent violations to implement more comprehensive improvements that impact the majority of accessibility issues. From the 25 success criteria, general recommendations for improvements were developed based on WCAG 2.2 guidelines.

Table 7. Recommendation for Improvement Based On Success Criteria

#	Success Criteria	Recommendation for Improvement
1	1.3.1: Info and Relationships	Using code to strengthen the relationship between content and information conveyed through presentation elements such as headings, lists, tables, etc.
2	2.4.1: Bypass Blocks	Providing a way to skip repetitive content.
3	1.1.1: Non-text Content	Creating alternative text for visual and audio content that describes images/videos/audio/buttons.
4	3.1.1: Language of Page	Indicating the primary language used on the page through code.
5	2.4.2: Page Titled	Providing a descriptive page title using appropriate coding technologies.
6	3.3.2: Labels or Instructions	Providing labels or instructions for form input.
7	4.1.2: Name, Role, Value	Providing appropriate name, role, state, and value to components.
8	2.4.4: Link Purpose (In Context)	Providing a descriptive name or context for all links.
9	1.3.3: Sensory Characteristics	Describing controls based on name, not just appearance or location.
10	2.5.3: Label in Name	Making control labels names appropriate.
11	2.1.1: Keyboard	Ensuring pointer actions have equivalent keyboard actions.
12	3.2.1: On Focus	Not changing context while a user is focused on a particular item.

#	Success Criteria	Recommendation for Improvement
13	3.2.2: On Input	Informing the user that the context will change based on input.
14	2.4.6: Headings and Labels	Using headings and labels appropriately within content.
15	1.4.3: Contrast (Minimum)	Ensuring sufficient contrast between text and its background.
16	1.4.11: Non-text Contrast	Ensuring visual elements have a contrast ratio of at least 3:1 against the background color.
17	1.3.5: Identify Input Purpose	Using code to indicate the purpose of form input.
18	2.4.11 Focus Not Obscured (Minimum)	Ensuring that when an item receives keyboard focus, at least some of the surrounding content remains visible.
19	2.4.7: Focus Visible	Ensuring that each item that receives focus has a visible indicator.
20	1.4.10: Reflow	Ensuring that all elements remain readable and nothing is hidden on a 320 x 256 pixel viewport.
21	1.4.12: Text Spacing	Ensuring text readability by adjusting text properties such as increasing line height, paragraph spacing, letter spacing, and word spacing.
22	1.4.5: Images of Text	Using alternative text on images that contain text.
23	3.2.3: Consistent Navigation	Having a consistent navigation order across pages.
24	2.5.8 Target Size (Minimum)	Ensuring that targets (buttons, icons, objects) meet minimum size requirements or have sufficient spacing around them.
25	3.2.4: Consistent Identification	Identifying and consistently using repeated functions.

Of the 25 success criteria where accessibility issues were found, there are nine success criteria related to the first principle of WCAG 2.2, Perceivable, that can be improved by making visual improvements. These nine success criteria include:

1. 1.3.1: Info and Relationships

On the Landing Page, the heading 'Jangkauan Platform Merdeka Mengajar hari ini' is incorrectly marked as a paragraph (<p>). To meet WCAG guidelines, it should be marked as a heading (<h1> or <h2>) to provide better context for screen reader users.

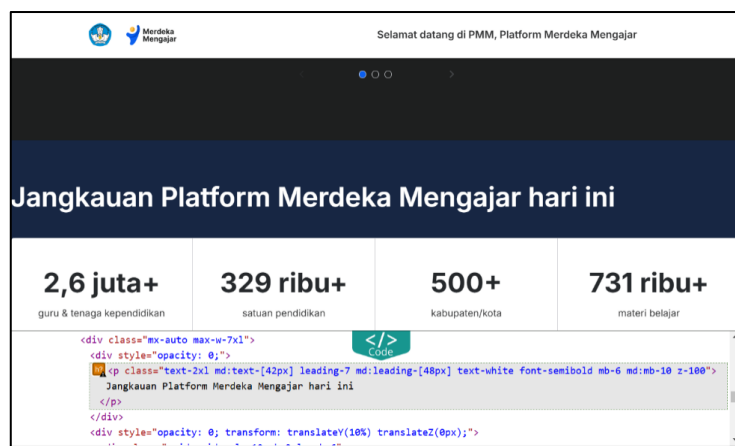


Figure7. Recommendation for 1.3.1

2. 1.1.1: Non-text Content

On the Landing Page, alternative text for images is either missing or meaningless. For example, an image of a teacher might have alt text like 'Gambar ibu guru mengajar di kelas'. WCAG recommends using descriptive alt text like 'A teacher instructing students in a classroom'.



Figure8. Recommendation for 1.1.1

3. 1.3.3: Sensory Characteristics

Navigation buttons on the Privacy Policy and Terms of Service pages lack descriptive labels. For instance, a 'back' button should have a text label like 'Back to Previous Page'. This ensures users, especially those who rely on screen readers, understand the button's purpose.

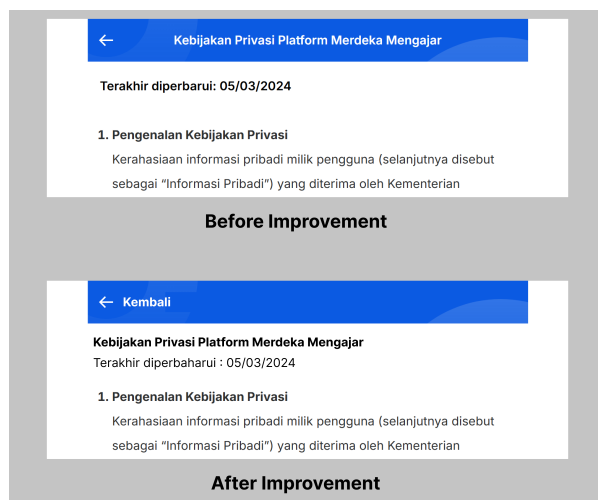


Figure9. Recommendation for 1.3.3

4. 1.4.3: Contrast (Minimum)

On the PMM homepage, the text 'Beta' in color #2C70E5 has insufficient contrast (3.51:1). To meet WCAG standards, the color should be changed to improve contrast. For example, changing it to #00337A increases contrast to 9.12:1.

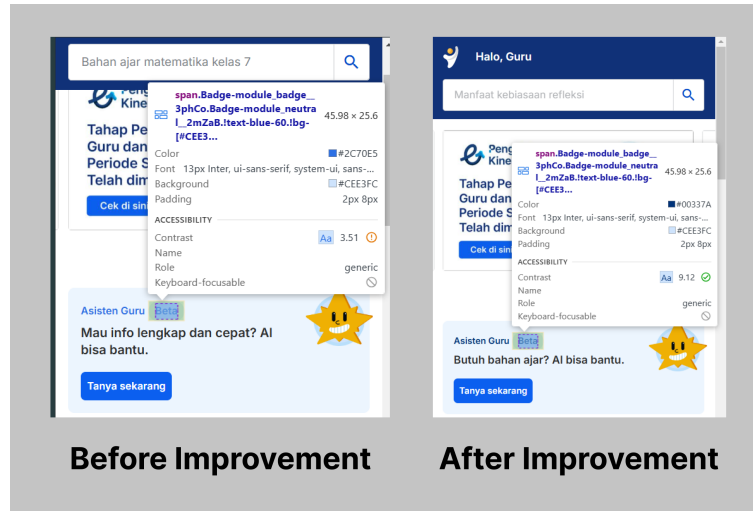


Figure10. Recommendation for 1.4.3

5. 1.4.11: Non-text Contrast

WCAG requires a contrast ratio of at least 3:1 between visual elements and the background. On the 'List Modul Ajar' page, the 'like' icon has a low contrast ratio of 2.05. Changing its color to #65696C improves the contrast to 4.54.

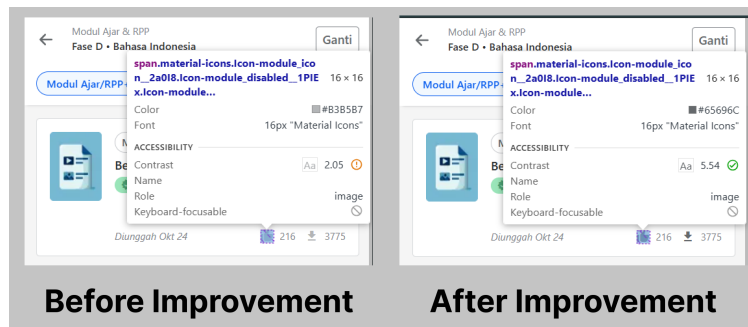


Figure11. Recommendation for 1.4.11

6. 1.3.5: Identify Input Purpose

On the profile photo change page, the image upload input lacks a label. While a placeholder is used, screen readers cannot convey the purpose of this field without a label. WCAG recommends using labels to clearly indicate the purpose of form inputs.

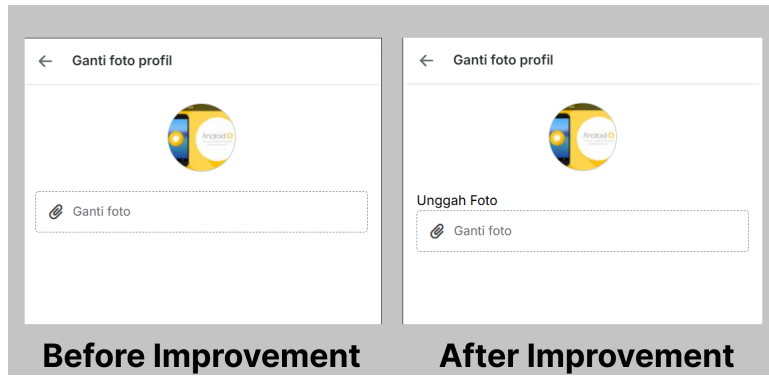


Figure12. Recommendation for 1.3.5

7. 1.4.10: Reflow

WCAG recommends that all content should be visible on screens as small as 320x256 pixels. On the 'Pelatihan Mandiri' page, the navigation header disappears when scrolling, hiding content. A collapsible header that hides when scrolling is recommended.

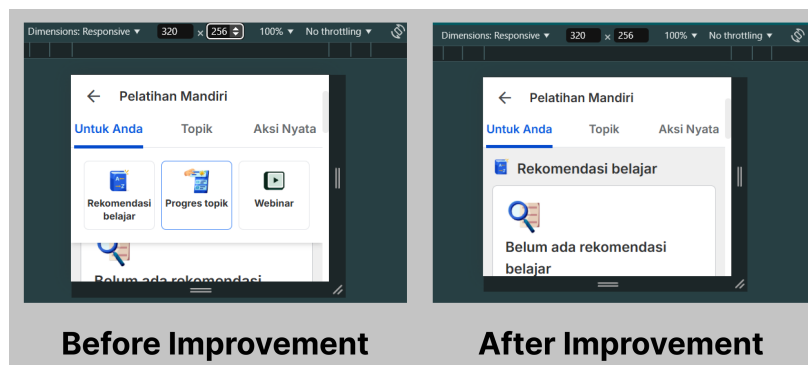


Figure13. Recommendation for 1.4.10

8. 1.4.12: Text Spacing

On the community webinar list page, the line spacing is too tight. WCAG recommends adjusting line height to at least 1.5 times the font size, and increasing paragraph spacing, letter spacing, and word spacing. Increasing the line height to 1.5 times the font size improves readability.

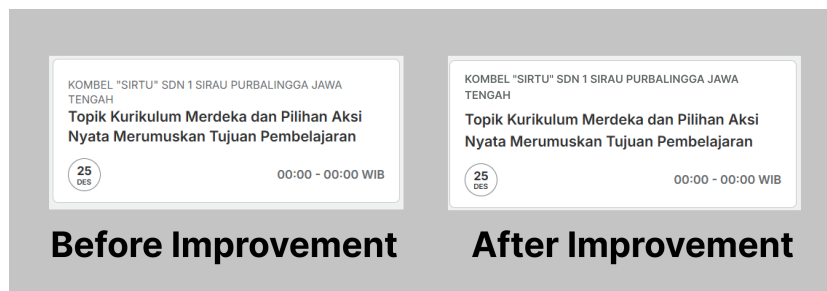


Figure 14. Recommendation for 1.4.12

9. 1.4.5: Images of Text

Images containing text should have alternative text. On the PMM homepage banner, the image lacks alt text. The alt text should describe the image content, such as *alt: 'Pengelolaan Kinerja. Tahap Penilaian Kinerja Guru dan Kepala Sekolah Periode Semester 2 Telah dimulai'*.

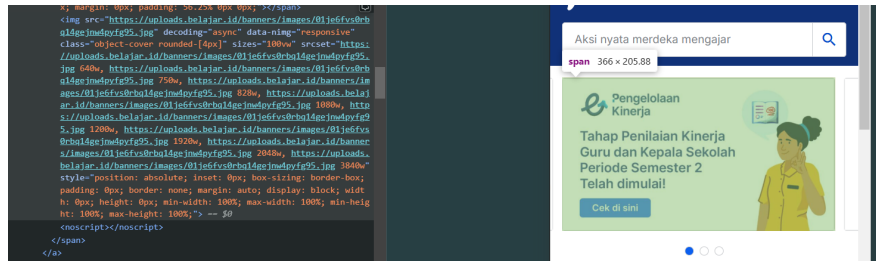


Figure15. Recommendation for 1.4.5

D. Conclusion

The accessibility evaluation of the Merdeka Mengajar Platform revealed significant accessibility issues across various pages, potentially hindering users with visual, auditory, or cognitive impairments. The evaluation, conducted using both automated and manual methods, highlighted recurring issues related to 13 Level A and 12 Level AA success criteria. Specifically, the most frequent Level A issue was related to criterion 1.3.1: Info and Relationships, with 85 findings. For Level AA, criterion 2.4.6: Headings and Labels had the highest number of issues at 87. Furthermore, the evaluation indicated that nine of the 25 success criteria with identified issues could be addressed through visual design improvements.

Several recommendations can be drawn from this research for future studies. Firstly, future research could consider expanding the scope of the evaluation by utilizing a more diverse range of tools to support comprehensive testing against all WCAG 2.2 success criteria. Secondly, future studies could evaluate the accessibility of other government-developed platforms to ensure their inclusivity for a wider audience. Finally, future research could explore the use of other standards, such as ISO/IEC 40500:202 or EN 301 549, to compare results with those obtained using WCAG 2.2.

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