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Evaluation of User Experience in the Extraordinary Computer-Based Test Application for HTML Programming Course Material

Evaluasi User Experience Aplikasi Extraordinary Computer Based Test pada Penilaian Mata Kuliah Pemrograman Materi HTML

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Abstract

This study aims to evaluate the use of the Extraordinary Computer-Based Test (CBT) application in assessing the HTML Programming course at the Politeknik Pelayaran Sumatera Barat, in line with the ongoing technological advancements in education. The integration of technology in education is expected to enhance the efficiency of assessments while also fostering a more interactive and responsive learning environment that meets the needs of students. The research employs a quantitative approach with an evaluation design based on the CIPP model (Context, Input, Process, Product). The study's subjects consist of 62 third-semester students from cohort VIII, 2024, divided into three classes. Data were collected through learning outcome tests, questionnaires, and practical assessment rubrics, covering the cognitive, affective, and psychomotor domains. The results indicate that the CBT application is effective in improving students' learning outcomes, with an average cognitive score of 83, and the highest scores in the areas of HTML application structure and development. The affective evaluation revealed a positive student response, with an affective score of 82, while the psychomotor evaluation showed adequate practical skills with a score of 80. This study reveals that CBT not only improves the effectiveness of assessments but also enriches the learning experience by providing real-time feedback and more personalized guidance. The findings contribute to the development of technology-based learning tools and offer practical solutions to enhance the quality of education. Additionally, the study recommends further development to integrate other technologies into the learning process.

Keywords: *Computer-based test, HTML programming assessment, student learning outcomes, cognitive, affective, psychomotor aspects, learning evaluation.*

Abstrak

Penelitian ini bertujuan untuk mengevaluasi penggunaan aplikasi Extraordinary Computer-Based Test (CBT) dalam penilaian mata kuliah Pemrograman HTML di Politeknik Pelayaran Sumatera Barat, seiring dengan tuntutan teknologi yang terus berkembang dalam pendidikan. Penggunaan teknologi di bidang pendidikan diharapkan dapat meningkatkan efisiensi penilaian sekaligus menciptakan lingkungan belajar yang lebih interaktif dan responsif terhadap kebutuhan mahasiswa. Metode penelitian yang digunakan adalah pendekatan kuantitatif dengan desain evaluasi program berdasarkan model CIPP (Context, Input, Process, Product). Subjek penelitian terdiri dari 62 mahasiswa semester tiga angkatan VIII tahun 2024 yang terbagi dalam tiga kelas. Data dikumpulkan melalui tes hasil belajar, angket, dan rubrik penilaian praktik yang meliputi ranah kognitif, afektif, dan psikomotor. Hasil penelitian menunjukkan bahwa aplikasi CBT efektif dalam meningkatkan hasil belajar mahasiswa, dengan rata-rata nilai kognitif mencapai 83, dan nilai tertinggi pada aspek struktur dan pengembangan aplikasi HTML. Evaluasi afektif menunjukkan respons positif mahasiswa dengan nilai 82, sementara evaluasi psikomotor menunjukkan keterampilan praktis yang memadai dengan nilai 80. Penelitian ini mengungkapkan bahwa CBT tidak hanya meningkatkan efektivitas penilaian, tetapi juga memperkaya pengalaman belajar mahasiswa melalui umpan balik secara real-time dan pembimbingan yang lebih personal. Temuan ini memberikan kontribusi terhadap media pembelajaran berbasis teknologi dan menawarkan solusi praktis untuk meningkatkan kualitas pendidikan. Selain itu, penelitian ini menyarankan pengembangan lanjut untuk integrasi teknologi lain dalam pembelajaran.

Kata Kunci: Computer-based test, mata kuliah pemrograman HTML, hasil belajar mahasiswa, aspek kognitif, afektif, psikomotor, evaluasi pembelajaran.

1. Introduction

The rapid development of information and communication technology has significantly impacted the field of education, including programming learning (Hanafi et al., 2023; Sansi et al., 2023). One of the key innovations resulting from this advancement is the implementation of Computer-Based Testing (CBT), which has been widely adopted by educational institutions to enhance the effectiveness and efficiency of assessments (Basar et al., 2023; Siallagan & Hanafi, 2024). At the Politeknik Pelayaran Sumatera Barat, specifically within the D-IV Marine Transportation Program, CBT is being implemented in HTML learning as a solution to assess student competencies more interactively and accurately. Research by (Yılmaz, 2021) suggests that integrating technology into education can increase student learning motivation by up to 30%, highlighting the strategic importance of technology in creating a dynamic and responsive learning environment.

Learning evaluation plays a crucial role in education, offering valuable insights into students' understanding of the material (Abdulrahaman et al., 2020; Alqahtani & Rajkhan, 2020; Hamilton et al., 2021). However, conventional evaluation methods are often seen as inadequate, particularly in programming education, which requires both hands-on practice and deep comprehension (Prasetya et al., 2023, 2024; Wulansari et al., 2024). CBT presents an attractive alternative, providing an interactive evaluation experience tailored to student needs and enabling real-time monitoring of learning progress. A study by (Efendi et al., 2021) found that CBT implementation in programming education improved learning outcomes by up to 25%, demonstrating its potential to simplify the assessment process and significantly enhance academic performance.

Beyond quick and accurate evaluations, CBT also facilitates more efficient data processing, enabling instructors to focus on developing better teaching materials and methods (Cahyaningsih et al., 2024; Owan et al., 2023). This system allows students to gain a clearer understanding of their strengths and weaknesses in mastering HTML, which includes skills such as text formatting, multimedia integration, hyperlinks, and style displays. Moreover, CBT-based evaluations provide instructors with data to offer more personalized guidance based on students' progress (Rachman & Nugrahawan, 2024; Ulaş & Seçer, 2022).

Despite these advantages, there remains a gap in research concerning the challenges and opportunities of integrating CBT into programming education. Specifically, there is limited exploration of how CBT can be used to assess and enhance students' mastery of HTML concepts. Additionally, the effectiveness of CBT in creating a structured, interactive, and data-driven learning environment for programming courses has not been thoroughly examined. This study seeks to address this gap by evaluating the Extraordinary CBT application used in the HTML programming course at Politeknik Pelayaran Sumatera Barat. It will assess the application's effectiveness in delivering interactive, real-time evaluations and its ability to identify students' strengths and weaknesses. Furthermore, the study aims to develop complementary web-based modules to enhance the learning experience and propose personalized learning paths using data analytics to address the limitations of traditional evaluation methods.

This research is expected to make significant contributions to programming education. It will develop innovative web-based learning modules that integrate seamlessly with the CBT system, offering a structured and interactive approach to mastering HTML. The study will also provide valuable insights into optimizing technology-based assessments, enhancing evaluation methods for programming courses. Additionally, it will offer practical recommendations for implementing CBT systems in specialized educational settings, aiding institutions in modernizing their teaching methodologies. Finally, the findings will be aligned with workforce demands to ensure that

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students gain relevant skills and competencies. Ultimately, this study aims to improve the quality of programming education and establish a model for integrating technology-based assessments that address both academic and practical needs.

2. Literature Review

The study conducted by (Maricar et al., 2023) evaluated user experience on the Maidekost website using the "USE Questionnaire" to assess aspects such as usefulness, satisfaction, ease of use, and ease of learning. This research was part of the platform's early development phase for finding boarding house information. The evaluation revealed high usability levels, with average scores of 3.76 for usefulness, 3.79 for satisfaction, 4.18 for ease of use, and 4.27 for ease of learning, resulting in an overall usability percentage of 79.96%. However, interviews highlighted the need for improvements, particularly in information completeness and interface design, to better meet user needs. These findings are relevant to evaluating computer-based applications like the Extraordinary Computer Based Test (ECBT), where usability is a crucial factor in ensuring an optimal user experience in digital environments.

Another study by (Ahnan et al., 2021) used the "User Experience Questionnaire (UEQ)" to evaluate the "ADI STETSA" system, an educational information system supporting learning and administrative activities at SMAN 4 Malang. The evaluation measured six scales: attractiveness, perspicuity, efficiency, dependability, novelty, and stimulation. The results showed positive scores across most scales, though novelty in the website's admin interface required further improvement. This research highlights the importance of interactive and innovative design in educational systems. In the context of the ECBT application for programming courses focusing on HTML material, a similar evaluation approach can be applied to measure and enhance the quality of user experience, ensuring the application is not only efficient but also engaging and easy to use for more effective learning.

3. Research Methods

3.1. Type of Research

This study uses a quantitative method based on the philosophy of positivism (Park et al., 2020). The research was conducted on a specific population or sample using random sampling techniques. Data were collected through research instruments, such as questionnaires, learning outcome tests, and practical assessment rubrics. The data analysis is quantitative/statistical, using numerical values as the basis for data processing. This research is a program evaluation that adopts the CIPP model (Context, Input, Process, Product), focusing on evaluating the product, specifically the use of the Extraordinary Computer-Based Test (CBT) application in the HTML Programming course at the Politeknik Pelayaran Sumatera Barat (Babadi et al., 2024; Basaran et al., 2021; Mohebi et al., 2018). Evaluation was conducted across three main learning domains: cognitive, affective, and psychomotor. The CIPP Model is presented in detail in Figure 1.

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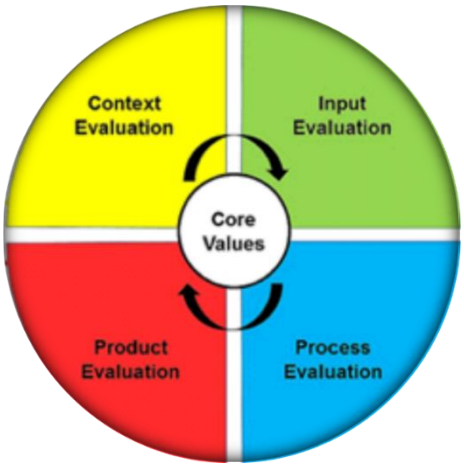

Figure.1. CIPP Model (Context, Input, Process, Product)

3.2. Research Subject

The selection of classes in this study was based on the total population size and specific sampling considerations. The research population consisted of 62 third-semester students from cohort VIII in 2024 at the Politeknik Pelayaran Sumatera Barat. Given that the population size was less than 100, the study employed a total sampling technique, which ensured the inclusion of all students as participants. The sample encompassed three existing classes: Class A with 21 students, Class B with 21 students, and Class C with 20 students. These classes were not selected randomly but were included in their entirety, as they naturally represented the entire population. This total sampling approach enabled comprehensive data collection, capturing the full range of variability among all participants without requiring additional stratification or randomization. Data for the study were gathered using a mixed-methods approach, integrating qualitative and quantitative data concurrently to evaluate user experiences with the CBT application (Austin et al., 2020). Primary data sources included questionnaires to assess student perceptions of the CBT application, learning outcome tests to measure academic performance, and practical assessment rubrics to evaluate hands-on application use (Ghaffar et al., 2020). This methodology ensured a robust and inclusive analysis, leveraging the diverse experiences of all students within the population.

3.3. Data Collection

The research instruments cover three learning domains (Rahim et al., 2024). The cognitive domain was measured through a 25-item objective test based on the HTML course material. The affective domain was assessed using a Likert scale questionnaire, while the psychomotor domain was evaluated through an observation sheet with a rubric rating scale ranging from "very high" to "low". The data collection details for each domain are as follows:

3.3.1.Cognitive Domain

This domain was measured using an objective test consisting of 25 questions. The questions were designed based on the material taught in the HTML Programming course.

3.3.2.Affective Domain

This domain was evaluated using a questionnaire (survey) constructed with a Likert scale. The Likert scale provides response options ranging from very positive to very negative (Jebb et al., 2021). The detailed options for the Likert scale are shown in Table 1.

Table.1. Likert Scale Response Options

Statement Item	Positive	Negative
Always (AL) / Strongly Agree (SA)	5	1
Often (OF) / Agree (A)	4	2
Sometimes (ST) / Neutral (N)	3	3
Rarely (RL) / Disagree (D)	2	4
Never (NV) / Strongly Disagree (SD)	1	5

3.3.3.Psychomotor Domain

The psychomotor domain was assessed using an observation sheet and a rating rubric. This rubric measures the students' practical skills with a scale presented in Table 2.

Table.2. Measurement of the Psychomotor Domain

Practical Skill Range	Demonstrated Ability
91 – 100	Students can perform tasks without errors and are highly skilled
71 – 90	Students can perform tasks well with minimal errors
51 – 70	Students can perform tasks with assistance or show errors that need correction
50 – 0	Students lack sufficient skills or require full guidance

3.4. Data Analysis Technique

Data analysis was conducted using a mixed-method approach, combining quantitative and qualitative methods (Anchors et al., 2024; Sharma et al., 2023). One key aspect of the analysis involved calculating the Total Correct Response (TCR) percentage to assess respondents' achievement levels based on questionnaire or survey results. TCR is a method that calculates respondents' achievement levels as a percentage, reflecting how well they meet the expected targets (Anchors et al., 2024). The TCR formula is expressed as follows:

$$\text{TCR} = \left(\frac{\text{Total Actual Score}}{\text{Total Max Score}}\right) 100\ \%$$

Description**:**
Total Actual Score: The total score obtained by respondents from the questionnaire or survey.
Total Maximum Score: The highest possible score based on the number of indicators or questions in the questionnaire.

In order to determine the level of achievement of respondents through the following steps: First, the data from the completed questionnaires will be tabulated. Second, the score for each indicator will be calculated. Third, the total score will be calculated. Finally, the data will be analyzed using descriptive statistical methods.

Descriptive statistics were employed in this study to summarize and interpret the collected data. Data presentation includes tables, charts, pie diagrams, and calculations of mode, median, deciles, percentiles, mean, standard deviation, and percentages to represent the data distribution. Percentage analysis, based on the TCR formula, is used to evaluate respondents' achievement levels, as illustrated in Table 3.

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Table.3. Respondent Achievement Categories

Range	Description
90% - 100%	Very Good
80% - 89%	Good
70% - 79%	Satisfactory
69% - 55%	Poor
54% - 0%	Very Poor

4. Results and Discussion

The study's results on the evaluation of the use of the Extraordinary CBT (Computer-Based Test) application in assessing the outcomes of the HTML Programming course at the Politeknik Pelayaran Sumatera Barat, are explained based on the research questions formulated. This research reveals the learning achievements in the cognitive, affective, and psychomotor domains.

4.1. Cognitive Domain

The cognitive domain assessment administered 25 objective questions to test students' understanding of HTML-based web application technology. These questions covered text formatting, tables, multimedia, hyperlinks, forms, and styles in web application development. The evaluation was conducted on 62 students involved in the study.

Table.4. Cognitive Domain Evaluation of the Use of Extraordinary CBT Applications

Mean	Std. Deviation	Minimum	Maximum	Sum
82.90	9.448	60	100	5140

Based on Table 4, the cognitive domain results indicate an average score (mean) of 82.90, with a standard deviation of 9.448. The most frequent score (mode) is 76, the lowest score (minimum) is 60, and the highest score (maximum) is 100. The total sum of all scores is 5140. A more detailed breakdown of the scores for each sub-aspect based on the materials tested can be seen in Table 5.

Table.5. Average Learning Outcomes of Cognitive Aspects According to HTML Material

No.	Material	Average Score	Value Category
1	Format	78	Medium
2	Table	80	High
3	Multimedia	80	High
4	Hyperlink	81	High
5	Form	83	High
6	Style	83	High
7	Structure and lighter	90	Very High
8	Application Development	89	High
Average		**83**	**High**

The study results describe students' cognitive learning outcomes in the HTML Programming course, as presented in Table 5, reflecting their mastery of various aspects of web application development. In the text formatting aspect, students achieved an average score of 78, indicating a relatively good understanding of essential elements such as headings, paragraphs, and text styles (bold, italic, underline), although there is room for improvement in its application. In the table element, an average score of 80 indicates sufficient ability to create and organize simple tables,

although mastery of more complex layouts still needs improvement. In multimedia, students scored an average of 80, showing a good understanding of embedding elements like images, audio, and video, though some students need improvement in integrating elements with page layouts.

In the hyperlink aspect, the average score of 81 shows a pretty good mastery in creating internal and external links and organizing them for more interactive experiences, such as configuring links to open in a new tab. In the form aspect, an average score of 83 reflects students' ability to construct form elements like text inputs, submit buttons, checkboxes, and dropdowns, as well as an understanding of the importance of data validation. In the style aspect, students achieved an average score of 83, demonstrating a good command of using CSS for page styling, although there is still a need to improve skills in creating responsive and consistent designs. The highest scores were achieved in the structure and lighter elements, with an average score of 90, demonstrating excellent mastery in structurally organizing HTML elements and using tags like meta tags, headers, and footers to create neat and functional documents. The application development aspect scored an average of 89, indicating students' exceptional ability to integrate various HTML elements into a comprehensive web application, such as text, tables, multimedia, hyperlinks, forms, and styles.

The average score of 83 indicates a solid understanding of basic HTML concepts, with the highest scores in structure and application development. This shows that students have a good understanding of building structured web applications. However, some aspects, such as text formatting and tables, still require attention to improve learning outcomes. The media used for evaluating the learning outcomes are presented in Figure 2.

Figure.2. Main Menu of the CBT Application (a); Manage Question Bank Menu (b); Manage Exam Schedule Menu (c); Manage Exam Participants and Research Subjects Menu (d)

As shown in Figure 2, the Extraordinary CBT application for assessing the HTML Programming course should be supplemented with practice materials covering text processing, table creation, multimedia use, and hyperlink integration in applications. To further enhance

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students' knowledge, it is also recommended to include simple CSS guides to help them better understand design aspects. Additionally, regularly conducting mini-projects based on CBT can help improve the accuracy of student learning assessments. By leveraging advanced technology, this application has great potential to support the effective development of students' programming skills.

4.2. Affective Domain

The affective domain assessment was conducted by distributing 20 questions to 62 respondents in this study. The questionnaire was designed to explore students' responsibility, honesty, and discipline in learning. Below are the primary data from the study related to the affective domain, as presented in Table 6.

Table.6. Affective Domain Evaluation of the Use of Extraordinary CBT Applications

Mean	Std. Deviation	Minimum	Maximum	Sum
81.50	6.108	64	94	5053

Referring to Table 6, the results of the affective domain evaluation show several vital statistics: the average score is 81.50, with a standard deviation of 6.108; the most frequent score (mode) is 79; the lowest score (minimum) is 64, the highest score (maximum) is 94, and the total sum of all scores is 5053. A detailed breakdown of the scores for each sub-aspect of the affective domain can be seen in Table 7.

Table.7. Average Affective Domain Assessment

No	Statement	Percentage (%)	Category
1	Completing assignments on time without procrastination in the HTML Programming course using the Extraordinary CBT application	93	Very High
2	Putting my best effort into every assignment given by the lecturer in the HTML Programming course using the Extraordinary CBT application	91	Very High
3	Taking responsibility for thoroughly understanding the course material in the HTML Programming course using the Extraordinary CBT application	85	High
4	Avoiding copying others' work and completing every assignment independently in the HTML Programming course using the Extraordinary CBT application	89	High
5	Consistently attending scheduled lectures on time in the HTML Programming course using the Extraordinary CBT application	80	High
6	Repeating the material at home to better understand the lessons in the HTML Programming course using the Extraordinary CBT application	82	High
7	Respecting study time by minimizing distractions such as using a phone or social media	85	High
8	Taking notes of assignments and schedules to avoid forgetting	64	Low

9	Completing group tasks responsibly without shifting the workload onto other team members	73	Moderate
10	Avoiding giving incorrect answers just for grades during exams in the HTML Programming course using the Extraordinary CBT application	81	High
11	Being open to feedback and suggestions from lecturers and peers to improve during the HTML Programming course using the Extraordinary CBT application	77	Moderate
12	Utilizing break times during lectures effectively to maintain focus	83	High
13	Avoiding unnecessary absences without clear reasons	81	High
14	Allocating time for independent study outside the scheduled lectures in the HTML Programming course using the Extraordinary CBT application	82	High
15	Honestly, acknowledging my mistakes if anything is overlooked or forgotten in assignments	75	Moderate
16	Strive to clearly understand assignment instructions before starting	83	High
17	Maintaining a consistent study schedule and following the HTML Programming course using the Extraordinary CBT application	79	Moderate
18	Resisting the temptation to cheat or ask for answers during exams in the HTML Programming course using the Extraordinary CBT application	83	High
19	Working harder to improve low grades during the HTML Programming course using the Extraordinary CBT application	79	Moderate
20	Following all classroom rules and respecting the learning process in the HTML Programming course using the Extraordinary CBT application	86	High
	Average	**82**	**High**

Based on the research findings presented in Table 7, the most prominent attitudes among students were discipline in completing assignments on time and adherence to course regulations. Conversely, the lowest scores were recorded in the indicator related to note-taking for assignments and lecture schedules to prevent forgetfulness. Overall, the average affective domain score of the students was 82%, reflecting a high learning attitude towards using the Extraordinary CBT (Computer-Based Test) application in the HTML Programming course at the Politeknik Pelayaran Sumatera Barat. Based on these findings, it is recommended that the Extraordinary CBT application continue to be used, given its positive contribution to enhancing students' learning attitudes. Furthermore, this application has the potential to be applied to other courses to encourage similar learning outcomes.

4.3. Psychomotor Domain

The psychomotor domain assessment was based on observations made by the lecturer, acting as an observer, while students applied their skills in the practical sessions of the HTML

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Programming course. The evaluation includes 12 critical competencies that focus on practical skills in this course. The primary data from the research regarding psychomotor domain scores are presented in Table 8.

Table.8. Psychomotor Domain Evaluation of the Use of Extraordinary CBT Applications

Mean	Std. Deviation	Minimum	Maximum	Sum
79.85	6.553	68	93	4951

The psychomotor domain results in Table 8 show that the average score (mean) is 79.85, with a standard deviation of 6.553. The most frequent score (mode) is 72, while the lowest score (minimum) is 68, and the highest score (maximum) is 93. The total score (sum) achieved is 4951. More details on the scores for each sub-aspect indicator in the psychomotor domain can be found in Table 9.

Table.9. Average Psychomotor Domain Assessment

No	Statement	Practical Score	Category
1	Creating Basic HTML Structure	78	Good
2	Displaying Text in Different Formats	81	Good
3	Creating Tables	91	Good
4	Inserting Images into Web Pages	79	Good
5	Inserting Audio or Video	77	Good
6	Creating Hyperlinks	80	Good
7	Creating Simple Forms	80	Good
8	Using CSS for Style Management	78	Good
9	Applying Responsive Layout	79	Good
10	Using Margin and Padding Settings	80	Good
11	Using Colors and Fonts Consistently	81	Good
12	Ensuring Hyperlinks and Media Function Properly	81	Good
	Average	**80**	**Good**

Based on the research findings presented in Table 9, it can be concluded that the student's practical skills in the HTML Programming course are categorized as "Good" across all evaluation criteria. This indicates that students could perform tasks effectively with minimal errors, as all evaluation aspects fell within the score range of 71-90, which is considered good. Therefore, the product evaluation recommends that the use of the Extraordinary CBT application in the HTML Programming course at the Politeknik Pelayaran Sumatera Barat be continued, and it may also be considered for implementation in other courses.

5. Conclusion

This study evaluated the use of the Extraordinary CBT application in the HTML Programming course at the Politeknik Pelayaran Sumatera Barat. Based on the evaluation results across three learning domains—cognitive, affective, and psychomotor—it can be concluded that the use of the CBT application positively impacts student learning outcomes. In the cognitive domain, students mastered various HTML topics with an average score of 82.90, indicating a solid understanding of the basic concepts of web application development. In the affective domain,

students exhibited positive attitudes towards using CBT, contributing to their motivation and engagement in learning. Meanwhile, in the psychomotor domain, students could demonstrate adequate practical skills in applying the material they learned. Overall, implementing CBT improved the quality of learning and evaluation results at the Politeknik Pelayaran Sumatera Barat.

6. Future Work

This research could be expanded by exploring other technologies that may complement or enhance the effectiveness of CBT in programming education. For instance, using augmented reality (AR) or virtual reality (VR) to create interactive simulations in HTML teaching could further improve students' practical understanding. Additionally, further research could include a comparative analysis between CBT and conventional evaluation methods to measure its impact on the quality of learning in greater depth. In the long term, this study could propose the development of a more advanced CBT application with features that are more adaptive to individual student needs and applicable across various other study programs at the Politeknik Pelayaran Sumatera Barat.

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