



Developing a Web-Based Application to Support Student Behavior Monitoring in Vocational Education

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Abstract: This study aims to develop and implement a web-based student behavior monitoring application for Grade X students of Computer and Telecommunication Network Engineering (TJKT) at SMKN 1 Sambas and to analyze its impact on student behavior and learning outcomes. The research employed a Research and Development (R&D) method using the ADDIE model, encompassing the stages of needs analysis, design, development, implementation, and evaluation. The data analysis combined quantitative descriptive and qualitative approaches. Quantitative data obtained from expert validation sheets and questionnaires were analyzed using percentage-based descriptive statistics to determine the feasibility and practicality of the developed application. Meanwhile, qualitative data derived from observations and documentation were analyzed through data reduction, data display, and conclusion drawing to support the interpretation of the findings. Data were collected through observations, questionnaires, and documentation, involving teachers, class advisors, parents, and students. The expert validation results indicated that the application is highly feasible, with scores of 88.31% from content experts, 88.94% from media experts, and 86.48% from technology experts. Practicality testing by teachers and parents also categorized the application as highly practical, with scores of 83.51% and 84.94%, respectively. Behavioral evaluation showed significant improvement, with teacher-led interventions reaching 81.27% (good category) and student self-interventions 85.45% (very good category). Furthermore, academic outcomes improved significantly, with the class average increasing from 70 to 79. The t-test analysis yielded a p-value of 0.000 ($p < 0.05$), indicating that the application effectively enhances both student discipline and academic performance. In conclusion, the developed web-based application is valid, practical, and effective in improving student behavior and learning outcomes.

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Introduction

The implementation of character education in schools has recently become a major concern, as character formation is a crucial aspect that must be cultivated and instilled in students from an early age. One form of character development is achieved through the strengthening of character education. As stipulated in Presidential Regulation of the Republic of Indonesia Number 87 of 2017, the Strengthening Character Education Program (PPK) is an educational initiative carried out by educational institutions with the aim of reinforcing students' character through the harmonization of moral cultivation (olah hati), emotional development (olah rasa), intellectual development (olah pikir), and physical development (olah raga). This program also emphasizes collaboration among schools, families, and the



community as part of the National Movement for Mental Revolution (Gerakan Nasional Revolusi Mental/GNRM).

In schools, students receive values education aimed at forming the foundation of character and cultivating positive values in everyday life (Mardikarini & Putri, 2020). Character values such as honesty, responsibility, discipline, politeness, and courtesy are instilled in accordance with the curriculum and students' developmental stages, so that they can serve as essential personal attributes in the future. Character education is also intended to address negative behaviors that frequently emerge among students, particularly in the modern era, where many individuals possess adequate knowledge but lack sufficient social skills and attitudes.

One character trait that receives particular emphasis is discipline. According to Lickona (2012), discipline falls within the domain of moral education and constitutes an essential component of children's character formation. Research conducted by Salsabila and Diana (2021) indicates that discipline is among the most problematic character traits, identified by 56% of teachers and 18% of parents, while simultaneously being considered the most important character to be instilled in students (88%). Discipline can be developed through the establishment of school regulations that are clearly displayed in classrooms, implemented collectively, and monitored by all members of the school community. In addition to general school rules, teachers also formulate specific regulations related to the learning process, such as punctuality in submitting assignments, active participation, and cooperation during learning activities.

The process of cultivating discipline outside instructional hours can begin with the formulation of school regulations that are clearly displayed in classrooms and school areas, enabling all school members teachers, staff, and students to understand and comply with the applicable rules. Once these regulations are established, all members of the school community are expected to collaborate in their implementation and supervision, including monitoring students who violate the rules. Thus, the enforcement of regulations becomes not only the responsibility of teachers but also a shared obligation of the entire school community, fostering a consistent and sustainable culture of discipline (Slameto, 2013).

In addition to general school regulations, teachers need to establish supplementary classroom rules that are specifically designed to support the effectiveness of the learning process. These classroom rules are collaboratively developed by teachers and students, allowing students to feel a sense of ownership and responsibility for their implementation (Sabornie & Emmer, 2014). Examples of classroom rules include the obligation to submit assignments on time, demonstrate cooperative behavior during lessons, respect peers during discussions, and maintain cleanliness and order in the learning environment (Ahmad, 2022; Demir et al., 2023). The implementation of these rules is regularly monitored by teachers, and in some cases, students are also involved in mechanisms of collective responsibility. This approach fosters a sense of ownership and active participation in shaping disciplined behavior (Slameto, 2013).

Research by Noviyanti and Setyaningtyas (2017) shows that the optimal implementation of classroom rules has a positive impact on students' learning participation. This suggests that when teachers consistently enforce rules and provide a clear classroom structure, students tend to be more active and engaged in the learning process. This finding aligns with Bandura's Social Cognitive Theory (1986), which emphasizes that individual behavior is influenced by observational learning, reinforcement, and self-regulation.



Consistent classroom rules provide clear behavioral models and feedback that reinforce students' active participation.

On the other hand, Fekadu (2019) found that students' awareness of school rules is significantly correlated with positive behaviors such as discipline, responsibility, and orderly learning habits. In other words, students who understand and recognize the importance of rules tend to demonstrate proactive and compliant behavior, even if they are not directly involved in the formulation of those rules. This indicates that the internalization of values and understanding of regulations play a more critical role in shaping positive behavior than formal involvement in rule-making processes.

However, although previous studies have emphasized the importance of classroom rules and behavioral monitoring, most of them primarily focus on conventional or manual monitoring systems and do not fully integrate digital solutions that enable real-time tracking and comprehensive behavioral evaluation. In contrast, the system developed in this study offers several distinctive features that differentiate it from earlier monitoring applications. First, it incorporates a reward point mechanism that provides immediate reinforcement for positive student behavior, thereby strengthening motivation through systematic feedback. Second, the system is integrated with a digital report card feature, allowing behavioral records to be accumulated and transparently communicated to teachers and parents. Third, the application facilitates collaborative monitoring involving teachers, parents, and students, which enhances accountability and continuity between school and home environments. These features highlight the novelty of the proposed system, particularly in combining behavior monitoring, reinforcement strategies, and reporting integration within a single digital platform.

Based on a preliminary survey conducted in Grade X of the TJKT department at SMKN 1 Sambas during the first semester of the 2024/2025 academic year, student behavior showed a significant negative trend. The problems identified included tardiness, absenteeism, smoking, fighting, theft, and defiance toward teachers. These behaviors negatively affected students' academic outcomes, as reflected in low report card grades, and also influenced their social interactions both at school and at home.

Each violation of school rules and regulations is assigned a specific point value according to the type and severity of the offense. To provide appropriate guidance or sanctions, teachers must first record all student violations manually in a ledger or record book and then calculate each student's total violation points. Once the total points are determined, teachers can decide on the appropriate disciplinary action or sanction. These sanctions vary, ranging from verbal warnings by homeroom teachers or subject teachers, to written agreements signed on stamped paper, and up to the most severe sanction, which involves summoning parents or guardians to jointly address the student's behavior.

This manual procedure has several weaknesses. First, the process of recording and calculating violation points is time-consuming, as teachers must create violation records, enter data individually, and ensure accuracy. Second, manual record-keeping is often less valid and prone to errors, as human mistakes may occur in point calculation or data entry. Third, the dissemination of information regarding students' behavior to parents or guardians becomes difficult, slow, and not always accurate, resulting in less effective communication between schools and parents in the guidance process.

These conditions indicate that the manual system for managing student violations is inefficient and does not support prompt and accurate decision-making. Therefore, innovation in the form of a digital system or application for monitoring student behavior is required to



automatically record, calculate, and report violations. Such a system would enable teachers to impose sanctions in a timely, valid, and transparent manner, while also facilitating communication with parents or guardians. In the currently implemented system, sanctions are imposed only on students who violate rules, whereas good behavior or compliance is not rewarded. This condition results in low motivation among students to voluntarily adhere to disciplinary rules.

These circumstances demonstrate that the manual and conventional implementation of school regulations has numerous limitations, particularly in terms of rule socialization, supervision, and behavior monitoring. This situation highlights the need for a digital system or application capable of monitoring, recording, and providing feedback on student behavior in a more effective, rapid, and transparent manner. Based on the identified problems, it is evident that the manual management of school regulations and student behavior guidance has significant limitations in terms of efficiency, data validity, and communication with parents. Manual violation recording requires considerable time, is prone to errors, and makes it difficult to provide timely feedback. Furthermore, the absence of a reward mechanism reduces students' motivation to comply with school rules.

Therefore, to address these issues, an information technology-based innovation in the form of an integrated and automated digital application for monitoring student behavior is required. The system will deduct points when students violate school rules and add points as rewards for positive behavior, enabling the balanced implementation of the reward and punishment principle. In addition, the system will be directly connected to students' and parents' mobile devices, allowing real-time access to point changes and increasing awareness and involvement among all stakeholders. Furthermore, the final point scores will be integrated into students' report card grades, ensuring that behavior monitoring has a direct impact on formal evaluation while also simplifying administrative management and reporting for teachers.

The use of digital applications to monitor student behavior can have a positive impact on character development. Such applications have been shown to enhance discipline, responsibility, and student engagement in the learning process, as student actions can be monitored in real time and immediately reinforced through rewards or sanctions (Sari et al., 2025; Suhendra et al., 2024). The integration of technology into character education not only facilitates supervision but also encourages students to actively improve their behavior and participate more intensively in learning activities. Additionally, it improves the efficiency of violation record-keeping and strengthens parental involvement in monitoring student behavior (Krisfianto & Indahyanti, 2024). Based on the above background, this study aims to describe the development of a website-based application for monitoring students' behavioral development in Grade X of the TJKT department at SMKN 1 Sambas.

Research Method

This study is a development research employing the ADDIE model, which consists of the Analysis, Design, Development, Implementation, and Evaluation stages. The analysis stage was conducted to identify the needs of teachers, homeroom teachers, parents, and technological requirements in developing a website-based Student Behavior Development Monitoring Application, so that behavior monitoring can be carried out effectively and sustainably. The design stage focused on developing the system structure, user interface, database, main features, as well as the application flow and navigation based on the results of



the needs analysis, in order to ensure that the student behavior monitoring system operates in an integrated manner and is easy to use.

The development stage involved realizing the system design into a website-based student behavior monitoring application through design implementation, component integration, feature development and testing, expert validation, and system refinement to ensure that the application functions optimally and is suitable for use. The implementation stage consisted of applying and using the student behavior monitoring application in a real school environment through user training, monitoring of application use, feedback collection, and system adjustments to ensure the effectiveness and sustainability of the application. The evaluation stage is the final phase of the ADDIE model, which aims to assess the effectiveness of the website-based student behavior monitoring application, both in terms of technical aspects and its impact on students' positive behavior and learning outcomes.

Data were collected through observation, interviews, and validation and practicality instruments using a Likert scale. The observation guidelines in this study covered aspects of student behavior, monitoring constraints, and application needs observed during the implementation of the website-based student behavior monitoring application. Interviews were conducted to explore users' needs, constraints, benefits, and expectations regarding the development of the student monitoring application, so that its features, design, and usage align with the learning process and school needs. Expert validation instruments were used to assess the feasibility of the content, media, and information technology aspects of the student behavior monitoring application, ensuring that the content aligns with educational objectives, the interface is user-friendly, and the system operates securely, reliably, and effectively in supporting learning and character development. The practicality instruments included teacher and parent practicality, behavioral interventions, student behavior, and learning outcomes to comprehensively evaluate the ease of application use, changes in student behavior, and their relationship with academic achievement.

The research data were analyzed using quantitative and descriptive methods to assess validity, practicality, and instrument reliability, evaluate the effectiveness of behavioral interventions and improvements in learning outcomes, and examine differences in students' learning outcomes after the implementation of the website-based student behavior monitoring application.

Results and Discussion

Analysis

The needs analysis at SMKN 1 Sambas, particularly in Grade X of the TJKT Department, shows that behavioral monitoring is still conducted manually and unsystematically, causing difficulties in data recapitulation for teachers. Both teachers and parents expressed a strong need for a sustainable digital system with features such as periodic data input, automatic reporting, real-time notifications, and digital portfolios, as well as ease of use through a simple and intuitive interface. From the parents' perspective, most still face challenges in monitoring their children's behavior and require faster access to information, while also supporting the use of a website-based system to improve communication with teachers.

Design

The design stage focuses on developing the system structure, workflow, database, user interface, and key features of the website-based application based on the needs analysis. The system is designed to support efficient and continuous behavioral monitoring through an



integrated process of data collection, storage, and reporting. The user interface emphasizes simplicity, accessibility, and ease of navigation to ensure usability for teachers, students, and parents. The database is structured using an Entity Relationship Diagram (ERD) to maintain data consistency, security, and accessibility. Key features include behavioral data input, automatic recapitulation, progress visualization, and real-time reporting, all designed to facilitate collaboration and simplify the monitoring process.

Development

The development stage in the ADDIE model aims to assess the feasibility and practicality of the website-based application for monitoring students’ behavioral development before its wider implementation. At this stage, the application was first consulted with the supervisor to obtain feedback on content, design, and technical aspects, which then served as the basis for product refinement. System implementation was carried out using a client–server architecture that separates user interface functions (client) from data processing functions (server) to enhance efficiency, security, and system maintainability.

Application development includes the integration of front-end, back-end, and database components, as well as the development of key features such as student behavioral data input, data recapitulation, developmental graphs, and real-time behavioral reports. Initial testing indicated that all features functioned in accordance with the design and user requirements.

Table 1. Validation Results

Validation	Percentage Score	Criteria
Subject Matter Expert	88.31%	Very Feasible
Media Expert	88.94%	Very Feasible
Information Technology Expert	86.48%	Very Feasible

The expert validation results indicate that the application falls into the Very Feasible category. Validation by the subject matter expert yielded an overall average score of 88.31%, media expert validation reached 88.94%, and information technology expert validation achieved 86.48%. These results demonstrate that the application is feasible in terms of content substance, media presentation, and technical aspects, requiring only minor revisions in accordance with the validators’ suggestions.

Table 2. Practicality Analysis Results for Teachers and Parents

Practicality Analysis	Percentage Score	Criteria
Teacher Practicality	83.51%	Very Practical
Parent Practicality	84.94%	Very Practical

A limited trial to assess the practicality of the application involved teachers and parents. The practicality analysis conducted by teachers resulted in an average score of 83.51%, categorized as Very Practical, reflecting ease of use, efficiency, feature functionality, interactivity, and user satisfaction. Meanwhile, the practicality assessment by parents obtained an average score of 84.94%, also categorized as Very Practical, indicating that the application is easy to access, effective in monitoring students’ behavioral development, responsive, and supportive of communication with the school. Based on the validation and practicality testing results, it can be concluded that the website-based student behavior monitoring application is very feasible and very practical, and therefore suitable to proceed to the implementation and broader-scale testing stages.

Implementation

The implementation stage involves applying the website-based student behavior development monitoring application in a real educational setting to examine its effectiveness



and usability. The implementation was conducted in Grade X of the TJKT Department at SMKN 1 Sambas, involving three classes with a total of 98 students. The application was directly used by teachers, homeroom teachers, and students in school activities to continuously record and monitor behavioral development. This allowed the monitoring process to be carried out in a structured, well-documented, and easily accessible manner for relevant stakeholders.

Prior to implementation, short training sessions were conducted for teachers and homeroom teachers regarding application operation procedures, including behavioral data input, report access, and monitoring student behavioral development. During the implementation process, application usage was monitored to ensure that all system functions operated as designed and to identify any technical or operational issues that might arise.

Evaluation

The evaluation stage of the development of the Website-Based Student Behavior Development Monitoring Application aimed to assess the effectiveness and practicality of the application after its implementation in Grade X of the TJKT Department at SMKN 1 Sambas. The evaluation was conducted using a behavioral intervention questionnaire administered to teachers and students to measure the impact of the application on the systematic monitoring, management, and modification of student behavior.

Table 3. Criteria for Teacher and Student Behavioral Intervention Assessment

Intervention Assessment	Percentage Score	Criteria
Teacher Assessment of Student Behavioral Intervention	81.27%	Good
Student Self-Assessment of Behavioral Intervention	85.45%	Very Good

The results of the behavioral intervention assessment conducted by teachers showed an overall average score of 81.27%, categorized as Good, indicating that the application is effective in supporting improvements in discipline, responsibility, motivation, independent learning, and positive behavioral change. Meanwhile, the students' self-assessment of behavioral intervention yielded an overall average score of 85.45%, categorized as Very Good, suggesting that application usage enhances self-awareness, learning motivation, independence, social skills, and positive attitudes toward the use of technology in learning.

Use of the Website-Based Student Behavior Monitoring Application in Behavioral Intervention

Assessments from both teachers and students indicate that the application is effective in supporting the student behavioral intervention process. The application functions not only as a recording tool but also as a systematic behavioral intervention instrument through real-time monitoring, enabling teachers to more easily identify behavioral changes, provide feedback, and determine appropriate intervention strategies.

Table 4. Recapitulation of Student Behavioral Intervention Assessment

Class	Teacher	Students
Class A	81.82	86.98
Class B	80.92	85.04
Class C	81.09	84.33
Average	81.27	85.45
Criteria	Good	Very Good

The use of the Website-Based Student Behavior Development Monitoring Application in behavioral intervention is categorized as Good to Very Good, as indicated by teacher and student assessment results. Based on the recapitulation, the average teacher assessment score was 81.27% (Good), with class-specific scores of 81.82% (Class A), 80.92% (Class B), and 81.09% (Class C). Meanwhile, student self-assessments showed an



average score of 85.45% (Very Good), with scores of 86.98% (Class A), 85.04% (Class B), and 84.33% (Class C).

The Effect of Using the Website-Based Student Behavior Monitoring Application on Students' Learning Outcomes

The use of the website-based student behavior development monitoring application contributes positively to the improvement of students' learning outcomes. This improvement is reflected in increased discipline, active learning participation, and student independence in managing their learning processes. The application helps students independently monitor their behavioral development and learning achievements, thereby encouraging the formation of positive learning habits. Furthermore, increased motivation and learning engagement facilitated by application features have a positive impact on material comprehension and academic achievement. Therefore, the application is not only effective in behavioral intervention but also supports the overall enhancement of students' learning outcomes.

Table 5. Differences in Learning Outcomes Before and After Using the Website-Based Monitoring Application

Score Range	Class A		Class B		Class C	
	Before	After	Before	After	Before	After
< 60	0	0	0	0	0	0
60–84	33	25	33	25	32	24
> 84	0	8	0	8	0	8
Mean	70.06	78.55	70.70	79.64	70.19	79.84
Improvement	8.49		8.94		9.65	

The results of the analysis indicate an improvement in students' learning outcomes after the implementation of the website-based monitoring application. Prior to the application, all students in Classes A, B, and C were within the score range of 60–84, with mean scores of 70.06, 70.70, and 70.19, respectively. After using the application, an increase was observed in the number of students achieving scores above 84, with eight students in each class reaching this category, while no students obtained scores below 60. The mean scores increased to 78.55 in Class A, 79.64 in Class B, and 79.84 in Class C, with improvements of 8.49, 8.94, and 9.65 points, respectively.

Table 6. Differences in Overall Mean Learning Outcomes Before and After Using the Website-Based Monitoring Application

Score Range	Application Use		Description
	Before	After	
< 60	0	0	Low
60–84	98	74	Moderate
> 84	0	24	High
Mean	70.32	79.34	
Improvement	9.02		
N-Gain	0.304		Moderate

The overall mean score increased from 70.32 to 79.34, representing an improvement of 9.02 points. The N-Gain value of 0.304 indicates that the improvement in learning outcomes falls within the moderate category. These findings demonstrate that the implementation of the website-based monitoring application is effective in improving students' learning outcomes, as reflected in the increased mean scores and the higher proportion of students achieving high score categories.



Table 7. Results of the Independent Samples t-Test

	t	df	Sig. (2-tailed)
Learning Outcomes (Equal variances assumed)	-10.935	194	.000
Learning Outcomes (Equal variances not assumed)	-10.935	192.972	.000

The results of the independent samples t-test show a significance value of $0.000 < 0.05$, indicating a statistically significant difference in learning outcomes before and after the use of the application. These findings confirm that the website-based monitoring application for tracking students' behavioral development is effective in improving the learning outcomes of Grade X students in the TJKT Department at SMKN 1 Sambas.

Discussion

The development of a website-based application for monitoring students' behavioral progress in Grade X of the TJKT Department at SMKN 1 Sambas was grounded in a needs analysis revealing that existing monitoring practices were still manual, unstructured, and inefficient in terms of data management and reporting. Teachers, homeroom teachers, and parents expressed the need for a digital system capable of providing systematic records, real-time reporting, and integrated communication. This finding underscores the importance of needs analysis in ensuring the relevance of educational product development (Anasputri et al., 2023; Rahayu, 2025), in line with the R&D framework of Borg and Gall.

The application was developed using the ADDIE model, incorporating key behavioral indicators such as discipline, responsibility, learning activeness, and cooperation, which are essential for students' character development (Mardikarini & Putri, 2020; Hasanah & Rowanda, 2024). Designed with a user-friendly interface and client-server architecture, the system integrates features such as behavioral input, automated recapitulation, progress visualization, real-time reporting, and digital portfolios to support continuous monitoring.

The findings indicate that the application is feasible and practical for use in educational settings, supporting previous studies that highlight the effectiveness of web-based monitoring systems in improving efficiency, data organization, and school-parent communication (Asria et al., 2024; Suharti & Susanti, 2021). Furthermore, the implementation of the application contributes to improving students' behavioral awareness and supports more structured intervention processes. Differences between teacher assessments and student self-assessments suggest the emergence of students' self-awareness and self-regulated learning (Rantung et al., 2023).

In addition, the use of the application shows a positive contribution to students' learning outcomes, indicating that behavior-based monitoring can support academic improvement. This aligns with previous findings that emphasize the relationship between behavioral management and learning achievement (Fadli et al., 2022; Rooshadiya et al., 2025). Overall, this study demonstrates that the developed application is not only feasible and practical but also effective in supporting character development and learning improvement. It enhances transparency, accountability, and collaboration among teachers, students, and parents, and is conceptually aligned with behaviorism theory and self-regulated learning. Therefore, the application has strong potential to be implemented more broadly as a sustainable, data-driven solution for student behavior monitoring (Robbani, 2021; Nugraha et al., 2016).



Conclusion

This study successfully developed and implemented a web-based student behavior monitoring application for Grade X students of the TJKT department at SMKN 1 Sambas using the ADDIE model. The findings confirm that the application is highly feasible, with expert validation scores exceeding 86%, and highly practical for both teachers (83.51%) and parents (84.94%). The implementation significantly enhanced behavioral intervention efficacy, evidenced by teacher-led assessment scores of 81.27% (Good) and student self-assessment scores of 85.45% (Very Good), demonstrating improved discipline, responsibility, and independence. Furthermore, the application yielded a statistically significant improvement in academic outcomes ($p < 0.05$), with an N-Gain of 0.304 (Moderate). Consequently, this digital system serves as a scalable, data-driven solution that transforms manual behavioral monitoring into a transparent, collaborative, and real-time framework for character development and academic enhancement.

Recommendation

It is recommended that teachers utilize the application consistently for continuous behavioral monitoring and use the data to provide feedback and support students' self-regulation. School leaders should support its implementation through training, infrastructure, and system integration to enhance data-driven decision-making and school-parent collaboration. Future researchers are encouraged to expand the study with broader samples, longitudinal designs, and the integration of advanced features such as adaptive feedback or AI-based analytics to further improve the effectiveness of behavioral monitoring systems.

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