

Design and Quality Evaluation of a Web Based Student Scoring System at the Special Education School in Batam Using ISO/IEC 25010

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ABSTRACT

The academic assessment process at an SLB in Batam currently relies on conventional manual methods and fragmented spreadsheet-based systems. This conventional approach frequently results in suboptimal score recapitulation, increased probability of data recording errors, and a general lack of efficiency in managing student evaluations. To address these systemic challenges, this research focuses on the design and quality evaluation of a web-based Student Scoring System developed using the Laravel framework and MySQL database. The development followed the structured Waterfall Software Development Life Cycle (SDLC) model, comprising requirements analysis, system design, implementation, and testing. Requirements were derived through intensive interviews with teachers as the primary stakeholders. Software quality was rigorously assessed using six characteristics of the ISO/IEC 25010 standard: Functional Suitability, Reliability, Performance Efficiency, Usability, Effectiveness, and Satisfaction. Evaluation instruments included expert judgment, WAPT for load testing, GTmetrix for performance analytics, and the Computer System Usability Questionnaire (CSUQ). The evaluation results demonstrate that the system achieved a 100% functional success rate, with all features operating according to user needs. Technical testing revealed high reliability with zero errors under normal load and a perfect 100% performance efficiency score. Furthermore, the system achieved a "very good" usability and satisfaction rating with an average score of 6.73. These findings indicate that the proposed system effectively improves the accuracy and transparency of academic scoring within the specialized environment of an SLB in Batam.



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I. INTRODUCTION

Special Schools (SLB) function as vital educational institutions dedicated to providing specialized services for students with diverse needs, including hearing (tunarungu), visual (tunanetra), intellectual (tunagrahita), and physical (tunadaksa) impairments, as well as autism. The pedagogical delivery in these settings necessitates a highly individualized approach because student characteristics and learning requirements are profoundly unique [26]. In the context of an SLB in Batam, the institution oversees three educational levels SDLB, SMPLB, and SMALB which, despite their distinct curricula, generally adhere to similar academic assessment mechanisms due to internal school policies and the practical management requirements of the faculty. The

current reliance on manual documentation and basic spreadsheets for these assessments presents substantial risks, such as recording errors, sluggish recapitulation times, and potential inconsistencies in student evaluation across the different levels [19].

In established assessment theory, a critical distinction is maintained between formative assessment, which serves as a feedback loop for improving learning strategies, and summative assessment, which facilitates a final recap of student achievements at the end of a unit or period [9], [10]. For special education, assessments must transcend mere quantitative scoring to include qualitative descriptions (keterangan) that offer a comprehensive view of student development rather than focusing solely on results [26], [27]. This research proposes the development of a web-based

Student Scoring System using Laravel and MySQL to modernize this workflow. While various academic systems exist, there is a notable research gap regarding the application of the ISO/IEC 25010 standard in special education contexts. This study adopts ISO/IEC 25010 over older standards like ISO 9126 [23] because it provides a more contemporary framework that emphasizes "Quality in Use," specifically Effectiveness and Satisfaction, which are paramount for teachers operating in a specialized environment. Consequently, the objective is to design, build, and evaluate a system that meets the specific demands of an SLB in Batam across six quality characteristics.

II. METHOD

A. Research Design

This study uses a Software Development Life Cycle (SDLC) approach with the Waterfall model. The Waterfall model was chosen based on the clarity of system requirements that had been obtained through initial interviews with the school. The system development stages include: (1) requirements analysis through interviews with teachers as the main users of the system, (2) system design using UML and ERD, (3) implementation using the Laravel framework and MySQL database, (4) functional testing and software quality evaluation, and (5) analysis of evaluation results based on the ISO/IEC 25010 standard.

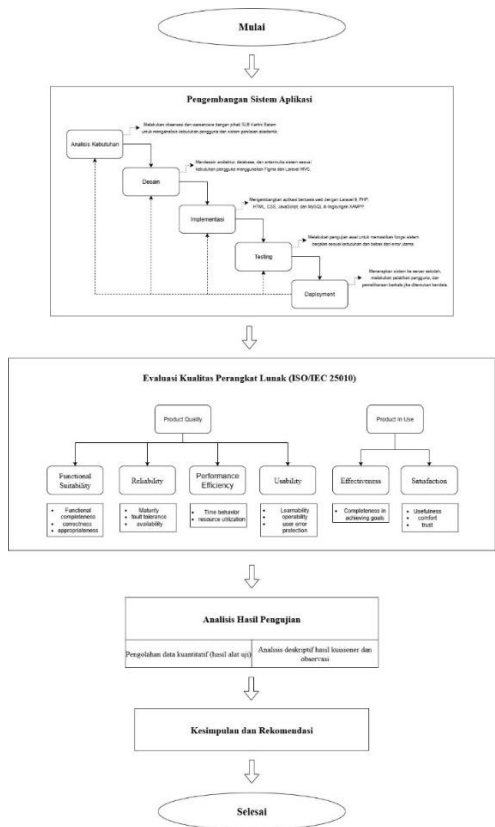


Figure 1. Research Stages

B. Data Collection

Primary data was obtained through direct field interviews with teachers at SLB Batam to identify workflow bottlenecks and through direct observation of the scoring process. Secondary data was retrieved through a rigorous literature review of academic journals focusing on ISO/IEC 25010, software usability, and the digitalization of academic assessments in special education.

C. System Design

The information architecture was modeled to support Role-Based Access Control (RBAC), defining unique interaction patterns for three user levels: Admin, Teacher, and Student.

TABLE I
USE CASE SCENARIO FOR SCORE INPUT

Main Actor	Teacher
Pre-conditions	Teacher is successfully authenticated and logged into the system.
Post-conditions	Student score data and qualitative descriptions are successfully persisted in the database.
Description	Used by the teacher to input, calculate, and manage academic scores for specific classes.
Main Scenario	1. Teacher selects the "Manage Scores" menu. 2. System displays class and subject options. 3. Teacher selects the target class and subject. 4. System retrieves and displays the student roster. 5. Teacher inputs numerical scores (NA Formatif, UTS, NA Sumatif, SAS). 6. Teacher saves the data. 7. System processes data and displays a success notification.
Alternative Scenario	* If required data fields are incomplete, the system displays a validation warning. * If a database connection error occurs, the system informs the user and data is not saved.

D. Quality Evaluation Instruments

The system was evaluated against six characteristics of the ISO/IEC 25010 standard, encompassing both Product Quality and Quality in Use dimensions.

TABLE II
ISO/IEC 25010 QUALITY EVALUATION INSTRUMENTS

No	Characteristic	Dimension	Method/Technique	Tools/Instrument	Indicator
1	Functional Suitability	Product Quality	Expert Judgment	Form checklist fungsional	≥90% of features operational
2	Reliability	Product Quality	Load & Stress Testing	WAPT	Zero errors under normal load
3	Performance Efficiency	Product Quality	Performance Testing	GTmetrix	Performance score ≥90%
4	Usability	Quality in Use	Questionnaire	CSUQ	Average score ≥6
5	Effectiveness	Quality in Use	Observation	Task Completion	High task

					success rate
6	Satisfaction	Quality in Use	Questionnaire	CSUQ	Average score ≥ 6

III. RESULT AND DISCUSSION

A. System Implementation

The Student Scoring System was developed using a Laravel-based Model-View-Controller (MVC) architecture with Role-Based Access Control to manage three distinct user interfaces. The Admin Dashboard handles centralized management of master data including teacher accounts, student rosters, subjects, and class assignments. The Teacher Dashboard provides score entry with filtering by educational level (SDLB, SMPLB, SMALB), while the Student Dashboard allows students to view academic summaries and print official reports in PDF format.

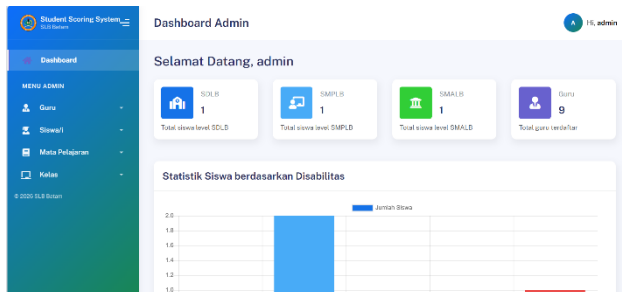


Figure 2. Admin Dashboard Page

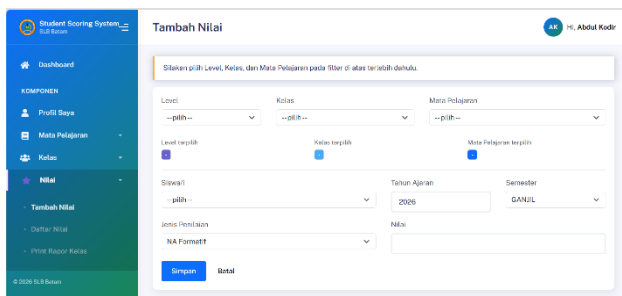


Figure 3. Score Input Page

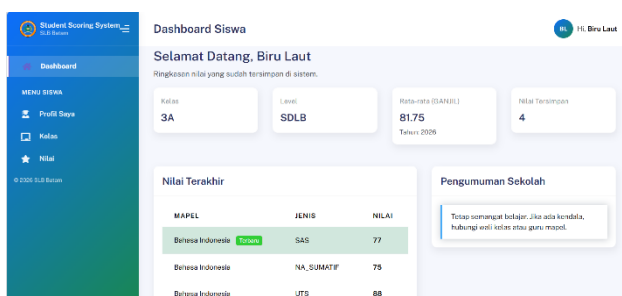


Figure 4. Student Dashboard Page

The student dashboard page displays students' personal information and a summary of academic scores. Students can

view their learning outcomes and access features to print score reports.

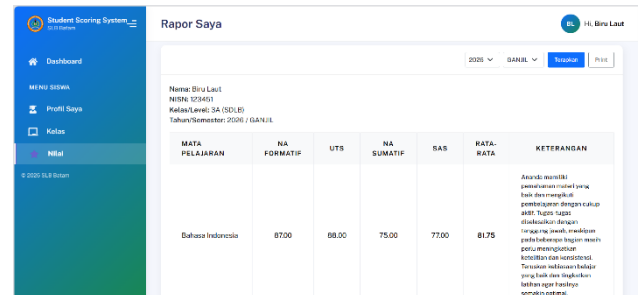


Figure 5. Personal Score Print Page

The personal score print page allows students to print their score reports in PDF format. The system displays all subject scores along with descriptions and average scores.

B. Functional Suitability Testing

Functional testing was validated through expert judgment using a 16 point checklist to ensure alignment with user requirements.

TABLE III
HASIL PENGUJIAN FUNKTIONAL SUITABILITY

No	Code	Tested Feature	Result	Description
1	FR-01	RBAC Authentication	Success	Access rights correctly differentiated
2	FR-02	Teacher CRUD	Success	Full data management functional
3	FR-03	Student CRUD	Success	Database persistence verified
4	FR-04	Subject Management	Success	Data relations functional
5	FR-05	Class/Homeroom Mgmt	Success	Logic for class assignment functional
6	FR-06	Level Filtering	Success	Filters for SDLB, SMPLB, SMALB functional
7	FR-07	Master Data Export	Success	PDF/Report output verified
8	FR-08	Score Entry	Success	Multi-component score input verified
9	FR-09	Automatic Calculation	Success	Algorithmic accuracy verified
10	FR-10	Description Entry	Success	Qualitative data stored correctly
11	FR-11	Score Modification	Success	Edit/Delete functions verified
12	FR-12	Report Card Generation	Success	Formatted PDF output functional
13	FR-13	Profile Management	Success	Personal data updates verified
14	FR-14	Student Overview	Success	Data visualization accurate
15	FR-15	Individual Grade View	Success	Individual student view functional
16	FR-16	Secure Logout	Success	Session termination verified

All system features work according to user needs with a 100% success rate.

C. Reliability Testing

Technical reliability was assessed using the WAPT tool. The system demonstrated high maturity and fault tolerance, maintaining 100% stability with zero failed sessions or hits during stress testing under normal operational parameters.

Successful sessions	Failed sessions	Successful pages	Failed pages	Successful hits	Failed hits	Other errors	Total kbytes sent	Total kbytes received	Avg response time, sec. (with page resources)
20	0	420	0	7534	0	0	9805	641553	(0.781379)

Figure 6. WAPT Testing Results

D. Performance Efficiency Testing

Performance was analyzed using GTmetrix to evaluate front-end optimization and server response times. The system achieved a 100% performance grade. Technical metrics include a Largest Contentful Paint (LCP) of 521ms significantly better than the 1.0s industry benchmark and a Total Blocking Time (TBT) of 0ms. A Cumulative Layout Shift (CLS) of 0 confirms a stable visual experience during rendering.

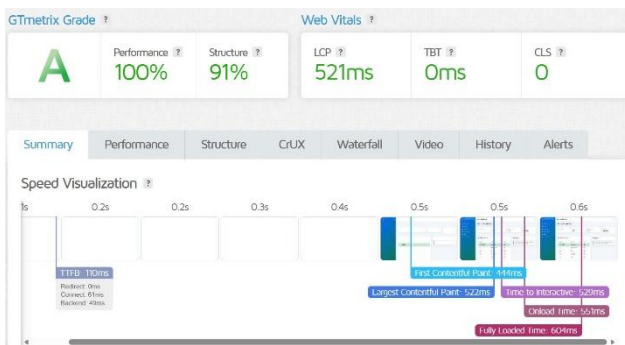


Figure 7. GTmetrix Testing Results

E. Usability and Satisfaction Analysis

The "Quality in Use" was measured via the Computer System Usability Questionnaire (CSUQ). While "Usability" focuses on the technical ease of navigation and learnability, "Satisfaction" measures the subjective comfort and trust of the user.

TABLE IV
CSUQ TESTING RESULTS

No	Statement	Average Score
1	System assists in managing student assessments	6.89
2	System simplifies the score input process	6.89
3	System accelerates score recapitulation	6.78
4	Information displayed is easy to understand	6.78
5	System provides clear and accurate information	6.78
6	Assessment reports are easy to read	6.89
7	System interface is easy to use	6.67
8	System navigation is easy to learn	6.67
9	Users do not experience significant difficulties	6.56
10	Users are satisfied with using the system	6.67
11	System meets user needs	6.56
12	Users are willing to continue using the system	6.67

Total Average	6.73
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F. Effectiveness Testing

Direct observation confirmed that task completion time for score re-entry and report generation was substantially reduced compared to manual methods.

TABLE V
RECAPITULATION OF ISO/IEC 25010 EVALUATION

No	Characteristic	Method	Result	Category
1	Functional Suitability	Expert Judgment	100%	Very Good
2	Reliability	WAPT	0 Errors	Good
3	Performance Efficiency	GTmetrix	100%	Very Good
4	Usability	CSUQ	6.73	Very Good
5	Effectiveness	Observation	Improved	Good
6	Satisfaction	CSUQ	6.73	Very Good

IV. CONCLUSION

The development and evaluation of the Student Scoring System for SLB Batam successfully demonstrated that a web-based digital solution can meet the complex requirements of special education administration. According to the ISO/IEC 25010 standard, the system achieved a 100% functional success rate and demonstrated excellent technical performance with zero reliability errors and an optimal performance score. With a CSUQ average of 6.73, the system is categorized as "Very Good" for usability and satisfaction. The implementation of this system effectively transitions the school from prone-to-error manual processes to a structured, high-performance digital environment.

Future work will focus on expanding the evaluation to include security and compatibility characteristics. Additionally, plans are in place to deploy the system on a live hosting server for broader accessibility and to integrate automated notification features to provide real-time assessment results to stakeholders.

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