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CLOSING THE ASSESSMENT GAP: THE SIMMARKS APP FOR EQUITABLE COURSEWORK EVALUATION

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Abstract:

Coursework includes a variety of technical activities and assignments assessing students' affective and psychomotor abilities, crucial components of the student evaluation. Some of the coursework rely on the lecturer's subjective assessments that could leads to inconsistent mark distributions among different student groups. Thus, to overcome this issue, a scoring rubric is designed as assign marks for each domain and criteria requirement. Despite this, significant disparities in ratings persist mainly due to assessor neglect to refer the appropriate domain criteria during evaluations. SimMarks App was developed to allow the selection of domain criteria before conducting any assessments, ensuring reliable score simulations and helping identify potential issues. Testing has demonstrated the app's viability, effectiveness, and user-friendliness. It executed commands with over 90% accuracy, and the target user rated its usability as good. An average score error margin just 1.1 marks. The app's success is largely attributed to the adopted of the ADDIE paradigm during its development. As the SimMarks App continues to evolve, it is poised for broad deployment, ensuring more accurate and consistent evaluations.

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Keywords:

Coursework Evaluation, Mark Simulation, Application, Lecturer, Teaching And Learning Process

Introduction

Courses are primarily evaluated through a combination of coursework and final exams, with the final grade being a cumulative score of both components. Grades range from 0.0 to 4.0, where an A+ or A represents the highest achievement, and an F denotes failure. Graduates are classified into four categories based on their GPA: first class, second upper, second lower, or third class. These classifications are reflected on their academic transcripts and degree scrolls.

In the Civil Engineering Diploma program at UiTM, coursework evaluation is multifaceted, encompassing in-class and online quizzes, exams, lab and technical reports, fieldwork, industrial training, case studies, technical drawings, presentations, models, and mini-projects. The program employs an outcome-based education (OBE) approach, assessing students across cognitive, affective, and psychomotor domains to ensure comprehensive evaluation beyond traditional final exams. This approach aims to cultivate higher-order cognitive skills such as analysis, synthesis, evaluation, and application (Spady & Marshall, 1991), with assessments designed to foster critical thinking, decision-making, and problem-solving skills (Jonathan, 2017). OBE aligns with industry needs and national goals by producing graduates with the requisite soft skills (Mohd Nor & Zaharim, 2007).

However, deviations from established guidelines in coursework evaluation can lead to inaccurate grading, adversely affecting both graduates and the institution. This issue is compounded by the diversity of courses and grading methods, which require lecturers to master the learning outcomes and objectives of OBE. Effective assessment relies heavily on the lecturer's competence and the quality of the scoring rubric (Klein, 2004). At UiTM, scoring rubrics are used to ensure systematic and fair evaluation, yet discrepancies in grading can arise even with standardized rubrics, often due to subjective judgment and rubric clarity (Stefl-Mabry, 2004; Pickford & Brown, 2007).

The reputation of educational institutions is at stake when academic performance does not accurately reflect graduates' achievements. Inaccurate assessments can undermine the institution's vision and objectives, leading to decreased employability of its graduates. Therefore, educational institutions must always be aware of any weaknesses in the teaching and learning process and then later take corrective measures, so that the graduates produced could meet the industry requirements. Educational institutions should understand that employability is not static but requires ongoing development (Beh & Wong, 2023). On the other hand, in context of industry requirements, the educational institutions need to continuously develop skill and upskilling their graduates' capabilities. Policy interventions for ecosystem support in educational institutions is one of the ways forward to the universities in enhancing graduate employability especially in reducing the technical graduate unemployment (Jung et al., 2024). Addressing this issue requires a concerted effort to enhance rubric clarity, lecturer training, and evaluation consistency, ensuring that graduates' skills and competencies are genuinely represented. As a result, in enhancing educational institutions competence, positive correlation between competencies and student achievement needs to be considered

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where the appropriate teaching and learning process should be implemented, besides, developing validation tools that facilitate the university lecturers and students (Jiaxin et al., 2024).

Proposed Solutions

Brainstorming among group members is the initial step in selecting suggested approaches, where participants collaboratively identify the fundamental causes of an issue. First, these causes are categorized into primary and secondary groups. Each group member then analyzes these factors and suggests feasible solutions. During group discussions, every suggestion is thoroughly examined using a why-why analysis to highlight its advantages and disadvantages. A clear relationship is established between the causes of the problem and the proposed solutions. The best option is chosen by evaluating the details, benefits, drawbacks, and their connection to the underlying issues. Ultimately, the creation of an application is identified as the most effective solution, as it addresses both primary and secondary issues.

Development Of Proposed Solutions

The aim of the proposed method is to address the problem of inconsistent grading by various lecturers. The ADDIE model, consisting of the phases of analysis, design, development, implementation, and evaluation, is employed to create this solution. This model was selected for its proven ability to produce effective applications. The ADDIE model's interconnected phases allow for iterative improvements, ensuring that each phase can be reviewed and refined as necessary to meet the project's objectives (Mohammed Nor Azhari et al., 2023). This iterative process ensures that the issue of grading disparities will be successfully resolved.

Analysis Phase

This phase involves gathering crucial information that serves as the foundation for the subsequent stages of application development. Key data points include identifying the root causes of grading discrepancies, understanding the requirements of the target audience, and defining the goals to be achieved through the application. This information was collected via a survey involving twenty lecturers. After analyzing the survey results, it was determined that the optimal solution is to develop an application that can simulate grading based on the scoring rubric, providing comprehensive explanations of the rubric criteria.

Given its extensive use, the proposed application-based solution positively influences the teaching and learning process. Digital applications offer substantial benefits to both students and educators by providing information, direct access to knowledge resources, and facilitating communication and interaction (Farrah, 2011; Khaddage, 2012; Kizito, 2012; Mtega et al., 2012; Suwantarathip & Orawiwatnakul, 2015). Figure 1 illustrates an analysis chart that maps the relationship between the problem's causes and the target audience's requirements, guiding the development to ensure the application's effectiveness.

The primary objective established in this phase is to reduce the discrepancy in grading between lecturers and course coordinators to less than 3 marks. At Universiti Teknologi MARA, a difference of more than 2 marks can significantly impact the course grade, making this objective critical for maintaining grading accuracy.

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Design Phase

During this phase, the application development framework integrates the interface display and planned operations. This process involves creating a detailed roadmap, wireframes, establishing screen connections, project documentation, input storage, designing screen interfaces, and developing prototypes. The key information sources for developing the roadmap and wireframes include:

i. Course Syllabus: This document provides essential details about the assessment structure and grade allocation for the course.
ii. Scoring Rubric: This tool is crucial for simulating scores according to specific assessment criteria within the coursework.
iii. Chart Analysis: By analysing the relationship between the root causes of the problem and the target demographic's requirements, this framework guides the application development towards achieving its intended objectives.

Development Phase

The application development in this phase leverages the inputs provided by the framework established during the design phase. MIT App Inventor 2, an open-source software, is utilized for the application development, while Google Drive is employed for document and video storage. The criteria for this application emphasize the need for a user-friendly interface, easily accessible documents, and clearly defined, achievable objectives.

Implementation phase

During this phase, technical testing is performed to ensure the seamless operation of the application as programmed during development. This includes verifying various functionalities such as storage access, video playback, and command button functionality. Two lecturers from the College of Computing, Informatics, and Mathematic have been designated as co-instructors. This testing phase allows for the identification and correction of any failed operation commands and the evaluation of the suitability of the programmed operation commands.

Evaluation phase

Upon completing the initiation phase and confirming the application's effective functionality, the final stage involves evaluating user acceptance and effectiveness in achieving the objective. The primary goal is to maintain a target difference of fewer than three marks between course coordinators and lecturers. The sample group for this phase consists of 7 individuals from the target group: 2 course coordinators and 5 lecturers from the Civil Engineering Study Centre.

The application is utilized to evaluate coursework in two Civil Engineering Diploma courses, specifically Water and Wastewater Engineering Laboratory and Hydraulics. User acceptance is assessed using a Likert Scale (Mohammad Fahmi, 2015) based on the following criteria:

i. Understandability: The ease with which users can comprehend the interface and its features and functions.
ii. User-friendliness: The visual appeal of the interface, including elements such as colour schemes, layouts, images, and textual content.
iii. Effectiveness: The application's ability to meet objectives and solve pertinent challenges.

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The assessment of goal attainment involves comparing performance evaluations of various coursework types using the application, as administered by instructors and course coordinators. Specifically, evaluations by lecturers and course coordinators are compared across five samples for each coursework variant. These assessments will determine whether the application meets the desired standards of the target audience or requires further improvements.

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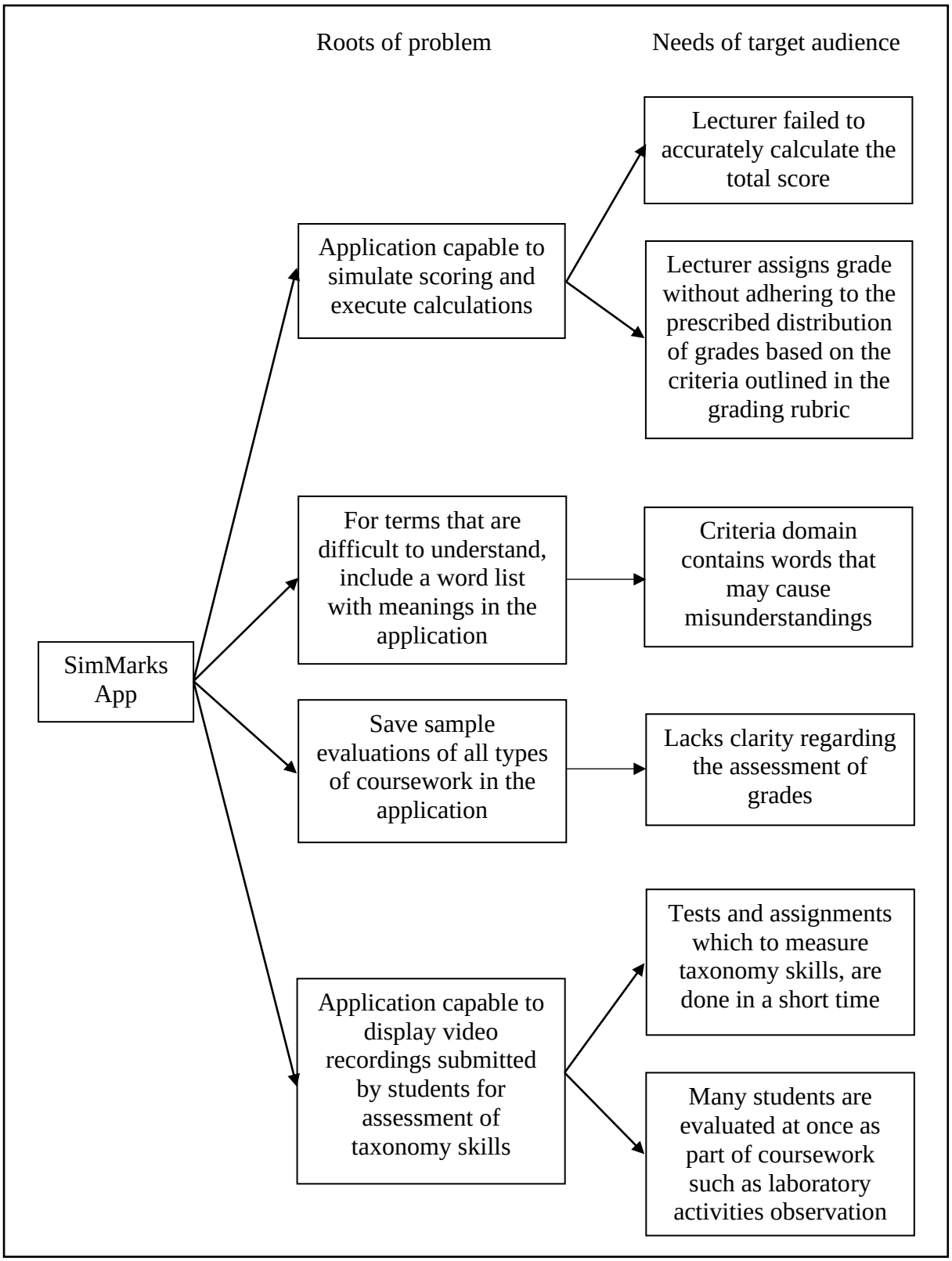

Figure 1: Relationship Between Root of Problem and Needs of the Target Audience

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Simulation Marks (SimMarks) App

The SimMarks App was developed to resolve grading discrepancies among instructors within a given course. Instead of a mark-oriented approach, the app uses a domain-oriented assessment method. This involves selecting a specific domain for assessment and then simulating marks based on that domain. The primary goal is to ensure fair and efficient evaluations, eliminating bias and emotional influence. Additionally, the app serves as a comprehensive resource for instructors to share course-related information and facilitates the easy distribution of recorded grades to both individual students and entire classes. It aligns with Education Revolution 5.0, Industrial Revolution 4.0, and Sustainable Development Goal (SDG) #4, which focuses on Quality Education. Figure 2 and Figure 3 in the original context show the case diagram of the SimMarks App and a screen samples, respectively.

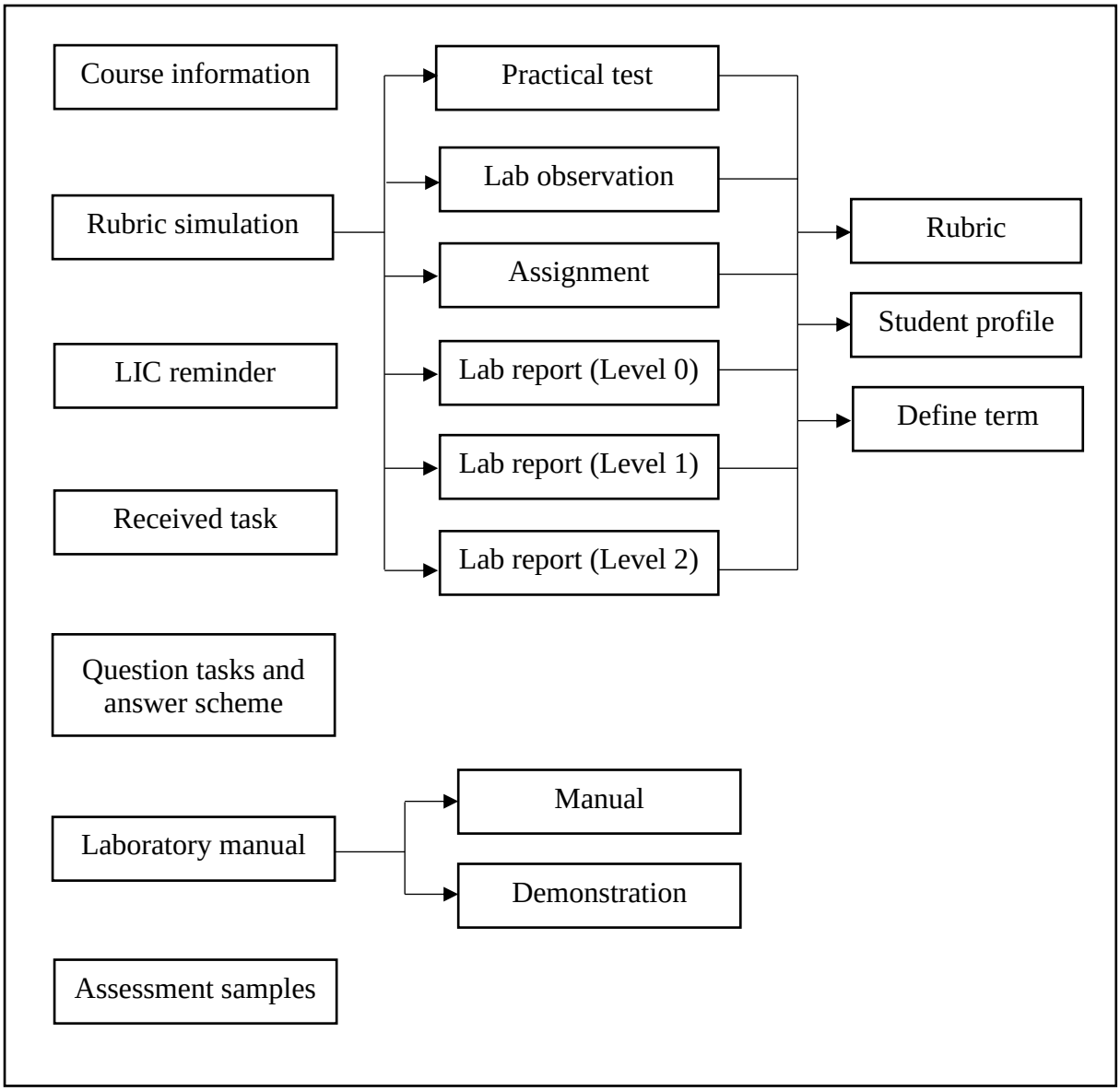

Figure 2: Case Diagram of SimMarks App

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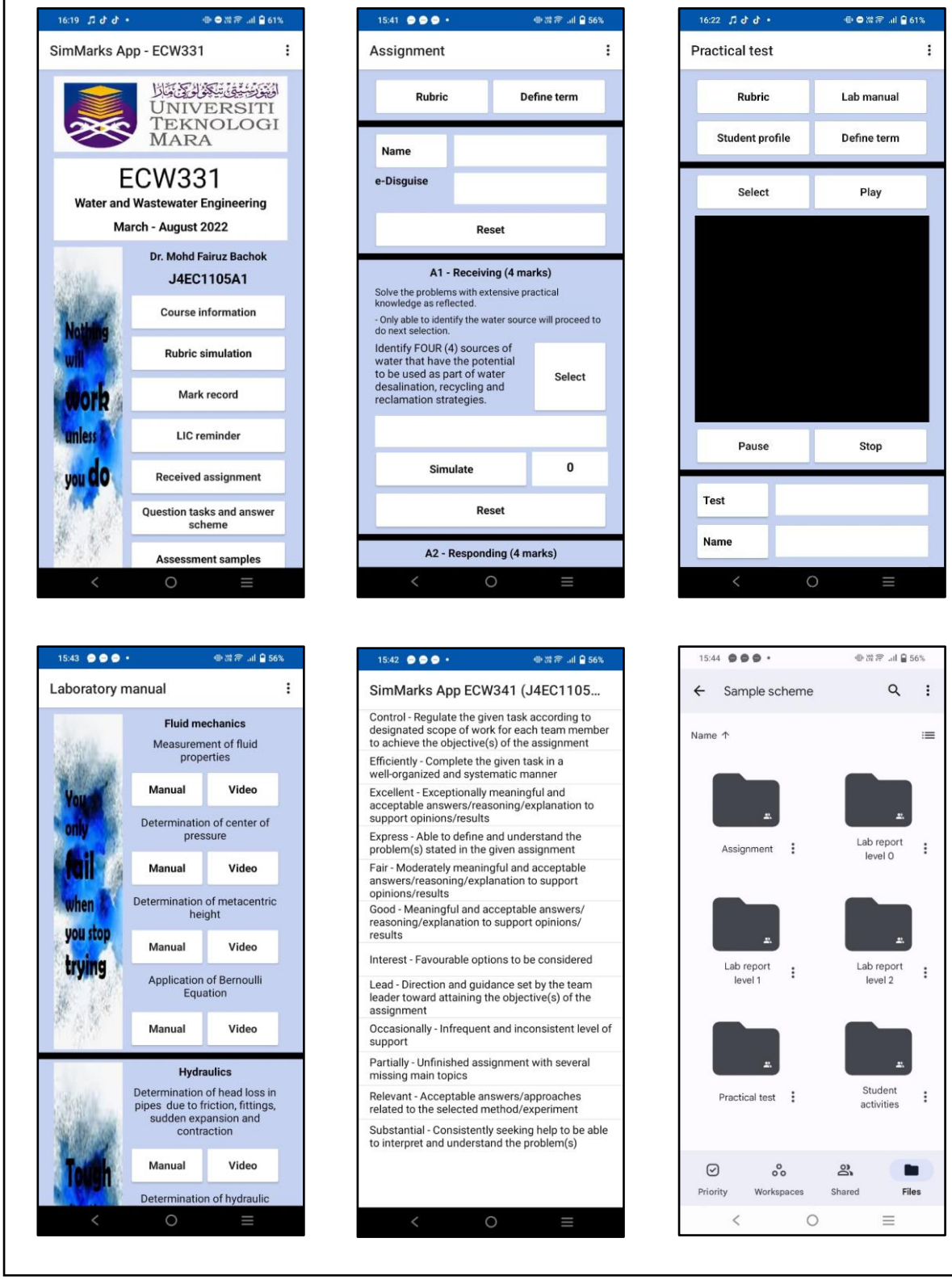

Figure 3: Samples of SimMarks App Screen

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Discussion

The SimMarks App successfully achieved its goals by prioritizing efficiency and user-friendliness throughout its development, which adhered to the ADDIE Model's five stages. The application demonstrated high efficiency during the implementation phase, with most operation commands functioning as intended and a minimal failure rate of only 20% (Table 1). Additionally, Table 2 supports the application's user-friendliness, as surveys from the target demographic consistently rated it as good or very good. Despite the efficient and user-friendly operation, the app's true value lies in fulfilling its intended purpose. The objective was met, as evidenced by an average discrepancy of 1.1 marks in coursework grades, which is below the target threshold (Table 3). This success underscores that employing the ADDIE model in application development can result in efficient, user-friendly applications that meet customer preferences and achieve developmental goals.

Besides the ADDIE Model, other critical factors in the app's successful development included identifying the root causes of customer issues and requirements, creating roadmap wireframes, testing functionality, engaging the target audience, and meeting set objectives. Continuous enhancement until achieving user satisfaction is essential. Therefore, these factors are crucial considerations when developing practical applications, especially in educational settings.

Table 1: Results of Technical Test-run in Implementation Phase

Functions	Number (no.)	Testing Frequency (no.)	Testing Result (no.)		Success Rate (%)
			Success	Failure	
Button to navigate new screen	11	22	22	0	100.0
Button to open list picker and appear at textbox	17	34	32	2	94.1
Button to reset the textbox input	43	86	86	0	100.0
Button to simulate mark according to domain criteria	32	64	60	4	94.1
Button to calculate simulation mark	6	12	10	2	83.3
Button to open list of define terms	6	12	12	0	100.0
Button to open student profile	6	12	12	0	100.0
Button to save textbox input at list view	7	14	12	2	85.7
Button to reset text at list view	7	14	12	0	100.0
Button to send total simulation mark to student	6	12	12	0	100.0
Button to access storage	6	12	12	0	100.0
Button to select written coursework, sample or video from storage	6	12	12	0	100.0
Button to play video	2	4	4	0	100.0
Button to pause video	2	4	4	0	100.0
Button to stop video	2	4	4	0	100.0
Button to open time picker and appear at textbox	5	10	8	2	80.0
Button to open date picker and appear at textbox	5	10	10	0	100.0
Average (%)					96.3

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Table 2: Results of Target Group Acceptation Test-run in Evaluation Phase

Target Group Feedback	Score	Classification
Performance effectiveness	4.6	Very good
Graphic user interface design of application (user-friendly)	4.2	Good
Understanding concept of application	4.8	Very good
Simulation mark according to domain criteria	4.4	Good
Achieve the objective	4.6	Very good
Suitable as a supporting tool for teaching and learning process	4.8	Very good
Average	4.6	Very good

Table 3: Results of Objective Achievement Test-run in Evaluation Phase

Coursework	Maximum Mark	Difference Assessment Mark Between Lecturer and Course Coordinator						
		0	1	2	3	4	5	Average
Practical test	40	1	0	4	0	0	0	1.6
Laboratory activities observation	20	0	1	1	1	2	0	2.8
Assignment	10	4	1	0	0	0	0	0.2
Laboratory report (Level 0)	10	5	0	0	0	0	0	0.0
Laboratory report (Level 1)	10	3	2	0	0	0	0	0.4
Laboratory report (Level 2)	10	0	2	2	1	0	0	1.8
Average								1.1

Conclusion

Lecturers must possess a high level of competency to uphold professionalism in the teaching and learning process, particularly in evaluating student coursework. Inconsistent evaluations can have negative impacts on learners, lecturers, and the institution. This issue is more pronounced in programs with multiple courses where coursework carries significant weight and is assessed by various instructors across different student groups. This variability highlights the subjective nature of coursework evaluation, especially in the psychomotor domain.

As a mitigate substantial disparities in grading among lecturers, it is crucial to establish an effective mechanism. The development of the SimMarks App is expected to address this challenge. In the future, its hope that this teaching and learning tool could be used across UiTM campuses and potentially other tertiary educational institutions.

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