

Enhancing Fairness and Transparency in Coursework Assessment through the SimMarks App

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ABSTRACT

Coursework includes a variety of technical activities and assignments meant to assess students' emotional and psychomotor abilities, which are important aspects of student evaluation. Some of the homework is based on the lecturer's subjective judgments, which might result in varying mark distributions between student groups. To overcome this issue, a scoring rubric is developed to provide points to each area and criterion required. Despite this, there are significant discrepancies in ratings due to assessors failing to refer to appropriate domain criteria during evaluations. In ratings due to assessors failing to refer to the appropriate domain criteria during evaluations. The SimMarks App was designed to let users define domain criteria before administering examinations, ensuring reliable score simulations and identifying any issues. Testing demonstrated the app's practicality, effectiveness, and usability. It executed commands with more than 90% accuracy, and the target user rated its usability as good. The average score error margin is about 1.1 marks. The app's success is largely due to its implementation of the ADDIE paradigm throughout development. As the SimMarks App improves, it becomes more suitable for wider usage, resulting in more accurate and consistent evaluations.

Keywords: Coursework Evaluation, Mark Simulation, Application, Lecturer, Teaching and Learning process

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INTRODUCTION

The final grade is the total of the scores from the coursework and final exams, which are the primary ways for evaluating courses. Grades range from 0.0 to 4.0, with F marking failure and A+ or A indicating the finest achievement. Graduates are grouped into four classes according on their GPA which are first class, second upper, second lower, and third class. Their degree scrolls and academic transcripts show these distinctions.

The coursework assessment procedure in UiTM's Civil Engineering Diploma program includes exams, lab and technical reports, fieldwork, industrial training, case studies, technical drawings, presentations, models, and mini projects. To ensure extensive evaluation that goes beyond normal final examinations, the program employs an outcome-based education (OBE) approach, evaluating students across cognitive, emotional, and psychomotor domains. This technique, which includes examinations designed to improve critical thinking, decision-making, and problem-solving abilities, aims to build higher-order cognitive capabilities such as analysis, synthesis, evaluation, and application. OBE aligns with both national and industrial objectives by producing graduates with the requisite soft skills (Mohd Nor and Zaharim, 2007).

However, inaccurate grading may occur as a result of deviating from established norms in coursework evaluation, which would be damaging to both graduates and the institution. The multiplicity of courses and grading methods, which require instructors to become specialists in OBE's learning outcomes and objectives, exacerbates the situation. An effective evaluation depends on the instructor's skill and the quality of the scoring rubric (Klein, 2004). UiTM uses scoring rubrics to provide rigorous and equal evaluation; nonetheless, even with standardized rubrics, grading differences can arise, often due to subjective judgment and rubric clarity (Steffl-Mabry, 2004; Pickford & Brown, 2007).

Recent research has demonstrated the increased importance of standardized assessment frameworks and rubric-based evaluation in higher education. Rubrics give defined criteria that help increase assessment reliability and transparency while also promoting the development of students' critical thinking abilities and academic achievements. Research suggests that rubric-based exams might improve grading consistency and help students grasp performance expectations (Okafor, 2024). Furthermore, the application of OBE in higher education institutions necessitates ongoing improvement in assessment design, teaching methodologies, and lecturer competency to guarantee that learning outcomes and assessment methods are aligned (Mistamiruddin & Nasri, 2024).

When academic achievement fails to accurately reflect graduates' accomplishments, educational institutions' reputations are jeopardized. Inaccurate assessments may jeopardize the institution's mission and aims, rendering graduates less employable. To ensure that graduates meet industry requirements, educational institutions must constantly identify and address problems in the teaching and learning process. Educational institutions must acknowledge that employability is a dynamic process that requires ongoing improvement (Beh & Wong, 2023). However, given industry needs, educational institutions must continually improve the abilities and competencies

of their graduates. One option for universities to promote graduate employability, particularly in terms of minimizing technical graduate unemployment, is to implement legislative initiatives that support the ecosystem in educational institutions. To guarantee that graduates' talents and competencies are appropriately represented, a concerted effort is required to increase rubric clarity, lecturer training, and assessment uniformity. As a result, in addition to developing validation tools to assist university instructors and students, improving educational institutions' competence necessitates considering the positive correlation between competencies and student achievement when implementing the proper teaching and learning process (Jiaxin et al., 2024).

Proposed solutions

The first step in selecting recommended methods is brainstorming, which involves people working together to identify the underlying causes of an issue. These causes are classified into two categories: main and secondary. After studying these variables, each group member gives practical suggestions. During group talks, each idea is thoroughly scrutinized, with a why analysis used to emphasize the merits and downsides. The sources of the problem and the proposed solutions are demonstrated to be clearly connected. The best option is chosen by assessing the specifics, benefits, drawbacks, and how they relate to the underlying issues. The creation of an application is finally determined to be the optimal course of action since it addresses both primary and secondary issues.

Development of proposed solutions

The proposed technique tries to address the issue of inconsistent grading among professors. This solution was created utilizing the ADDIE technique, which consists of five phases: analysis, design, development, implementation, and evaluation. This model was chosen based on its demonstrated ability to create successful applications. The linked phases of the ADDIE model allow for iterative changes, ensuring that each phase may be analyzed and changed as needed to meet the project's objectives (Mohammed Nor Azhari et al., 2023). This repeated technique assures that the grading discrepancy problem will be effectively resolved.

Infrastructure Challenges

This step entails gathering critical data that will serve as the foundation for subsequent phases of application development. Important data points include identifying the root causes of grade inequalities, understanding the needs of the intended audience, and articulating the application's objectives. Twenty professors took part in a survey to collect this information. After analyzing the survey data, the best course of action was determined to be developing an application that can simulate grading based on the scoring rubric and offer detailed explanations of the rubric criteria. The proposed application-based solution has a positive influence on the teaching and learning process due to its widespread adoption. Digital applications benefit both teachers and students by providing information, direct access to knowledge resources, and encouraging communication and participation (Farrah, 2011; Khaddage, 2012; Kizito, 2012; Mtega et al., 2012; Suwantarathip & Orariwatnakul, 2015). Figure 1 depicts an analysis chart that illustrates the relationship between the target audience's demands and the causes of the problem, guiding development to ensure the application's efficacy and standards.

The primary goal of this phase is to narrow the grading discrepancy between lecturers and course coordinators to less than three marks. At Universiti Teknologi MARA, a difference of more than two marks might have a significant influence on the course grade, making this goal critical for grading precision.

Design Phase

During this phase, the application development framework integrates the interface display and scheduled processes. This technique comprises creating a detailed roadmap, wireframes, screen connections, project documentation, input storage, screen interface design, and prototype development. The key sources for developing the roadmap and wireframes are:

- i. Course Syllabus: This document provides crucial information about the course's assessment mechanism and grade allocation.
- ii. Scoring Rubric: This tool is necessary for replicating scores based on certain assessment criteria from the courses.
- iii. Chart Analysis: This technique guides application development toward its intended goals by examining the relationship between the root causes of the problem and the demands of the target market.

Development Phase

This phase's application development makes use of the framework's inputs from the design phase. The application was created with MIT App Inventor 2, an open-source software, and the documents and videos are saved on Google Drive. The requirements for this application emphasize the necessity of a user-friendly interface, easily accessible content, and well-defined, attainable goals.

Implementation phase

During this phase, technical testing is performed to ensure that the application runs as expected throughout development. This includes evaluating various functions such as storage access, video playback, and command button functionality. Two professors from the College of Computing, Informatics, and Mathematics have been named co-instructors. This testing process allows for the detection and correction of any failed operation commands, as well as the evaluation of the programmed operation commands' appropriateness.

Evaluation phase

After finishing the start-up phase and testing the application's effective operation, the final step is to assess user acceptability and efficacy in achieving the aim. The primary goal is to maintain the desired difference between course coordinators and lecturers under three marks. The sample group for this phase consists of seven members of the target group: two course coordinators and five lecturers from the Civil Engineering Study Centre.

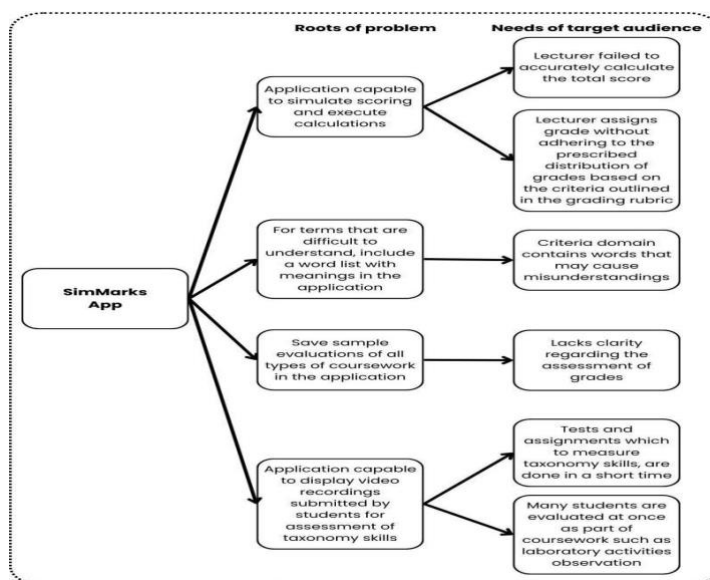
The program is used to evaluate homework for two Civil Engineering Diploma courses: Water and Wastewater Engineering Laboratory and Hydraulics. User approval is measured using a Likert Scale (Mohammad Fahmi, 2015) based on the following criteria:

- i. Understandability: The ease with which users may understand the interface, including its features and operations.
- ii. User-friendliness: The interface's visual appeal, which includes color schemes, layouts, graphics, and textual content.
- iii. Effectiveness: The application's capacity to accomplish objectives and address relevant difficulties.

Goal accomplishment is measured by comparing performance ratings of various coursework types using the program, which is conducted by instructors and course administrators. The evaluations of lecturers and course directors are compared in five samples for each coursework choice. These reviews will reveal if the application meets the target audience's expectations or needs to be enhanced.

Figure 1

Relationship Between Root of the Problem and Needs of the Target Audience



Simulation Marks (SimMarks) App

The SimMarks App was developed to solve grading disparities across professors within a given course. Instead of a mark-oriented method, the app uses a domain-oriented assessment mechanism. This requires selecting a domain for evaluation and simulating scores based on that region. The primary goal is to provide fair and efficient evaluations while eliminating prejudice and emotional effects. Furthermore, the app serves as a comprehensive resource for teachers to communicate course-related information, allowing for the straightforward distribution of recorded grades to both individual students and whole classrooms. It is compatible with Education Revolution 5.0, Industrial Revolution 4.0, and Sustainable Development Goal (SDG) #4, all of which focus on excellent education. Figures 2 and 3 of the original context provide a case diagram for the SimMarks App and screen demonstrations, respectively.

Figure 2
Case Diagram of SimMarks App

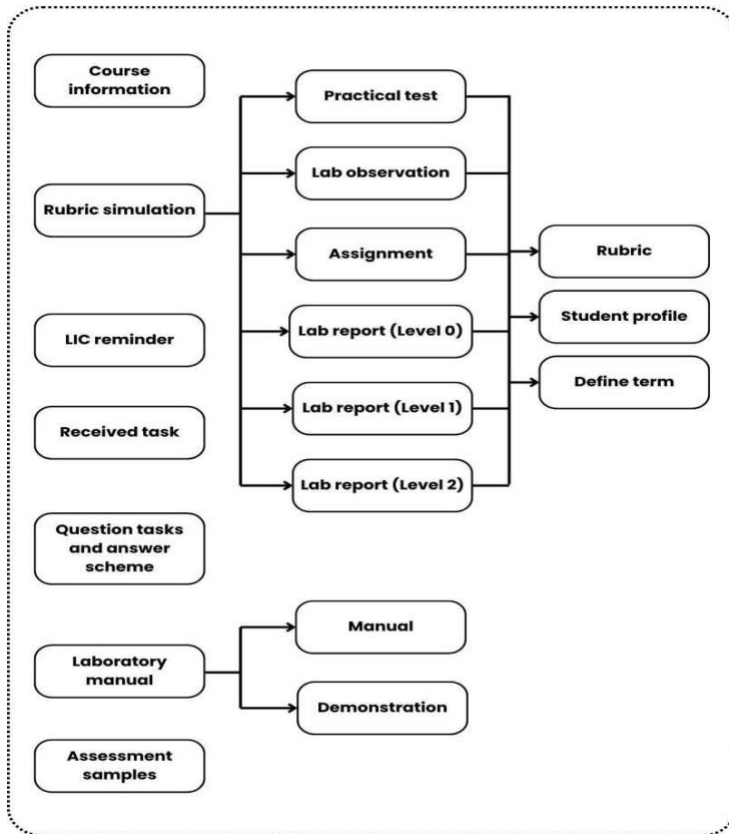
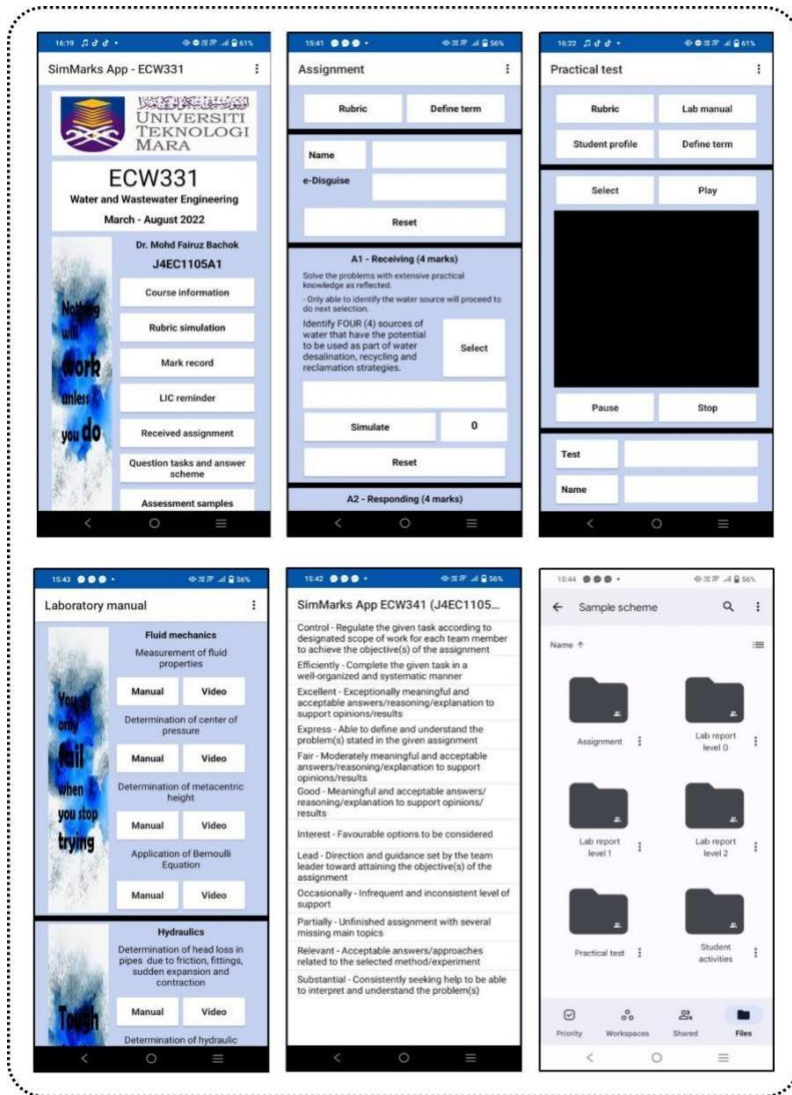


Figure 3
Samples of SimMarks App Screen



DISCUSSIONS

The SimMarks App attained its goals by emphasizing efficiency and usefulness throughout its development process, which followed the ADDIE Model's five stages. During the implementation phase, the program was extremely efficient, with the majority of operation instructions running smoothly and a failure rate of only 20% (Table 1). Furthermore, Table 2 shows the application's usability, since surveys of the target demographic consistently rated it as high or very good. Despite its rapid and user-friendly operation, the app's primary value lies in performing its intended purpose. The goal was met, as evidenced by an average difference of 1.1 marks in coursework grades, which was lower than the target level (Table 3). This example highlights how employing the ADDIE technique in application development may result in efficient, user-friendly programs that meet customer preferences while also fulfilling development goals

Aside from the ADDIE Model, other critical factors in the app's successful development were identifying the root causes of consumer issues and wants, creating roadmap wireframes, testing functionality, engaging the target audience, and meeting stated objectives. It is vital to keep improving until client contentment is attained. As a result, these factors are crucial considerations for developing practical applications, especially in educational settings.

Table 1

Results of Technical Test-run in Implementation Phase

Variable	Number (no.)	Testing Frequency (no.)	Testing	Result (no.) Failure	Success Rate (%)
			Success		
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

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	Testing Result (no.)						Average
	Mark	0	1	2	3	4	5	
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	0.2
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 be highly qualified to preserve professionalism in the teaching and learning process, particularly while judging student papers. Inconsistent evaluations can have a negative impact on students, educators, and the institution. This problem is particularly severe in programs with a large number of courses, when coursework is heavily weighted and scored by professors from different student groups. This variation highlights the subjective character of coursework grading, particularly in the psychomotor domain.

Designing an efficient system is crucial for reducing substantial grade disparities among teachers. The SimMarks App is intended to address this issue. It is envisaged that this teaching and learning tool will be used on all UiTM campuses, as well as at other tertiary education institutions.

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