Enhancing Fairness in Coursework Assessment Using the Simmarks App

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ABSTRACT

Coursework consists of a variety of technical tasks and assignments designed to measure students' emotional and psychomotor abilities, which are critical components of student evaluation. Some of the homework relies on the lecturer's subjective evaluations, which may result in variable mark distributions across various student groups. To address this issue, a scoring rubric is established to provide scores for each domain and criterion need. Despite this, large differences in ratings exist, owing to assessors' failure to refer to suitable domain criteria throughout evaluations. The SimMarks App was created to let users to set domain criteria prior to conducting assessments, assuring reliable score simulations and identifying any difficulties. Testing has shown the app's feasibility, efficacy, and use. It performed commands with greater than 90% accuracy, and the intended user evaluated its usability as good. The average score error margin is barely 1.1 marks. The app's success is primarily due to the use of the ADDIE paradigm throughout development. As the SimMarks App evolves, it is prepared for widespread use, resulting in more accurate and consistent evaluations.

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

INTRODUCTION

The final grade is the sum of the scores from the coursework and final examinations, which are the main methods used to evaluate courses. Grades vary from 0.0 to 4.0, with a F denoting failure and an A+ or A representing the best performance. Based on their GPA, graduates are divided into four groups: first class, second upper, second lower, or third class. Their degree scrolls and academic transcripts reflect these designations.

Exams, lab and technical reports, fieldwork, industry training, case studies, technical drawings, presentations, models, and mini-projects are all part of the coursework evaluation process in UiTM's Civil Engineering Diploma program. In order to assure thorough assessment that goes beyond typical final examinations, the program uses an outcome-based education [OBE] approach, evaluating students across cognitive, emotional, and psychomotor domains. With tests intended to promote critical thinking, decision-making, and problem-solving abilities, this strategy seeks to develop higher-order cognitive skills including analysis, synthesis, evaluation, and application [Spady & Marshall, 1991] [Jonathan, 2017]. By generating graduates with the necessary soft skills, OBE is in line with both national and industry objectives [Mohd Nor & Zaharim, 2007].

Inaccurate grading, however, might result from departing from set norms in coursework evaluation, which would be detrimental to both graduates and the institution. The variety of courses and grading schemes, which need that instructors become experts in the learning outcomes and objectives of OBE, exacerbate this problem. The proficiency of the instructor and the caliber of the scoring rubric are critical components of an effective evaluation [Klein, 2004]. Scoring rubrics are utilized at UiTM to guarantee methodical and equitable evaluation; yet, even with standardized rubrics, grading disparities can occur, frequently because of subjective judgment and rubric clarity [Stefl-Mabry, 2004; Pickford & Brown, 2007].

When academic performance does not fairly represent the accomplishments of graduates, the reputation of educational institutions is at risk. The institution's mission and goals may be compromised by inaccurate assessments, which would make graduates less employable. In order for graduates to satisfy industry standards, educational institutions must always be aware of any flaws in the teaching and learning process and then take remedial action. Educational institutions must to recognize that employability is dynamic and necessitates continuous improvement [Beh & Wong, 2023]. However, in light of industrial demands, educational institutions must constantly improve the skills and competencies of its graduates. One strategy for universities to improve graduate employability, particularly in lowering technical graduate unemployment, is through policy interventions for ecosystem support in educational institutions [Jung et al., 2024]. In order to ensure that graduates' abilities and competences are accurately represented, it is necessary to make a concentrated effort to improve rubric clarity, lecturer training, and assessment uniformity. Therefore, in addition to creating validation tools that support university instructors and students, improving educational institutions' competence requires taking into account the positive correlation between competencies and student achievement where the proper teaching and learning process should be implemented [Jiaxin et al., 2024].

PROPOSED SOLUTIONS

The first stage in choosing recommended strategies is brainstorming, in which participants work together to pinpoint the underlying reasons of a problem. These reasons are first divided into major and secondary categories. After analyzing these variables, each group member makes workable recommendations. Every proposal is carefully considered utilizing a why-why analysis to highlight its benefits and drawbacks during group discussions. The causes of the issue and the suggested fixes are shown to be clearly related. The optimal choice is determined by weighing the specifics, advantages, disadvantages, and how they relate to the underlying problems. The development of an application is ultimately found to be the best course of action as it tackles both core and secondary problems.

DEVELOPMENT OF PROPOSED SOLUTIONS

The suggested approach aims to solve the issue of different lecturers' uneven grading. This solution is developed using the ADDIE approach, which consists of the phases of analysis, design, development, implementation, and evaluation. This model was chosen due to its shown capacity to generate successful applications. The interconnected phases of the ADDIE model enable iterative improvements, guaranteeing that each phase may be examined and improved as needed to achieve the project's goals [Mohammed Nor Azhari et al., 2023]. This iterative procedure guarantees the effective resolution of the grading disparity problem.

Infrastructure Challenges

This step involves collecting vital data that forms the basis for the application development phases to follow. Identifying the underlying reasons for grade disparities, comprehending the needs of the intended audience, and outlining the objectives to be met by the application are important data points. Twenty academics participated in a survey to get this data. Developing an application that can simulate grading based on the scoring rubric and provide thorough explanations of the rubric criteria was found to be the best course of action after the survey data were analyzed.

The suggested application-based solution has a favorable impact on the teaching and learning process due to its widespread adoption. By offering information, direct access to knowledge resources, and promoting contact and engagement, digital apps provide significant advantages to both instructors and students [Farrah, 2011;

Khaddage, 2012; Kizito, 2012; Mtega et al., 2012; Suwantarathip & Orawiwatnakul, 2015]. Figure 1 shows an analysis chart that maps the link between the needs of the target audience and the sources of the problem, directing the development to guarantee the efficacy of the application.standards.

The main objective of this phase is to decrease the grading gap between lecturers and course coordinators to fewer than 3 marks. At Universiti Teknologi MARA, a discrepancy of more than two marks can have a substantial impact on the course grade, making this aim crucial for grading accuracy.

Design Phase

During this phase, the application development framework combines the interface display and scheduled processes. This procedure entails producing a thorough roadmap, wireframes, establishing screen connections, project documentation, input storage, designing screen interfaces, and constructing prototypes. The primary information sources for creating the roadmap and wireframes are:

i. Course Syllabus: This document contains critical information on the assessment system and grade allocation for the course.

ii. Scoring Rubric: This tool is essential for simulating scores using specified evaluation criteria from the coursework.

iii. Chart Analysis: This approach directs application development toward accomplishing its intended goals by analyzing the link between the core causes of the problem and the needs of the target population.

Development Phase

This phase's application development takes advantage of the framework's inputs from the design phase. The program is developed using MIT App Inventor 2, an open-source software, and documents and videos are stored on Google Drive. The criteria for this application highlight the importance of a user-friendly interface, conveniently available materials, and well defined, attainable goals.

Implementation phase

During this phase, technical testing is undertaken to ensure that the application runs smoothly as planned throughout development. This involves testing different features including storage access, video playback, and command button performance. Two academics from the College of Computing, Informatics, and Mathematics have been appointed as co-instructors. This testing step enables the discovery and rectification of any unsuccessful operation commands, as well as the assessment of the programmed operation commands' adequacy.

Evaluation phase

After completing the commencement phase and validating the application's successful operation, the final stage is to assess user approval and efficacy in attaining the goal. The major aim is to keep the target gap between course coordinators and lecturers under three marks. The sample group for this phase is made up of seven people from the target group: two course coordinators and five 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 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 achievement is assessed by comparing performance ratings of various coursework kinds utilizing the application, as administered by teachers and course directors. The assessments of lecturers and course directors are compared across five samples for each coursework option. These assessments will indicate whether the application fulfills the target audience's expectations or needs to be improved.

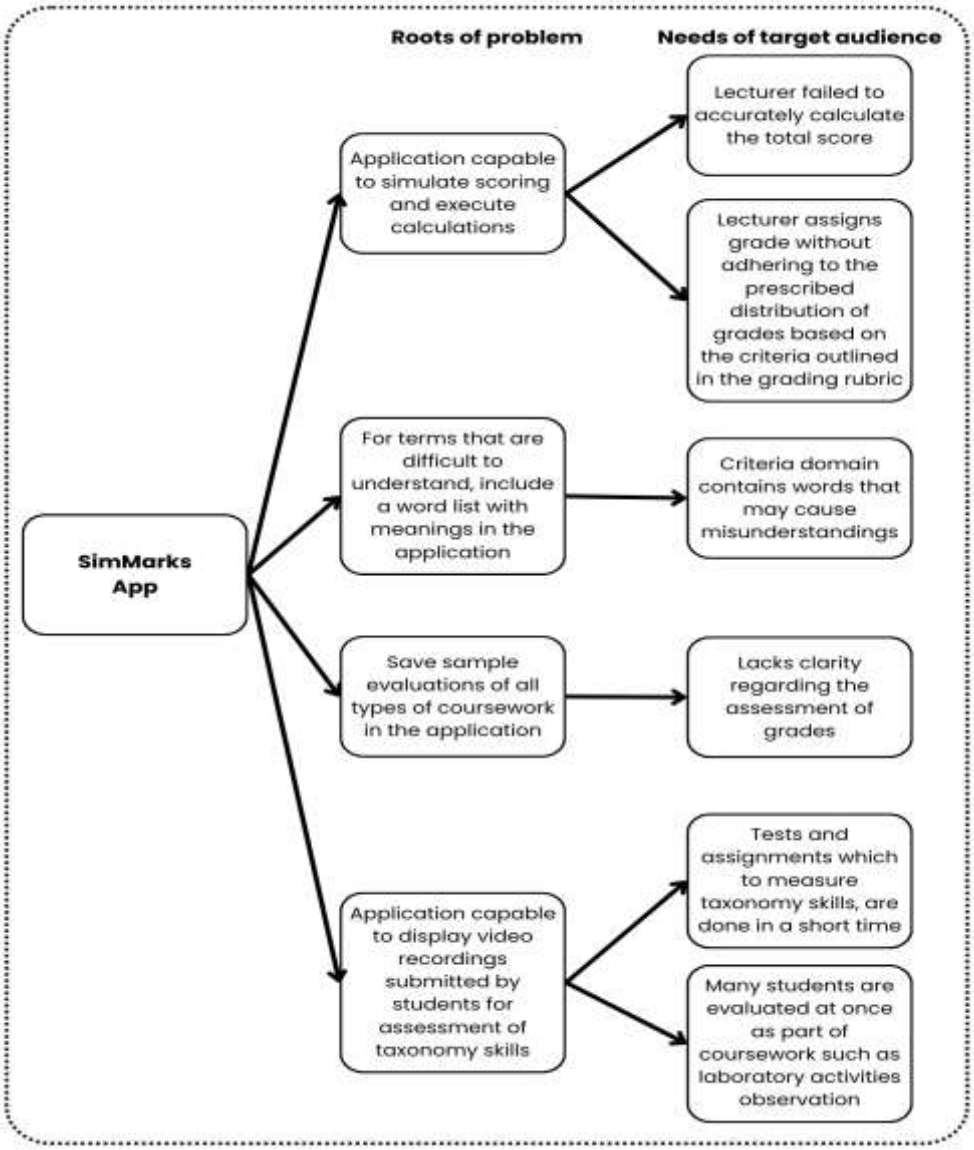

Figure 1: Relationship Between Root of Problem and Needs of the Target Audience

Simulation Marks (SimMarks) App

The SimMarks App was created to address grading differences amongst teachers within a specific course. Rather than a mark-oriented approach, the app employs a domain-oriented evaluation mechanism. This entails picking a certain domain for evaluation and then simulating scores depending on that area. The major objective is to achieve fair and efficient evaluations while removing prejudice and emotional effect. Furthermore, the app acts as a complete resource for teachers to exchange course-related information and allows for the simple dissemination of recorded grades to both individual students and whole classes. It is consistent with Education Revolution 5.0, Industrial Revolution 4.0, and Sustainable Development Goal [SDG] #4, which emphasizes on quality education. Figures 2 and Figure 3 in the original context depict a case diagram for the SimMarks App and screen examples, respectively.

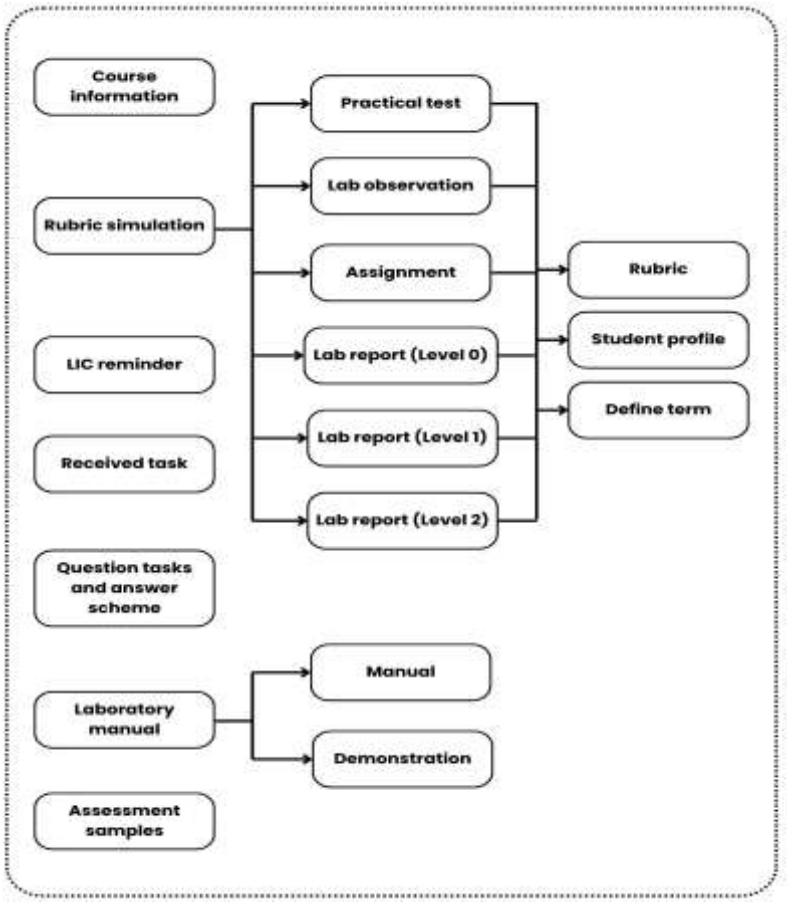

Figure 2: Case Diagram of SimMarks App

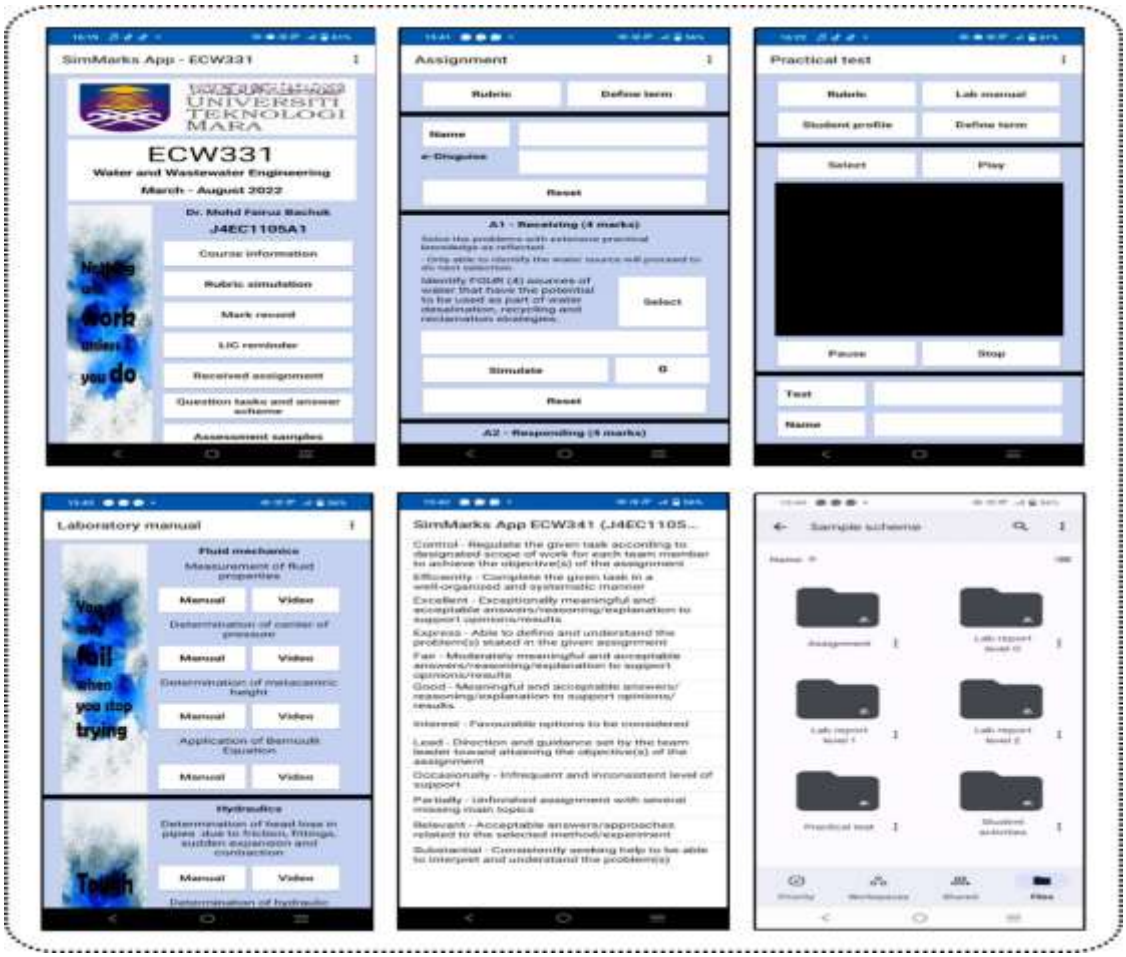

Figure 3: Samples of SimMarks App Screen

DISCUSSION

The SimMarks App met its objectives by stressing efficiency and usability throughout its development, which followed the ADDIE Model's five phases. During the implementation phase, the program displayed great efficiency, with the majority of operation instructions operating well and a failure rate of only 20% [Table 1]. Furthermore, Table 2 demonstrates the application's usability, since surveys from the target population regularly rated it as good or very good. Despite its quick and user-friendly functioning, the app's main worth is in serving its intended goal. The aim was fulfilled, as indicated by an average disparity of 1.1 marks in coursework grades, which was less than the target level [Table 3]. This example demonstrates that using the ADDIE approach in application development may provide efficient, user-friendly apps that suit consumer preferences while also achieving developmental objectives.

Aside from the ADDIE Model, other essential variables in the app's successful development were determining the core causes of customer concerns and needs, building roadmap wireframes, testing functionality, engaging the target audience, and reaching established targets. It is critical to continuously improve until customer happiness is achieved. As a result, these aspects are critical considerations for creating practical applications, particularly in educational contexts.

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**

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**	**Averange**
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 have a high level of expertise to maintain professionalism in the teaching and learning process, especially while evaluating student papers. Inconsistent ratings can have a detrimental influence on students, instructors, and the institution. This problem is especially severe in programs with many courses, where

coursework bears major weight and is graded by teachers from separate student groups. This heterogeneity demonstrates the subjective nature of coursework grading, particularly in the psychomotor domain.

To reduce significant discrepancies in grading among instructors, it is critical to design an effective procedure. The SimMarks App is supposed to fix this issue. In the future, it is hoped that this teaching and learning tool will be used throughout UiTM campuses and possibly other tertiary education institutions.

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