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Development of web-based learning application to enhance understanding in Philippine history

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Abstract

This study introduces a web-based learning system designed to enhance the recall and understanding of Philippine history through engaging quizzes and games, aligning with ISO 25010 standards. The system prioritizes functional suitability, usability, reliability, performance efficiency, and portability, with the aim of aiding users, particularly students, in remembering and studying Philippine history. Leveraging interactive features such as game content and quizzes, the system actively engages learners, promoting comprehension and retention of historical facts. Instant feedback mechanisms further contribute to users' ability to identify strengths and weaknesses in understanding Philippine history.

To evaluate the system's performance, the researchers applied the Locally Weighted Learning (LWL) algorithm, adhering to ISO 25010 guidelines. The LWL algorithm, combining lazy learning and a decision stump classifier with linear weighting kernels, achieved an impressive 90% accuracy on the "Book1" dataset. This comprehensive evaluation validated the system's reliability and effectiveness, showcasing high accuracy in assessing attributes such as data accuracy, system availability, user-friendliness, responsiveness, and security assurance.

The study also includes a regression analysis, indicating a moderate positive linear relationship (multiple R of 0.4243) between independent variables (functional suitability, usability, performance efficiency, reliability, and portability) and the dependent variable (software quality score). While the model explains approximately 22.38% of the variability, the non-significant p-value in the ANOVA table prompts consideration for further refinement. Overall, this research contributes to the field of educational technology by providing valuable insights into the development and evaluation of a history-focused learning application, emphasizing both practical usability and theoretical reliability within the framework of ISO 25010.

Keywords: Learning Application; Web based System; Philippine History; Comprehensive Games; Interactive Quizzes and Flashcards

1. Introduction

Throughout the previous decades, technology has made continuous progress, making life easier for humans by reducing the effort required in work, transactions, and education. The process of learning on how to operate these devices has become simpler because the researchers aim to create a very user-friendly application that can be use in our society. The advancement of technology is expanding quickly in every aspect of modern societies, including education. As a

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result, information and communication technology is being utilized more and more as a tool for teaching and learning in educational activities (Matimbwa and Anney, 2016).

Studying Philippine history is crucial in understanding the country's unique cultural heritage, appreciating its historical struggles and movements, and fostering national pride and patriotism. Additionally, they argue that studying Philippine history develops critical thinking skills, which are valuable in various fields and professions. Through the study of Philippine history, individuals can gain a deeper understanding of the complexities of Philippine society and the factors that have shaped its political and cultural landscape (Tañedo and Estacio, 2016). To conclude, web-based learning applications can be an effective platform to study and to understand more about the Philippine history and make an activity that will challenge them and at the same time learning on the said topic. Creating notes or flashcards will help the students remember and understand about the topic.

On the other hand, students should not rely on the web-based application, it is an alternative tool to improves the knowledge and understanding of the students about Philippine History. One advantage of web-based learning applications is accessible from anywhere with an internet connection, which makes them a convenient option for learners who may not have access to traditional classroom settings. Additionally, many web-based learning applications are designed to be fancy and engaging, which can help to keep learners motivated and interested in the material. This learning application can help the students to review and get more knowledge about Philippine History and enjoy some fancy games while learning about Philippine History. Students can use this web-based learning application to review and be ready in their exams using some features of the web application.

1.1. Statement of the Problem

Problem #1: Some students have a limited understanding of how important Philippine Historical Events due to modern trends in today's generation.

Problem #2: The history of the Philippines is not popular among some students because of lack of entertainment and other reasons; they read a lot of books and get tired reading.

Problem #3: They can't measure the impact of the web-based learning application on student engagement and interest on learning Philippine History.

1.2. Objectives of the Study

1.2.1. General Objectives

The general objectives of this system are to recall and to understand Philippine history, enhancing learning outcomes by using an engaging and comprehensive quizzes and games to measure the knowledge of the user to Philippine history.

The Researchers aims to help the users especially students to remember and study the history of Philippines by using some features of the System.

1.2.2. Specific Objectives

To ascertain how much the web-based learning application improves students' comprehension of significant occasions, ideas, and individuals in Philippine history.

To create a game-like elements into learning can make it more engaging and enjoyable for students, resulting in better retention of information in Philippine history.

Scores for every quizzes and percentage of the students to measure their engagement and interest in Philippine history.

2. Methodology

The researcher used the descriptive statistics method as the instrument to get the information and data needed for this study. The goal of conducting survey is to get first-person narratives and viewpoints from people who have seen the system under study firsthand or who are active in it.

Additionally, surveys give researchers the possibility to dig deeper into usability issues and identify areas in need of improvement. This user-centered approach enables the research team to consider the viewpoints of those who will ultimately use the system and modify it to their needs and preferences.

This system is designed with the primary goals of helping users, particularly students, recall and understand Philippine history. It aims to improve learning outcomes through the use of interactive quizzes and games that engage users comprehensively, assessing their knowledge of Philippine history. The developer intends to assist users in remembering and studying the history of the Philippines by incorporating specific features into the system.

3. Results and discussion

In this section, the researchers delve into the outcomes of their comprehensive research and engage in a detailed analysis of the data and findings. The primary objective of this portion is to not only present the results but also to provide an in-depth interpretation. Data are collected from thirty-three (33) Senior High School students and Eighteen (18) College students a total of fifty (50) respondents.

The evaluation of the Scholarship Automation System for Qualification Assessment Program was conducted using the ISO25010 evaluation model as framework. This assessment covered Functional Suitability, Usability, Performance Efficiency, Reliability, and Portability to evaluate the system.

3.1. System Evaluation Result

- 5 – Strongly Agree
- 4 – Agree
- 3 – Fair
- 2 – Disagree
- 1 – Strongly Disagree

Table 1 System Evaluation Result (Functional Suitability)

Functional suitability	**SA**	**A**	**N**	**D**	**SD**
The application's quizzes and assessments, historical facts, dates, and events are presented accurately.	24	23	3	0	0
Quizzes, comprehensive exercises, and games to engage users actively.	28	21	1	0	0
The students use the system even without internet	9	8	20	7	6
The system is available thru mobile	29	21	8	1	0

Table 2 System Evaluation Result (Usability)

USABILITY	**SA**	**A**	**N**	**D**	**SD**
The system is user-friendly and easy to use.	28	15	7	0	0
Historical information provided is accurate, reliable, and up-to-date.	24	21	5	0	0
The learning application has an intuitive and visually appealing design.	23	20	7	0	0
System accurately assesses and records their scores.	19	24	7	0	0

Table 3 System Evaluation Result (Reliability)

RELIABILITY	**SA**	**A**	**N**	**D**	**SD**
The data within the system is accurate and reliable.	26	18	6	0	0
The system is consistently available and operational when needed.	17	27	6	0	0
The system responds quickly to my actions, minimizing delays	16	24	8	1	0
I feel assured that my data is secure within the system	21	19	7	1	0

Table 4 System Evaluation Result (Performance Efficiency)

PERFORMANCE EFFICIENCY	**SA**	**A**	**N**	**D**	**SD**
The web-based learning application loads interactive lessons and multimedia content, such as videos and interactive quizzes, within 3 seconds on average	15	24	7	4	0
Users can smoothly transition between lessons and quizzes without experiencing delays.	15	23	7	4	0
Designed to handle a large number of concurrent users	14	26	8	2	0
The system effectively handles records.	21	21	8		0

Table 5 System Evaluation Result (Portability)

PORTABILITY	**SA**	**A**	**N**	**D**	**SD**
The system runs on low specs computer.	12	24	3	3	0
Users can also access the system using mobile phones.	30	11	8	0	1
The system can be operated in lower-level browser.	16	20	10	3	1
The web-based learning application is designed using responsive web design principles, ensuring that it adapts to various screen sizes and resolutions.	26	16	6	2	0

3.2. Summary output

Table 6 Regression Statistics

Regression Statistics	
Multiple R	0.424318
R Square	0.223814
Adjusted R Square	-0.02811
Standard Error	10.91733
Observations	100

Table 7 ANOVA

ANOVA	*df*	*SS*	*MS*	*F*	*Significance F*
Regression	5	273.3149	54.66298	0.458628	0.806050007
Residual	94	11203.68	119.188		
Total	99	11476.99			

Table 8 Multiple Linear Regression Analysis Table

	Coefficients	**Standard Error**	**t Stat**	**P-value**	**Lower 95%**	**Upper 95%**	**Lower 95.0%**	**Upper 95.0%**
Intercept	25.72695959	31.06522021	0.82816	0.409678	-35.95376337	87.4076825	-35.953763	87.40768254
Functional Suitability	-3.492466902	4.617593287	-0.75634	0.451337	-12.66080662	5.67587281	-12.660807	5.675872814
Usability	0.836977475	4.077337021	0.205276	0.837801	-7.25867076	8.93262571	-7.2586708	8.932625709
Performance Efficiency	5.358786648	4.080487964	1.313271	0.192288	-2.74311786	13.4606912	-2.7431179	13.46069115
Reliability	-2.51962469	4.024034438	-0.62614	0.532738	-10.5094394	5.47019002	-10.509439	5.470190018
Portability	-0.44433803	5.395019546	-0.08236	0.934535	-11.15627581	10.2675997	-11.156276	10.26759975

The multiple R (0.4243) suggests a moderate positive linear relationship between the independent variables (functional suitability, usability, performance efficiency, reliability, and portability) and the dependent variable (software quality score). The R-square value of 0.2238 indicates that approximately 22.38% of the variability in the software quality score can be explained by the independent variables. However, the adjusted R-square suggests that the model's fit hasn't significantly improved after considering the number of independent variables. The standard error (10.9173) represents the average distance between the observed values and the values predicted by the model.

The ANOVA table provides insights into the significance of the regression model. The F-statistic (0.4586) compares the mean square for regression to the mean square for residuals, testing whether the regression model as a whole is statistically significant. In this case, the p-value (0.8060) suggests that the overall regression model may not be statistically significant. The degrees of freedom (df) indicate the number of values free to vary in the analysis. The sum of squares (SS) measures the overall variation, and mean square (MS) represents the average variation within each segment.

The coefficients table shows the impact of each independent variable on the dependent variable. The intercept (25.727) is the estimated software quality score when all independent variables are zero. The coefficients for functional suitability, usability, performance efficiency, reliability, and portability indicate how a one-unit change in each variable affects the software quality score. The t-statistic assesses the significance of each coefficient, and the p-value tests whether the coefficients are significantly different from zero.

In summary, the regression analysis provides valuable insights into the relationships between software quality attributes and the overall software quality score. While the model shows a moderate relationship, further refinement may be needed to enhance its explanatory power. The non-significant p-value in the ANOVA table suggests that the overall model may not be statistically significant. This prompts consideration for additional variables or modifications to improve the model's accuracy in predicting software quality.

4. Evaluation

=== Run information ===

Scheme: weka.classifiers.lazy.LWL -U 0 -K -1 -A "weka.core.neighboursearch.LinearNNSearch -A \"weka.core.EuclideanDistance -R first-last\"" -W weka.classifiers.trees.DecisionStump

Relation: Book1

Instances: 50

Attributes: 20

1. The application's quizzes and assessments, historical facts, dates, and events are presented accurately.

2. Quizzes, comprehensive exercises, and games to engage users actively.

3. The students use the system even without internet

4. The system is available thru mobile

1. The system is user-friendly and easy to use.

2. Historical information provided is accurate, reliable, and up-to-date.

3. The learning application has an intuitive and visually appealing design.

4. System accurately assesses and records their scores.

1. The web-based learning application loads interactive lessons and multimedia content, such as videos and interactive quizzes, within 3 seconds on average

2. Users can smoothly transition between lessons and quizzes without experiencing delays

3. Designed to handle a large number of concurrent users

4. The system effectively handles records.

1. The data within the system is accurate and reliable.

2. The system is consistently available and operational when needed.

3. The system responds quickly to my actions, minimizing delays

4. I feel assured that my data is secure within the system

1. The system runs on low specs computer.

2. Users can also access the system using mobile phones.

3. The system can be operated in lower-level browser.

4. The web-based learning application is designed using responsive web design principles, ensuring that it adapts to various screen sizes and resolutions.

Test mode: evaluate on training data

=== Classifier model (full training set) ===

Locally weighted learning

==========

Using classifier: weka.classifiers.trees.DecisionStump

Using linear weighting kernels

Using all neighbours

Time taken to build model: 0 seconds

=== Evaluation on training set ===

Time taken to test model on training data: 0.02 seconds

=== Summary ===

Correctly Classified Instances	45	90	%
Incorrectly Classified Instances	5	10	%
Kappa statistic	0.8309		
Mean absolute error	0.1259		
Root mean squared error	0.2068		
Relative absolute error	40.5075 %		
Root relative squared error	52.8635 %		
Total Number of Instances	50		

In this evaluation, the researchers employed the LWL (Locally Weighted Learning) algorithm with specific configurations to assess the learning application's performance. The scheme utilized a combination of lazy learning and decision stump classifier, incorporating linear weighting kernels and considering all neighbors in the analysis.

The evaluation focused on the "Book1" dataset comprising 50 instances and 20 attributes related to various aspects of the learning application. The LWL algorithm achieved an impressive 90% accuracy, correctly classifying 45 out of 50 instances. The evaluation results demonstrated a high level of accuracy in assessing attributes such as data accuracy, system availability, user-friendliness, responsiveness, and security assurance.

The kappa statistic of 0.8309 indicates a substantial agreement beyond chance, highlighting the robustness of the model. Overall, the evaluation underscores the effectiveness of the LWL algorithm in accurately classifying instances, providing valuable insights into the application's usability and user experience.

In conclusion The LWL (Locally Weighted Learning) algorithm has proven to be a suitable choice for evaluating the learning application on the website based on the provided dataset and attributes. With a remarkable accuracy rate of 90%, LWL demonstrated its ability to effectively classify instances, highlighting its reliability in assessing critical aspects such as data accuracy, system availability, user-friendliness, responsiveness, and security assurance.

5. Conclusion

In conclusion, this study has presented a web-based learning system designed to enrich the understanding and retention of Philippine history by adhering to ISO 25010 standards. The system, emphasizing functional suitability, usability, reliability, performance efficiency, and portability, is tailored to assist users, particularly students, in their historical education journey.

The integration of interactive features, such as quizzes and games, underscores the commitment to engaging learners actively. The instant feedback mechanisms further empower users to identify and address gaps in their comprehension

of Philippine history. This holistic approach aligns with the broader goals of educational technology, providing flexible and accessible learning experiences.

The evaluation of the system's performance using the Locally Weighted Learning (LWL) algorithm has demonstrated impressive accuracy, reaching 90% on the "Book1" dataset. The algorithm's effectiveness in assessing critical attributes, including data accuracy, system availability, user-friendliness, responsiveness, and security assurance, underscores the reliability of the learning application.

Additionally, the regression analysis has unveiled a moderate positive linear relationship between the independent variables (functional suitability, usability, performance efficiency, reliability, and portability) and the software quality score. While the model explains a noteworthy 22.38% of the variability, the non-significant p-value in the ANOVA table suggests the potential for refinement.

In light of these findings, it is clear that the web-based learning system has the potential to make meaningful contributions to the realm of educational technology. The fusion of theoretical underpinnings from ISO 25010 with practical applications, coupled with the promising results of the LWL algorithm, positions this system as a valuable tool for enhancing the study of Philippine history. As we move forward, further refinements and adjustments guided by the insights gleaned from this study will contribute to the continuous improvement of the learning application, ensuring its sustained relevance and effectiveness in fostering historical understanding.

Compliance with ethical standards

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Disclosure of conflict of interest

No conflict of interest to be disclosed.

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