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Enhancing Teacher Performance Assessment in Educational Institutions: An Extreme Programming Approach

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Keywords

Teacher Performance Assessment
Extreme Programming
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Abstract. Optimal education quality can be achieved when teachers provide quality and effective teaching. To measure and improve teacher performance, teacher performance appraisal is crucial. Considering the complexity of teachers' tasks, the importance of objective and data-driven teacher appraisals, and the existing problems in teacher appraisal systems, this research aims to investigate and develop a better teacher performance appraisal system to improve education quality in educational institutions. This research adopts the Extreme Programming (XP) approach as the application development method. XP is one agile method that focuses on collaboration, flexibility, and iterative development. The results showed that the application development has reached the user acceptance testing stage. About 85 percent of test participants in user acceptance testing, including teachers, principals, and administrative staff, felt that the app met their needs and could be used well. This research contributes to improving the quality of education in educational institutions by introducing a technology-based teacher performance appraisal application to improve the efficiency and objectivity of the appraisal. In addition, this research develops an understanding of the use of Extreme Programming in developing educational applications.

1. INTRODUCTION

Education is an essential foundation in the development of society and the state. The quality of education is highly dependent on the quality of teachers, who have a central role in shaping students' development and educational outcomes. Optimal education quality can be achieved when teachers provide quality and effective teaching. To measure and improve teacher performance, teacher performance appraisal is critical. A teacher's job involves various aspects, including lesson planning, implementation of teaching, evaluation of student learning outcomes, and various administrative and man-agerial tasks. Teacher performance appraisal is the process used to measure the extent to which teachers fulfill these tasks. This assessment may include evaluations from various parties, such as the principal, fellow teachers, or school administrative staff[1]–[3].

However, in many cases, the existing teacher appraisal system is inadequate or lacks a structured system. The lack of clear guidelines and assessment criteria often results in subjective and inconsistent judgments. This can affect teacher motivation, teaching quali-ty, and student learning outcomes. In addition, constraints in teacher performance appraisal are also issues that need to be addressed. These constraints include a lack of training for assessors, a lack of resources needed to conduct a comprehensive assessment, and inequities in assessment across schools or districts. Considering the complexity of teachers' tasks, the importance of objective and data-driven teacher appraisals, and the problems in the teacher appraisal system, this study aims to investigate and develop a better teacher performance appraisal system to improve the quality of education in primary school education institutions[3]–[6].

The development of information and communication technology has opened up new op-portunities in managing and assessing teacher performance. A more efficient and appro-priate solution is needed with the increasing complexity of teachers' tasks. Teacher per-formance appraisal is relevant in providing tools that can help measure, track, and man-age teacher performance better. Such apps can provide a more objective basis for teacher appraisal and enable continuous monitoring of teacher progress[7]–[11].

Several methods can be used in developing applications, such as the waterfall method, agile method, or prototype method. Choosing the proper development method is crucial in achieving project success[12]–[16]. The proper development method will guide how the teacher performance appraisal application will be designed, developed, and implemented. This study chose the Extreme

Programming (XP) method as the application development method. XP is one of the agile methods that focuses on collaboration, flexibility, and itera-tive development. In the context of teacher performance appraisal, XP allows for the in-volvement of teachers and stakeholders in the development process[16], [17]. This allows for con-tinuous improvement based on user feedback and changing needs. XP also encourages prototyping, which suits the purpose of developing a performance appraisal application[14], [18]–[23].

This research aims to develop a teacher performance appraisal application that primary school education institutions can use. This application will assist in measuring and mon-itoring teachers' performance more objectively, provide helpful feedback for their profes-sional development, and improve efficiency in teacher performance management. This research is expected to significantly contribute to improving the quality of education in primary schools. These contributions include the development of a technology-based teacher performance appraisal application to improve the efficiency and objectivity of the appraisal. Improved understanding of the use of Extreme Programming methods in de-veloping educational applications. A better understanding of how teacher performance apps can support teachers' professional development. They improved teacher perfor-mance management, which can positively impact student learning outcomes. With an ef-fective teacher performance app, it is hoped that primary schools can better manage this critical human resource and improve the quality of education students provide.

2. METHOD

The development of this application adopts the Extreme Programming approach. This re-search consists of 5 main stages: Initial Exploration of Requirements, Iteration Planning, Coding and Testing, Continuous Assessment, and User Acceptance Testing. These stages help ensure the teacher performance management application is developed well by in-volving stakeholders, following best development practices, and producing a product that meets user needs and expectations. This process also allows for continuous improvement and refinement over time.

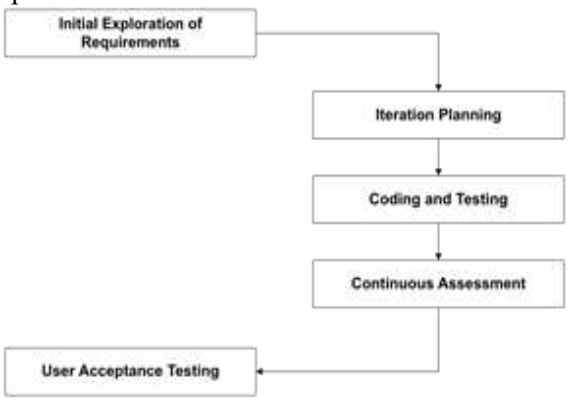

Figure 1. Research Stage

Initial Exploration of Requirements

This stage begins with identifying user and stakeholder needs, including teachers, prin-cipals, and administrative staff. Research is conducted to understand the regulations and guidelines for teacher performance appraisal that apply in specific institutions and re-gions. Data on the current appraisal process was collected, including documents used, workflows, and existing appraisal formats. The results of this exploration were used to detail the functional and technical needs of the application, such as must-have features, interfaces, and data requirements.

Iteration Planning

The first iteration of planning starts with identifying the core features or components to be developed. The development team prioritizes the features and details the tasks to be com-pleted. An iteration schedule is set, which can last several weeks.

Coding and Testing

The development team starts coding the application based on the predefined design and

specifications. During coding, best development practices, including unit tests, are per-formed to ensure the reliability of the code. Once the components or features have been coded, functional and integration testing is done to check if everything works properly. Any necessary fixes or changes are made during this stage.

Continuous Assessment

During the development stage, continuous assessment is conducted to monitor the pro-ject's progress and check whether the developed features meet the users' needs. The de-velopment team and stakeholders constantly communicate to provide feedback and iden-tify necessary changes or improvements.

User Acceptance Testing

User acceptance testing was conducted once the app reached a sufficiently mature stage. Teachers, principals, and administrative staff are involved in the testing to ensure that the app fits the needs and can be used properly. The user acceptance test results are used to decide whether the app is ready for implementation.

3. RESULTS AND DISCUSSION

Initial Exploration of Requirements

As shown in Figure 2, an application that can manage, facilitate, and monitor the teacher performance appraisal process by applicable regulations and guidelines is re-quired. The application must also accommodate the various stages of the workflow, in-volve various stakeholders, and provide valuable data for decision-making and teachers' professional development. In addition, data security and privacy should be maintained, and strong design thinking should be used to ensure a good user experience. Overall, this application is expected to provide tangible benefits in teacher performance management in educational institutions.

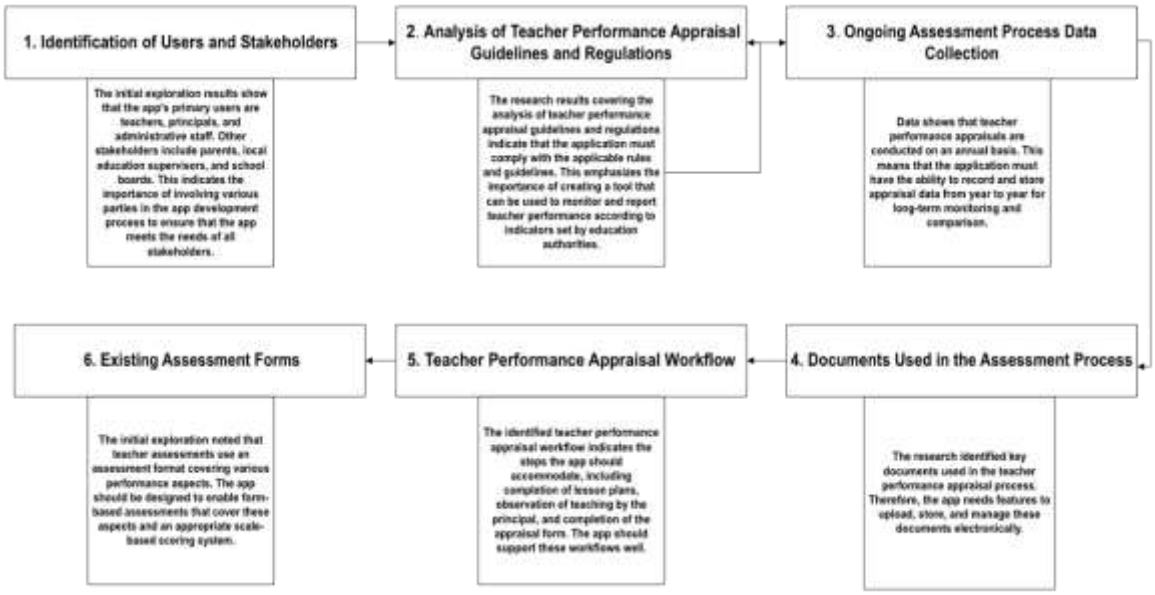

Figure 2. Result of Initial Exploration of Requirements

Iteration Planning

The flow of iteration planning is shown in Figure 3. Identifying the core features to be de-veloped in the first iteration is a crucial step. This includes features essential for the teach-er performance management application, such as the login system, teacher data entry, student data entry, scheduling of teaching observations, and storage of assessment docu-ments. This shows the focus on building the essential elements forming the app's founda-tion. The establishment of an iteration schedule lasting 4 weeks is essential. It provides a clear time frame for the achievement of iteration goals. Good time management is critical to a successful software development project. The

development team can prioritize work well and measure project progress by dividing time and resources into different phases. During iterations, feedback from users and stakeholders will be important. This makes it possible to make the necessary changes or adjustments in the development according to user needs. Iteration supports an approach that is responsive to changes and needs.

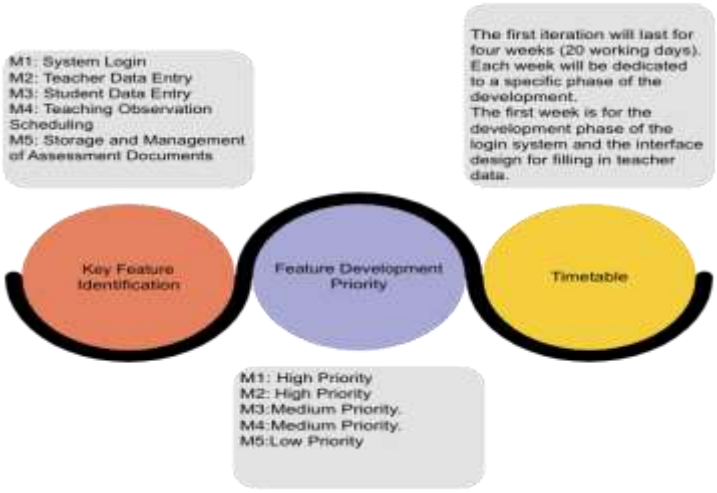

Figure 3. Iteration Planning

Coding and Testing

Careful coding and systematic testing are critical factors in creating reliable applications. The ability to detect and fix issues during the testing phase is critical to ensure that the app meets user expectations and functions according to the predefined design. Overall, this stage helps in measuring the project's progress and maintaining the application's quality during development. The coding stage is when the app starts to become a reality. The data shows that two core features have been coded: the login system and teacher data entry. This is an essential first step in building a teacher performance management app. The coding process has taken significant time, with the login system taking 7 days and the teacher data entry taking 10 days. This reflects the relative complexity of developing these features.

Functional and integration testing is the next step after unit testing. The results show that the application's login system and teacher data entry have integrated well. This indicates that the app's components interact efficiently, and no serious issues were identified. Func-tional and integration testing is essential to ensure the application works properly.

Figure 4. Coding and Testing

During testing, some minor bugs and issues were identified. The data shows that the development team immediately made the necessary fixes and changes. This reflects the team's responsiveness to the test results and ability to address issues quickly. These fixes and changes are

integral to the software development process and are essential to ensure the application runs well and meets user needs.

Continuous Assessment

The Continuous Assessment phase allowed the development team to monitor the project's progress closely. The data showed that about 60% of the planned features were completed by the end of week 2. This reflects effective project management and good pro-gress in achieving the targets set in Iteration Planning. User feedback is an essential ele-ment in the Continuous Assessment stage. The data shows that initial feedback from teachers regarding the login system is positive. This indicates that the application is achieving its initial goals of easy user access and meeting general user needs. User feed-back is a valuable source of information that helps the development team understand the user's perspective to make appropriate changes and improve the user experience.

The data shows that changes and improvements were identified and implemented during the Continuous Assessment stage. Changes to the login interface and bug fixes to the login system are concrete examples of responses to user feedback and project evalua-tion results. The ability to identify and implement changes during this stage indicates flexibility in software development. The data shows that the project has reached the final stage of development as progress has been made, and changes have been implemented. This indicates that the Continuous Assessment process allows the project to evolve and develop responsively. The ability to measure progress and adjust plans quickly is essen-tial in maintaining the quality and relevance of the application. A critical aspect of Con-tinuous Assessment is the ability to respond to changes in user needs. The data shows that the changes to the login interface were a direct result of user feedback. This shows that the development team prioritized user satisfaction and the app's ability to meet their needs.

User Acceptance Testing

During the User Acceptance Testing stage, user acceptance testing was conducted to ensure that the application met the users' needs for implementation. In this test, 35 stake-holders were involved as test participants. Of these, 20 participants were teachers, 1 was a principal, and 10 were administrative staff. The participation of various stakeholders en-sured that diverse perspectives were taken into account.

The test results showed that about 85 percent of the test participants, including teachers, principals, and administrative staff, felt that the app met their needs and could be used well. They stated that the app could help ease their tasks related to teacher per-formance management and better education service delivery. A few test participants expe-rienced problems, mainly related to the interface navigation for filling in teacher data. However, most of these issues were resolved during the testing session.

The test results also show that several additional improvements are needed based on the issues identified during testing. These included improving the teacher data entry in-terface and adding a user guide. These improvements were identified and planned to be implemented before the app implementation. Based on the user acceptance test results, 85 percent of stakeholders agreed to proceed with the app implementation. This decision was based on the excellent level of satisfaction from most users and the additional improve-ments that could be implemented. Implementation will be the next step in moving the ap-plication from the development stage to the production stage.

4. CONCLUSION

This research has successfully investigated and developed a teacher performance appraisal application to improve teacher performance management in primary school education institutions. The development of this application is based on the Extreme Programming (XP) method, which emphasizes collaboration, flexibility, and iterative development. The results showed that the app reached the user acceptance testing stage, where most stakeholders, including teachers, principals, and administrative staff, were satisfied with the app. They reported that the app helped simplify tasks

related to teacher performance management and improved education services. A few test participants experienced issues mainly related to the navigation of the interface for filling in teacher data, which is currently being improved. The importance of this app lies in its ability to improve objectivity and efficiency in teacher performance assessment. With this application, educational institutions can better manage this critical human resource and improve the quality of education provided to students. This research enhances the understanding of the use of Extreme Programming methods in developing educational applications. In addition, this research's positive results are expected to impact student learning outcomes and teacher professional development positively.

REFERENCES

[1] A. Calma, G. Suder, and T. P. Kenworthy, "Focus on education: Taking stock of key themes, topics, trends and communities in international business and international management education research," *The International Journal of Management Education*, vol. 22, no. 1, p. 100902, Mar. 2024, doi: 10.1016/j.ijme.2023.100902.

[2] M. Widodo, "Exploring the Role of Educational Technology in Promoting Civic Education in Indonesia: Current State, Challenges, and Opportunities," 2023. [Online]. Available: https://creativecommons.org/licenses/by/4.0/

[3] H. STAI Rasyidiyah Khalidiyah Amuntai Kalimantan Selatan and S. STAI Rasyidiyah Khalidiyah Amuntai Kalimantan Selatan, "National Standards of Education in Contents Standards and Education Process Standards in Indonesia," 2022.

[4] J. Lassa, M. Petal, and A. Surjan, "Understanding the impacts of floods on learning quality, school facilities, and educational recovery in Indonesia," *Disasters*, vol. 47, no. 2, pp. 412–436, Apr. 2023, doi: 10.1111/disa.12543.

[5] S. H. Halili, "Technological Advancements in Education 4.0," *The Online Journal of Distance Education and e-Learning*, vol. 7, no. 1, pp. 63–69, 2019, [Online]. Available: www.tojdel.net

[6] Anealka Aziz, "Education 4.0 Made Simple: Ideas For Teaching," *International Journal of Education and Literacy Studies*, vol. 6, no. 3, p. 92, 2018, [Online]. Available: https://journals.aiac.org.au/index.php/IJELS/article/view/4616

[7] D. Yin, "Study on the Simulative Financial Management System in ERP Education," *IERI Procedia*, vol. 2, pp. 642–648, 2012, doi: 10.1016/j.ieri.2012.06.147.

[8] M. Alam, "Activists' heterodoxic beliefs in fostering urban environmental education in Indonesia," *Local Development & Society*, vol. 4, no. 1, pp. 128–145, Jan. 2023, doi: 10.1080/26883597.2022.2058887.

[9] V. Khatibi, A. Keramati, and F. Shirazi, "Deployment of a business intelligence model to evaluate Iranian national higher education," *Social Sciences & Humanities Open*, vol. 2, no. 1, p. 100056, 2020, doi: 10.1016/j.ssaho.2020.100056.

[10] I. Y. Al-Filali, R. M. S. Abdulaal, S. M. Alawi, and A. A. Makki, "Modification of Strategic Planning Tools for Planning Financial Sustainability in Higher Education Institutions," *Journal of Engineering Research*, Nov. 2023, doi: 10.1016/j.jer.2023.11.015.

[11] M. Nermend, S. Singh, and U. S. Singh, "An evaluation of decision on paradigm shift in higher education by digital transformation," in *Procedia Computer Science*, Elsevier B.V., 2022, pp. 1959–1969. doi: 10.1016/j.procs.2022.09.255.

[12] M. Paasivaara, B. Behm, C. Lassenius, and M. Hallikainen, "Large-scale agile transformation at Ericsson: a case study," *Empir Softw Eng*, vol. 23, no. 5, 2018, doi: 10.1007/s10664-017-9555-8.

[13] M. A. Dewi and R. Irham, "Penerapan Agile Scrum Pada Pengembangan Aplikasi Bimbingan Daring Skripsi Mahasiswa," vol. 4, no. 2, Mar. 2021, doi: https://doi.org/10.47970/siskom-kb.v4i2.195.

[14] A. Mishra and Y. I. Alzoubi, "Structured software development versus agile software development: a comparative analysis," *International Journal of System Assurance Engineering and Management*, Aug. 2023, doi: 10.1007/s13198-023-01958-5.

[15] R. Hasan, A.- Ta, and R. Razali, "Prioritizing Requirements in Agile Development : A Conceptual Framework," *Procedia Technology*, vol. 11, no. Iceei, pp. 733–739, 2013, doi: 10.1016/j.protcy.2013.12.252.

[16] A. Akhtar, B. Bakhtawar, and S. Akhtar, "EXTREME PROGRAMMING VS SCRUM: A COMPARISON OF AGILE MODELS," *International Journal of Technology, Innovation and Management (IJTIM)*, vol. 2, p. 2022, doi: 10.54489/ijtim.v2i1.77.

[17] J. Chen, T. Yu, L. Yin, J. Tang, and H. Wang, "A unified time scale intelligent control algorithm for microgrid based on extreme dynamic programming," *CSEE Journal of Power and Energy Systems*, vol. 6, no. 3, pp. 583–590, Sep. 2020, doi: 10.17775/CSEEJPES.2019.00100.

[18] T. Dingsøyr, S. Nerur, V. Balijepally, and N. B. Moe, "A decade of agile methodologies: Towards explaining agile software development," *Journal of Systems and Software*, vol. 85, no. 6. 2012. doi: 10.1016/j.jss.2012.02.033.

[19] P. Serrador and J. K. Pinto, "Does Agile work? - A quantitative analysis of agile project success," *International Journal of Project Management*, vol. 33, no. 5, 2015, doi: 10.1016/j.ijproman.2015.01.006.

[20] R. Santos *et al.*, "A Comparative Analysis of Agile Teamwork Quality Instruments in Agile Software Development: A Qualitative Approach", doi: 10.18293/DMSVIVA2023-217.

[21] S. Al-Saqqa, S. Sawalha, and H. Abdelnabi, "Agile software development: Methodologies and trends," *International Journal of Interactive Mobile Technologies*, vol. 14, no. 11, 2020, doi: 10.3991/ijim.v14i11.13269.

[22] T. Dingsoeyr, D. Falessi, and K. Power, "Agile Development at Scale: The Next Frontier," *IEEE Software*, vol. 36, no. 2. IEEE Computer Society, pp. 30–38, Mar. 01, 2019. doi: 10.1109/MS.2018.2884884.

[23] F. Almeida, J. Simões, and S. Lopes, "Exploring the Benefits of Combining DevOps and Agile," *Future Internet*, vol. 14, no. 2, Feb. 2022, doi: 10.3390/fi14020063.