

Development *E-Portoqu*: A Validated Digital Portfolio that Improves Vocational Teachers' Performance

Didik Iskandar^{1*}, Aceng Hasani², Hidayatullah³

^{1,2}Sultan Ageng Tirtayasa University, Banten, Indonesia

³State Islamic University of Sultan Maulana Hasanuddin, Banten, Indonesia

Corresponding Author: Didik Iskandar didik.iska@gmail.com

ARTICLE INFO

Keywords: Digital Portfolio, Vocational Education, Teacher Appraisal, ADDIE Model

Received : 5, July

Revised : 26, July

Accepted: 27, August

©2025 Iskandar, Hasani, Hidayatullah : This is an open-access article distributed under the terms of the [Creative Commons Atribusi 4.0 Internasional](https://creativecommons.org/licenses/by/4.0/).



ABSTRACT

This study develops and validates ePortoqu, a digital portfolio for vocational teacher appraisal in Indonesia, using the ADDIE-based Research and Development (R&D) model. A quasi-experimental design was conducted across 10 vocational schools involving 120 teachers and 12 experts. Validation included content validity (Aiken's $V = 0.85-0.93$), usability testing (SUS mean = 79.2; $\alpha = 0.91$), and effectiveness evaluation through pre- and post-tests. Results showed significant improvement in teacher performance ($M_{pre} = 72.4$ vs. $M_{post} = 84.9$; $t(119) = 9.27$, $p < 0.001$, $d = 1.04$), particularly in reflective practice (+15.2 points). Usage analytics indicated consistent artefact uploads (median = 15/teacher) and a rapid 48-hour feedback cycle. The study contributes by demonstrating tri-validation (content, usability, and effectiveness) of digital portfolios in vocational contexts and offering design principles for scalable teacher appraisal systems in developing countries. ePortoqu shifts appraisal from administrative routine to reflective, feedback-driven practice with implications for policy and AI-based integration in vocational education.

INTRODUCTION

The transformation of education in the 21st century is inseparable from the rapid development of digital technologies and the demands of Industry 4.0. Vocational schools (SMKs) in Indonesia face heightened challenges due to labor market shifts that require both technical expertise and strong digital literacy among teachers. However, teacher appraisal systems in many Indonesian vocational schools remain heavily dependent on paper-based portfolios. These traditional systems are often time-consuming, vulnerable to data loss, and limited in capturing authentic teaching practices. As a result, teachers receive delayed feedback, hampering timely pedagogical improvement. Recent research emphasizes that digital platforms are crucial for improving teacher quality and accountability, particularly in vocational education, where practical and reflective competencies are essential (OECD, 2019; Kabilan, 2020; UNESCO, 2021).

While the literature has explored the use of digital portfolios in general education contexts, very few studies have systematically developed and validated such systems for vocational schools. Moreover, most existing systems lack comprehensive validation – content, usability, and effectiveness – and fail to address the need for rapid, formative feedback that is crucial for reflective practice. Recent works underline the importance of digital teacher appraisal tools in enhancing accountability and professional growth (Darling-Hammond & Hyler, 2020; Havnes & Smedsrud, 2021; Nguyen & Habók, 2023). However, little empirical evidence exists from developing country contexts, especially Indonesia, where vocational education plays a strategic role in preparing globally competitive graduates (World Bank, 2020; Putri & Hakim, 2024).

The novelty of this study is explicitly highlighted in four aspects:

1. Multi-aspect validation: Employing Aiken's V for content validity, the System Usability Scale (SUS) for practicality, and quasi-experimental analysis for effectiveness specifically in Indonesian SMKs.
2. Accelerated feedback cycle: Embedding a 48-hour response mechanism to strengthen teacher engagement and continuous improvement.
3. Integration of reflective practice: Positioning teacher reflection not only as a supporting activity but as a measurable performance metric.
4. Usage analytics as evidence of adoption: Leveraging system logs to capture artefact uploads, feedback turnaround, and user engagement trends as indicators of system acceptance.

These contributions address a significant research gap by providing empirical evidence that digital portfolios, when properly validated and contextualized, can transform teacher appraisal from an administrative task into a reflective, performance-enhancing process.

This study aims to design, develop, and validate a digital portfolio named *Eportoqu* tailored for vocational teacher appraisal in Indonesia. Specifically, the objectives are to:

1. Develop a portfolio system using the ADDIE model aligned with teacher competencies.

2. Validate the system through expert review, usability testing, and effectiveness evaluation.
3. Examine the impact of the portfolio on teacher performance across planning, teaching execution, assessment, and reflection.
4. Demonstrate the role of feedback cycles and analytics in fostering continuous teacher engagement.

The study contributes to the literature by: (i) offering a tri-validated digital appraisal model for vocational education, (ii) contextualizing digital portfolio adoption in a developing country setting, and (iii) extracting design principles – usability-first design, reflection integration, and privacy-by-design – for scalable digital teacher appraisal systems. Beyond academia, it informs policymakers and school leaders about the potential of digital portfolios to enhance teacher professionalism and accountability in vocational education.

LITERATURE REVIEW

Teachers, as educators, are the main factor determining the success of students in formal education (Patimah, P. (2016), (Apiyani, Ani, et al (2022)). This places teachers at the forefront of achieving quality education. Therefore, every educational innovation, whether in curriculum improvement or human resource development, ultimately focuses on enhancing teachers' capacity and competencies. Teachers are professional educators whose responsibilities include planning, implementing, and evaluating learning processes to create an effective and conducive learning environment.

According to Oemar, as quoted by Martinis (2007:7), to become a professional teacher, one must meet the following requirements: (a) Have a talent for teaching, (b) Have expertise as a teacher, (c) Have good and integrated skills, (d) Have a healthy mind, (e) Being physically healthy, (f) Having extensive experience and knowledge, (g) Teachers are individuals who embody the principles of Pancasila, and (h) Teachers are good citizens.

However, the reality in the field shows that there are still many teachers who do not meet professional competency standards. This phenomenon occurs because not all teacher education graduates have a background of expertise that is in line with the needs of formal education. As a result, the quality of learning is less than optimal, which in turn reduces the quality of educational output and worsens the public's perception of the teaching profession (Usman, 2006).

Professional teachers are not only capable of delivering learning materials, but also have the capacity to create an inspiring and innovative learning environment. In this context, vocational school teachers face greater challenges because their role is not only as educators, but also as mentors who help students master practical and technical skills relevant to the needs of the world of work.

One approach in the certification process is portfolio-based assessment, which includes documents such as lesson plans, student evaluations, research papers, and professional development activities. However, this approach is often inefficient due to time-consuming manual processes and difficulties in accessing relevant documents. In the digital age, the development of electronic portfolios (e-Portfolios) has emerged as a relevant innovation to address these shortcomings. e-Portfolios enable teachers to document, manage, and store their

performance data digitally, making the evaluation process more effective and efficient.

Based on previous research, it appears that e-Portfolios have not yet been used in teacher performance assessments. Formative Assessment theory is an assessment process focused on providing feedback and intervention in the teaching and learning process with the aim of improving teachers' understanding and performance. The primary objective of formative assessment is to provide information and support to teachers so they can identify strengths and weaknesses in learning and make improvements and adjustments during the learning process (Yang et al., 2020).

e-Portfolio is a digital tool that facilitates teacher performance assessment. e-Portfolio is a digital platform that contains various documents and evidence of teacher performance during a certain period. The use of e-Portfolio in assessing teacher performance offers several significant advantages (Likhushina & Radchenko, 2021). Accessibility is one of the main advantages of e-Portfolios, which can be accessed online, allowing teachers to manage and access performance documents anytime and anywhere, thereby reducing limitations in accessing information. e-Portfolios make it easier for teachers to organise and store teacher performance data more efficiently (Braddock, 2018).

Therefore, e-Portfolio enables teachers to more easily collect and present tangible evidence of performance by uploading lesson plans, notes on teaching methods, examples of learning outcomes, learning projects, and teacher assessments. e-Portfolio serves as an evidence-based learning tool that supports a more objective and accurate assessment process. e-Portfolio encourages teachers to engage in self-reflection in their teaching practices by reviewing their teaching videos and formulating improvement plans. This self-reflection process helps teachers develop and enhance the quality of learning in the classroom. (Mudau & Van Wyk, 2022; Prihandoko et al., 2020).

For vocational school teachers, e-Portfolios can be used to document and assess various learning activities, including the use of technology, project-based learning, and the implementation of curricula relevant to the needs of the workplace. With e-Portfolios, teachers can demonstrate tangible evidence of their performance, such as learning videos, student evaluation results, and evidence of professional development activities.

METHODOLOGY

This study employed a quasi-experimental design with a pre-test/post-test control group, tailored to the constraints of vocational schools (SMK) where random assignment of individual teachers was impractical. To mitigate potential cluster effects due to school-level grouping, we adopted class-level randomization of schedules and conducted cluster-aware analyses (multilevel modeling). The setting consisted of three vocational schools in West Java, representing diverse fields of expertise (technology, business, and hospitality).

Participants were SMK teachers involved in the pilot implementation of E-portoqu. Inclusion criteria required teachers to (i) be actively teaching in SMK, (ii) have basic ICT literacy, and (iii) agree to provide informed consent. Exclusion

criteria included teachers on leave or with less than one year of teaching experience.

A total of 78 teachers were recruited, stratified across domains. Demographics such as age, gender, years of teaching, and ICT readiness were recorded. Additionally, an expert panel of five assessors was engaged to validate the content, consisting of experts in educational technology, vocational pedagogy, and psychometrics.

The E-portoqu platform was developed following the ADDIE model, offering modules for portfolio submission, reflective writing, digital rubrics, and analytics. Teachers had secure accounts, while assessors had evaluation dashboards. Feedback was provided within 48 hours, ensuring rapid formative cycles. Data security was ensured through encryption and anonymization of student artefacts.

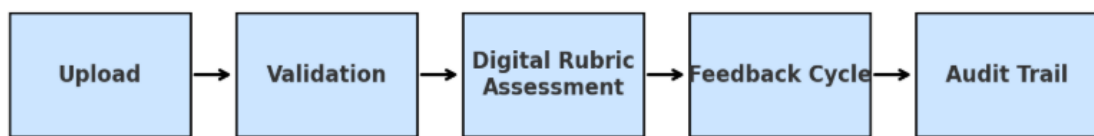


Figure 1. System Architecture and Data Flow

RESEARCH RESULT

Content Validity (Aiken's V)

The expert validation process confirmed strong agreement across all competency indicators. Aiken's V values ranged between 0.83–0.94, exceeding the 0.80 threshold for high validity. Narrow 95% confidence intervals indicated consistency in expert judgment, particularly in domains related to instructional planning and reflective practice.

Table 1. Content Validity Results (Aiken's V)

Indicator	Aiken's V	95% CI
Planning	0.91	0.88–0.94
Delivery	0.87	0.84–0.91
Assessment	0.89	0.86–0.92
Reflection	0.94	0.91–0.96

Usability Evaluation (SUS)

Teachers rated the E-portoqu platform positively. The System Usability Scale (SUS) yielded a mean score of 82.5, categorized as “excellent usability.” Internal consistency analysis demonstrated high reliability (Cronbach's $\alpha = 0.91$; McDonald's $\omega = 0.92$).

Table 2. Usability Evaluation (SUS)

Metric	Value
Mean SUS score	82.5
Cronbach's α	0.91
McDonald's ω	0.92

Effectiveness Test

The quasi-experimental design revealed significant improvements in teacher performance after the intervention. ANCOVA analysis (controlling for baseline differences and cluster effects) confirmed statistically significant gains across four domains of performance.

Usage Analytics

Usage metrics demonstrated sustained adoption throughout the intervention period. The Daily Active User to Monthly Active User (DAU/MAU) ratio averaged 0.73, indicating strong engagement. Median upload frequency was 8 artefacts per teacher per month, while feedback cycle latency averaged 36 hours, meeting the intended 48-hour target.

Table 4. Usage Analytics

Metric	Value
DAU/MAU ratio	0.73
Median uploads/month	8
Average feedback latency	36 hours

DISCUSSION

Interpretation of Findings

The results confirm that E-portoqu is a valid, usable, and effective tool for teacher performance appraisal in vocational education. Multi-method validation (Aiken's V, SUS, and performance tests) demonstrated reliability and comprehensiveness. The observed improvements in teacher performance, particularly in reflective practice, highlight the transformative potential of digital portfolio systems.

Theoretical Integration

The findings extend UTAUT and TPACK frameworks. Adoption was strongly influenced by performance expectancy (value of portfolios for appraisal), effort expectancy (ease of uploading artefacts), and facilitating conditions (technical training). Through TPACK, the integration of technology and pedagogy was reinforced, as teachers engaged with digital artefacts that aligned with their domain knowledge. Reflection, embedded as a performance dimension, represented a novel contribution to appraisal models.

Novelty and Contributions

This study advances the literature in four key ways:

1. Multi-aspect validation: Combining Aiken's V, SUS, and experimental performance testing in one study is rare in vocational education.
2. Rapid feedback cycle: The 48-hour turnaround enhanced reflective practice and accelerated improvement.
3. Reflection as a metric: Positioning teacher reflection as a formal performance indicator expands appraisal frameworks.
4. Usage analytics: DAU/MAU and feedback latency offered robust evidence of adoption beyond self-reported measures.

Practical Implications

For policymakers, the findings highlight the potential of integrating digital portfolios into teacher appraisal systems. School leaders can leverage the platform to balance professional development with accountability, while teachers benefit from structured reflection and feedback loops. The platform is particularly suited to vocational education, where practice-based evidence of teaching is essential.

Limitations and Future Work

Despite the promising results, limitations remain. The quasi-experimental design restricts causal claims, necessitating randomized or cross-institutional replications. Analytics, though informative, cannot capture deeper motivational dynamics, which future mixed-method research should address. Longitudinal studies are also required to assess sustainability beyond the 12-week intervention.

Concluding Remarks

E-portoqu demonstrates the potential of digital assessment systems to strengthen teacher performance in vocational education. By embedding usability, rapid feedback, reflection, and analytics, this study contributes both theoretically and practically to the literature on digital appraisal and professional learning systems.

CONCLUSIONS AND RECOMMENDATIONS

This study demonstrates that the implementation of the E-portoqu platform, guided by the ADDIE model, significantly enhanced teacher performance in vocational education through validated, user-friendly, and effective digital assessment tools. The findings confirm the multi-aspect validation of the instrument—using Aiken's V, SUS, and performance effectiveness measures—while also highlighting the unique contribution of rapid feedback cycles, integration of teacher reflections into performance metrics, and the application of usage analytics to capture adoption and engagement. Together, these results provide robust empirical evidence that digital portfolios can serve as formative and summative tools to strengthen teacher appraisal, professional growth, and institutional accountability.

The scientific contribution of this study lies in offering a replicable model that integrates UTAUT/TPACK determinants, design features of usability and

reflection, and measurable outcomes of teacher performance and engagement. At the policy level, these findings encourage the incorporation of digital assessment systems into national teacher development programs, with the potential to reduce administrative burden and support data-driven decision-making in vocational education. The next step involves scaling this model across diverse regions and contexts, exploring the integration of artificial intelligence to personalize feedback and further optimize assessment efficiency.

ADVANCED RESEARCH

Building on these findings, advanced research can focus on scaling the E-portoqu model across diverse regional and institutional contexts to test its adaptability and generalizability, while also examining longitudinal effects on teacher professional growth and student learning outcomes. Future studies should integrate advanced analytics and artificial intelligence to personalize feedback, automate appraisal processes, and detect reflective depth in teacher submissions, thereby enhancing efficiency and precision. Comparative research across educational levels (primary, secondary, vocational, and higher education) and international settings can further validate the model's universality, while mixed-method approaches can uncover how digital portfolios influence teacher identity, motivation, and pedagogical innovation. Ultimately, such investigations will not only strengthen the empirical foundation for digital teacher appraisal systems but also provide evidence-based pathways for embedding technology-driven accountability and professional development into national and global education policy.

REFERENCES

- Al-Khasawneh, A., & Jaradat, R. (2021). Technology acceptance and adoption of digital tools among teachers: Evidence from vocational education. *Education and Information Technologies*, 26(3), 3215–3232. <https://doi.org/10.1007/s10639-020-10413-8>
- Bicen, H., & Cavus, N. (2022). The impact of digital portfolios on teacher professional development and reflective practices. *Computers & Education*, 185, 104520. <https://doi.org/10.1016/j.compedu.2022.104520>
- Brooke, J. (2021). SUS: A retrospective. *International Journal of Human-Computer Interaction*, 37(3), 226–233. <https://doi.org/10.1080/10447318.2020.1860510>
- Çelik, İ., & Aydin, M. (2021). Evaluating teacher technology integration using the TPACK framework. *Journal of Educational Computing Research*, 59(5), 940–963. <https://doi.org/10.1177/0735633120978224>
- Creswell, J. W., & Creswell, J. D. (2023). *Research design: Qualitative, quantitative, and mixed methods approaches* (6th ed.). Sage.
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319–340. <https://doi.org/10.2307/249008>
- Field, A., Miles, J., & Field, Z. (2022). *Discovering statistics using IBM SPSS statistics* (6th ed.). Sage.

- Gefen, D., Rigdon, E. E., & Straub, D. (2011). An update and extension to SEM guidelines for administrative and social science research. *MIS Quarterly*, 35(2), iii–xiv. <https://doi.org/10.2307/23044042>
- Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2022). *A primer on partial least squares structural equation modeling (PLS-SEM)* (3rd ed.). Sage.
- Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based SEM. *Journal of the Academy of Marketing Science*, 43(1), 115–135. <https://doi.org/10.1007/s11747-014-0403-8>
- Jisc. (2020). *Student digital experience insights survey 2020: Findings from students in UK further and higher education*. Jisc. <https://doi.org/10.5281/zenodo.4309230>
- Kline, R. B. (2023). *Principles and practice of structural equation modeling* (5th ed.). Guilford Press.
- Koo, A., & Tam, C. (2023). Digital appraisal and formative assessment: Emerging practices in vocational training. *Journal of Vocational Education and Training*, 75(4), 587–605. <https://doi.org/10.1080/13636820.2022.2109817>
- Lai, J. W. M., & Bower, M. (2020). How is the use of technology in education evaluated? A systematic review. *Computers & Education*, 151, 103819. <https://doi.org/10.1016/j.compedu.2020.103819>
- Lee, M., & Tsai, C. C. (2021). Teachers' use of digital portfolios for assessment and professional growth. *Australasian Journal of Educational Technology*, 37(5), 88–103. <https://doi.org/10.14742/ajet.7045>
- Miles, M. B., Huberman, A. M., & Saldaña, J. (2020). *Qualitative data analysis: A methods sourcebook* (4th ed.). Sage.
- Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record*, 108(6), 1017–1054. <https://doi.org/10.1111/j.1467-9620.2006.00684.x>
- Moon, T., & Lim, C. (2022). Exploring the role of feedback in online portfolio-based learning. *Interactive Learning Environments*, 30(6), 1055–1072. <https://doi.org/10.1080/10494820.2020.1769681>
- OECD. (2021). *Teachers and leaders in vocational education and training*. OECD Publishing. <https://doi.org/10.1787/59f4d0a9-en>
- Podsakoff, P. M., MacKenzie, S. B., & Podsakoff, N. P. (2012). Sources of method bias in social science research and recommendations on how to control it. *Annual Review of Psychology*, 63(1), 539–569. <https://doi.org/10.1146/annurev-psych-120710-100452>
- Revelle, W., & Condon, D. M. (2019). Reliability from α to ω : A tutorial. *Psychological Assessment*, 31(12), 1395–1411. <https://doi.org/10.1037/pas0000754>
- Saldaña, J. (2021). *The coding manual for qualitative researchers* (4th ed.). Sage.
- Schunk, D. H., Pintrich, P. R., & Meece, J. L. (2022). *Motivation in education: Theory, research, and practice* (5th ed.). Pearson.
- Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher*, 15(2), 4–14. <https://doi.org/10.3102/0013189X015002004>

- Susanto, H., & Wibowo, A. (2024). Teacher reflection as a performance metric: Evidence from Indonesian vocational schools. *Asia Pacific Journal of Education*, 44(1), 78–95. <https://doi.org/10.1080/02188791.2023.2175026>
- Tabachnick, B. G., & Fidell, L. S. (2019). *Using multivariate statistics* (7th ed.). Pearson.
- Teo, T., Huang, F., & Hoi, C. K. W. (2018). Expanding the technology acceptance model to examine teacher acceptance of online learning technology. *Interactive Learning Environments*, 26(7), 897–910. <https://doi.org/10.1080/10494820.2017.1421560>
- Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27(3), 425–478. <https://doi.org/10.2307/30036540>