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ECW-DIGIPRO: AN INTEGRATED DIGITAL PROFESSIONAL READINESS ASSESSMENT MODEL AMONG PRE-SERVICE EFL TEACHERS

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Abstract: Digital teacher education requires technical proficiency, pedagogical judgment, reflective practice, language competence, and community well-being responsiveness. However, these dimensions are often assessed in isolation. To address this gap, this study developed and evaluated ECW-DigiPro (English for Community Well-Being Digital Professional), an integrated assessment system profiling pre-service EFL teachers' readiness. Adopting a Design-Based Research approach with an embedded quasi-experimental phase,

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the study evaluated 50 pre-service English teachers across four higher education institutions in Jombang, Indonesia. Instruments included a 25-item readiness questionnaire, expert validation forms, and pretest-posttest assessments. Baseline results revealed the highest scores in English Skill Competency (M=3.71), Pedagogical Readiness (M=3.47), and Digital Readiness (M=3.18), whereas Reflective Readiness (M=2.91) and Community Well-being Orientation (M=2.83) lagged. Expert validation confirmed strong content validity (Aiken's V=.896). Post-intervention, the experimental group demonstrated significant gains (+1.07, t24=6.89, p<.001), outperforming the control group (+0.32) in normalized gain (0.46 vs. 0.14) and effect size (d=1.06 vs. 0.28). It shows that the experimental group displayed markedly better advancement in professional preparedness, evidenced by a moderate N-Gain score and a large effect size. Overall, ECW-DigiPro effectively supports integrated readiness profiling and reflective development, though broader trials with direct between-group comparisons are recommended.

Keywords: *ECW-DigiPro, integrated assessment system, pre-service English teachers, professional readiness, reflective digital pedagogy*

INTRODUCTION

Digital transformation has reshaped teacher education by expanding what future teachers are expected to know and do. Competent technology use is important, but professional readiness also requires pedagogical judgment, contextual responsiveness, reflective decision-making, and the ability to use digital resources in ways that serve meaningful educational purposes. Research on technology- and AI-supported teaching similarly suggests that readiness depends not only on technical proficiency but also on teachers' confidence and judgment in integrating technology pedagogically (Yue et al., 2024; Zhai et al., 2023). Global policy

frameworks likewise emphasize professional autonomy, critical judgment, and context-sensitive uses of technology in education (UNESCO, 2021, 2023; OECD, 2023).

These demands are particularly relevant in Indonesian teacher education, where learning management systems and technology-enhanced instruction have become increasingly common. However, digital literacy and pedagogical competence are often developed as parallel rather than fully integrated strands of preparation (Durriyah & Zuhdi, 2018). This fragmentation can leave pre-service teachers able to operate digital tools without equivalent development in reflective judgment, adaptive pedagogy, or responsiveness to the social contexts in which teaching occurs.

Empirical studies with pre-service English teachers reinforce this concern. Digital competence does not automatically translate into pedagogically sound or context-sensitive technology use (Sumarni et al., 2023; Yuvita et al., 2023). Professional readiness therefore needs to be understood as a broader construct that combines what teachers know, how they make instructional decisions, how they evaluate their own practice, and how they connect professional action with learners and communities.

Technological Pedagogical Content Knowledge (TPACK) provides an influential foundation for conceptualizing teacher knowledge in technology-rich environments (Mishra & Koehler, 2006; Koehler et al., 2015). TPACK explains the dynamic interaction of technological, pedagogical, and content knowledge, but it is primarily a knowledge-integration framework. It does not, by itself, specify how readiness should be assessed as an evolving professional capacity that includes reflection, professional identity, and socially responsive judgment. Contemporary assessment scholarship likewise argues for assessment designs that do more than classify performance and instead provide feedback that can guide continuing development (Ahangama, 2026).

A broader view of teacher development helps address these dimensions. Korthagen (2017) positions reflection as central to professional learning and identity development, while Biesta (2020)

emphasizes that education involves not only qualification but also socialization and subjectification. Jonassen's (2004) work on meaningful learning further suggests that technology is pedagogically valuable when it supports active, constructive, authentic, and reflective knowledge building. Taken together, these perspectives support a view of professional readiness as multidimensional, developmental, and situated rather than merely technical.

The five dimensions of professional readiness used in ECW-DigiPro were selected to capture complementary aspects of this broader construct. Pedagogical Readiness reflects pedagogical knowledge and meaningful learning design (Shulman, 1987; Jonassen, 2004); Digital Readiness draws on the technological-pedagogical integration emphasized in TPACK (Mishra & Koehler, 2006); English Skill Competency represents the disciplinary language knowledge required for English language teaching (Richards, 2022); Reflective Readiness is grounded in reflective teacher learning and professional identity development (Korthagen, 2017) and Community Well-being Orientation is informed by the social purposes of education and the responsibility of education to contribute to shared futures (Biesta, 2020; UNESCO, 2021). The five dimensions are therefore intended to represent an integrated profile of subject-matter competence, pedagogy, digital capability, reflective judgment, and socially responsive professional purpose.

Previous English-teaching innovations, including EPUGA for speaking and Sentence Box for grammar learning, have demonstrated the value of targeted instructional tools (Fauziyah & Alviani, 2022; Fauziyah & Anggara, 2023). However, such innovations focus mainly on specific learning outcomes rather than on an integrated assessment of pre-service teachers' professional readiness. A gap therefore remains for a digital system that can diagnose multiple dimensions of readiness, provide structured reflective feedback, and translate assessment results into individualized

professional-development recommendations within the Indonesian EFL teacher-education context.

To address this gap, the present study developed ECW-DigiPro (English for Community Well-Being Digital Professional), a digital assessment system that integrates the five dimensions of professional readiness within a single diagnostic and reflective environment. Rather than functioning only as a score-reporting tool, ECW-DigiPro is designed to generate readiness profiles, prompt structured reflection, and provide recommendations for professional growth.

Accordingly, the study addressed three research questions: (1) What is the baseline profile of pre-service EFL teachers across the five dimensions of professional readiness? (2) To what extent do expert judgments support the content, construct alignment, interface usability, instructional alignment, and system logic of ECW-DigiPro? (3) What pretest-posttest changes in professional readiness are observed when ECW-DigiPro is implemented in a quasi-experimental comparison?

METHOD

Research Design

To develop and evaluate ECW-DigiPro, this study used a Design-Based Research (DBR) framework (Reeves, 2006) with an embedded quasi-experimental pretest-posttest comparison. DBR was appropriate because the study sought both to develop a context-responsive digital assessment system and to examine its performance in practice. The research followed six operational phases, comprising needs analysis, model development, expert validation, implementation, evaluation, and revision. The quasi-experimental component was embedded in the implementation and evaluation phases to provide preliminary evidence of change associated with the use of ECW-DigiPro (Fraenkel et al., 2019). The overall design is shown in Figure 1.

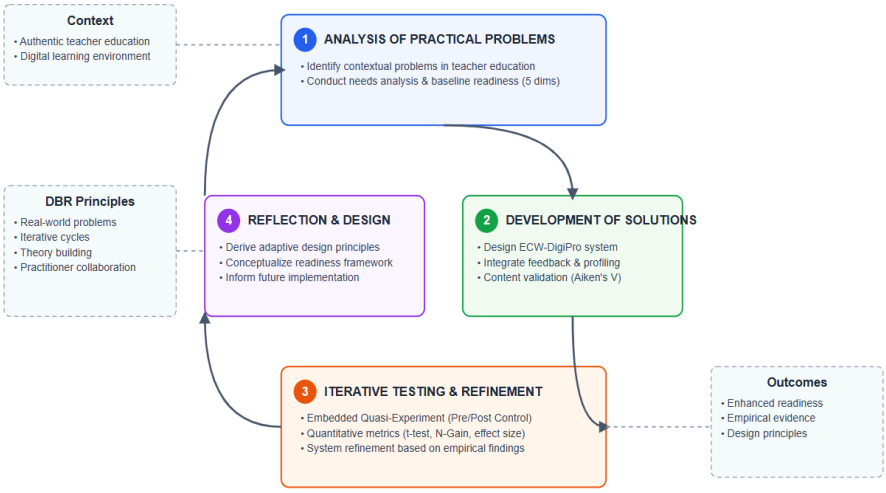


Figure 1. Integrated Design-Based Research and quasi-experimental framework for the development and evaluation of ECW-DigiPro (adapted from Reeves, 2006)

In the quasi-experimental phase, both groups completed a pretest (O1) and posttest (O2). The experimental group used ECW-DigiPro (X), including diagnostic profiling, reflective prompts, adaptive assessment activities, and personalized recommendations, whereas the control group continued with the conventional preparation approach. The design therefore supported analysis of within-group pre-post change and descriptive comparison of improvement patterns across groups.

The final DBR phase integrated quantitative evaluation results with expert and participant feedback to refine the platform. The revision focused on usability, the quality of reflective prompts, and the precision of recommendations. In this way, the DBR component informed iterative improvement of the design, while the quasi-experimental component provided preliminary evidence about changes in professional readiness.

Research Procedures

Figure 2 summarizes the six-phase development and evaluation procedure used in this study.

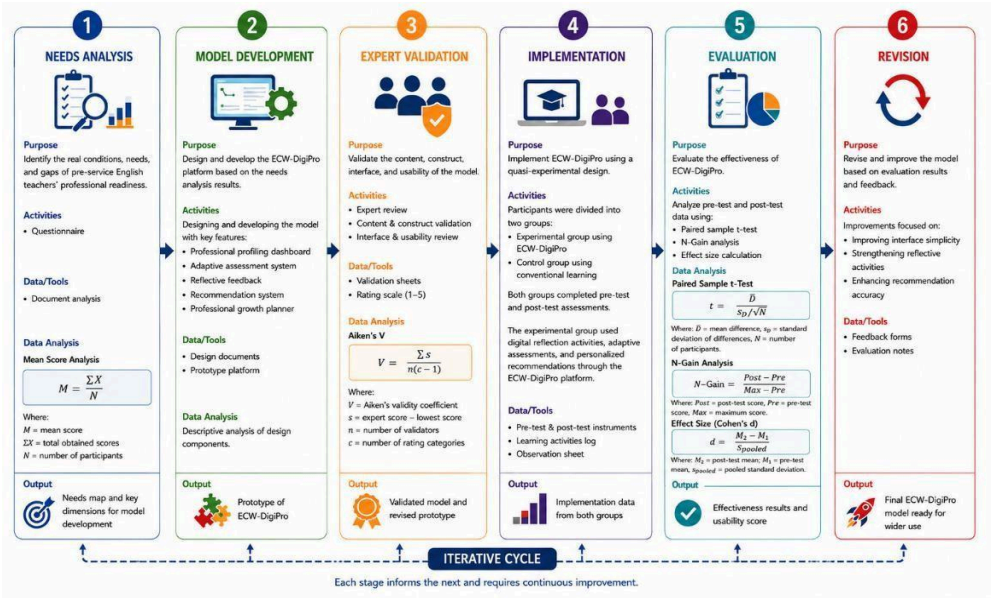


Figure 2. Six-phase research procedure integrating Design-Based Research and quasi-experimental evaluation in the development of ECW-DigiPro

Needs Analysis

The needs-analysis phase established the baseline professional-readiness profile of pre-service EFL teachers using a 25-item questionnaire covering the five dimensions of professional readiness: Pedagogical Readiness, Digital Readiness, English Skill Competency, Reflective Readiness, and Community Well-being Orientation. The dimension structure was theory-informed, drawing on TPACK and teacher-knowledge perspectives for pedagogical, digital, and disciplinary competence and using Korthagen's reflective teacher-learning perspective for Reflective Readiness and Biesta's and UNESCO's emphasis on the broader social purposes of education for Community Well-being Orientation. Dimension-level mean scores were used to identify relative strengths and areas requiring further development.

Model Development

The second phase translated the needs-analysis results and theoretical framework into the ECW-DigiPro digital platform. The

system was organized around five core functions, such as occupational analytics interface, adjustable evaluation framework, contemplative responses, suggestion platform, and a professional development planner message. These functions were designed to support repeated cycles of assessment, reflection, feedback, and professional-development planning rather than a one-time score report.

Expert Validation

The prototype was evaluated by three expert validators representing English language education, educational technology, and educational assessment. Using a five-point rating scale, the experts assessed content relevance, construct accuracy, interface usability, instructional alignment, and system logic. Aiken's V was used to summarize the degree of expert agreement on the relevance and adequacy of the evaluated components (Aiken, 1985).

Implementation

The fourth phase implemented ECW-DigiPro within the quasi-experimental component. The 50 participants were divided equally into two groups. The experimental group (n = 25) used ECW-DigiPro and the control group (n = 25) received the conventional preparation approach. Both groups completed pretest and posttest professional-readiness assessments. During implementation, the experimental group engaged with the platform's diagnostic assessments, structured reflection prompts, and individualized feedback and recommendations.

Evaluation

The evaluation phase examined changes in professional-readiness scores using paired-samples t-tests within each group, normalized gain (N-gain), and reported effect sizes. Mean-score changes and posttest readiness distributions were also compared descriptively across groups.

Revision

The final phase revised ECW-DigiPro in response to the evaluation findings and validator and participant feedback. The main refinements were simplifying dashboard navigation, strengthening the depth and clarity of reflective prompts, and improving the precision of personalized recommendations.

Participants and Sampling

Purposive sampling was used to recruit 50 final-year pre-service English teachers from English Education programs in Jombang, Indonesia at four higher education institutions, comprising three Islamic higher education institutions and one non-Islamic university. For maintaining the confidentiality, the institutions were assigned pseudonyms into institutions A, B, C, and D. Final-year students were selected because they met the study's inclusion criteria: (1) enrollment in the final year of an undergraduate English Education program; (2) completion of microteaching or a teaching practicum; (3) prior experience with technology-assisted learning environments; and (4) willingness to participate in reflective professional-assessment activities.

For the embedded quasi-experimental phase, participants were divided equally into an experimental group (n = 25) and a control group (n = 25). The experimental group used ECW-DigiPro, whereas the control group received the conventional preparation approach. The sample should therefore be interpreted as a small-scale developmental trial rather than as a population-representative sample.

Recruitment across four local institutions provided some institutional variation within the Jombang context while remaining consistent with the context-sensitive aims of DBR. Because the sampling strategy was purposive and geographically bounded, the findings are intended to inform model development and preliminary evaluation rather than broad statistical generalization.

Data Collection Instruments

Three data sources were used. First, a 25-item professional-readiness questionnaire measured the five dimensions of professional readiness using a five-point *Likert*-type response format.

Second, an expert-validation form assessed content relevance, construct accuracy, interface usability, instructional alignment, and system logic. Third, pretest and posttest professional-readiness assessments were used in the quasi-experimental phase. Expert judgment was used to evaluate the content and design validity of ECW-DigiPro, while the pretest-posttest data were used to examine preliminary evidence of change.

Data Collection Procedures

Data collection followed the six-phase DBR sequence. First, the needs-analysis questionnaire was administered to establish baseline professional-readiness profiles. Second, the ECW-DigiPro prototype was developed from the needs-analysis findings and theoretical framework. Third, experts in English language education, educational technology, and educational assessment validated the prototype. Fourth, the revised system was implemented in the quasi-experimental phase. Fifth, pretest-posttest outcomes and user feedback were evaluated. Sixth, the model was revised in response to the evaluation results.

During the implementation phase, all 50 participants completed the relevant pretest and posttest assessments. The experimental group used ECW-DigiPro and the control group followed the conventional preparation approach. Participants were informed about the purpose and procedures of the study and participated voluntarily.

Data Analysis

Quantitative analyses were conducted using IBM SPSS Statistics (Version 26.0). Research question one was addressed descriptively using dimension means and equivalent percentages (mean score divided by the maximum score of 5, multiplied by 100). Another question was addressed using Aiken's V based on the three expert ratings. For the last research question, within-group pretest-posttest change was examined using paired-samples *t*-tests, normalized gain (*N*-gain), and reported Cohen's *d* effect sizes. *Shapiro-Wilk* tests were

used to assess the normality assumption before the paired comparisons. Because the reported analysis did not include a direct inferential test of the difference in change between the experimental and control groups, cross-group contrasts in gains and effect sizes are interpreted descriptively rather than as a formal group-by-time treatment effect. Additionally, IBM SPSS Statistics (Version 26.0) was used for the descriptive and inferential analyses to improve computational accuracy, transparency, and reproducibility. Statistical results are reported using standard notation, including t values, degrees of freedom, p values, N-gain scores, and effect-size estimates.

Normality Assessment

Before the paired-samples *t*-tests, the data were screened using the Shapiro-Wilk test. The reported normality assessment indicated no statistically significant departure from normality ($p > .05$), supporting the use of parametric within-group comparisons. For a paired-samples *t*-test, the relevant normality assumption concerns the distribution of the difference scores. A separate homogeneity-of-variance assumption is not required for the within-group test.

Ethical Considerations

The study followed standard principles of voluntary participation, confidentiality, and research-purpose use of data. Participants were informed about the study objectives and procedures before data collection, and their identities and responses were kept confidential.

FINDINGS

The findings are organized around the three research questions: (1) the baseline profile across the five dimensions of professional readiness, (2) expert validation of ECW-DigiPro, and (3) pretest-posttest changes observed in the quasi-experimental phase. ECW-DigiPro is treated here as a digital assessment and developmental-support system rather than as a stand-alone instructional method.

RQ1: Baseline Professional Readiness Profile

The baseline analysis was descriptive because the purpose of RQ1 was to identify the relative strengths and development needs represented in the five-dimensional readiness profile. The 25-item questionnaire was completed by all 50 participants. Dimension-level mean scores, equivalent percentages, and readiness categories are presented in Table 1.

Table 1. *Baseline professional readiness profile of participants*

Dimension	Mean	Equivalent Percentage	Category
Pedagogical Readiness	3.47	69.4%	Moderate
Digital Readiness	3.18	63.6%	Moderate
English Skill Competency	3.71	74.2%	High
Reflective Readiness	2.91	58.2%	Low
Community Well-being Orientation	2.83	56.6%	Low

The baseline profile was uneven across the five dimensions. English Skill Competency had the highest mean (M = 3.71; 74.2%, high), followed by Pedagogical Readiness (M = 3.47; 69.4%, moderate) and Digital Readiness (M = 3.18; 63.6%, moderate). Reflective Readiness (M = 2.91; 58.2%) and Community Well-being Orientation (M = 2.83; 56.6%) were classified as low. The pattern suggests that participants entered the study with comparatively stronger disciplinary language competence than reflective and community-oriented professional capacities.

The ECW-DigiPro system converted questionnaire responses into dimension-level profiles through a structured architecture linking the assessment interface, analysis engine, and readiness database (Figure 3).

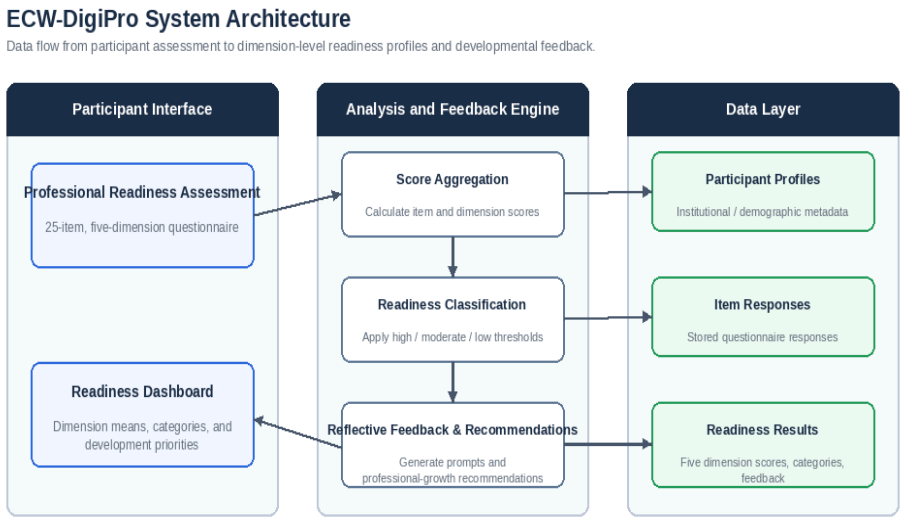


Figure 3. *ECW-DigiPro system architecture for questionnaire intake, score analysis, and readiness-profile output.*

The diagnostic workflow then aggregated item responses, calculated dimension means, and classified scores into high, moderate, or low readiness categories (Figure 4).

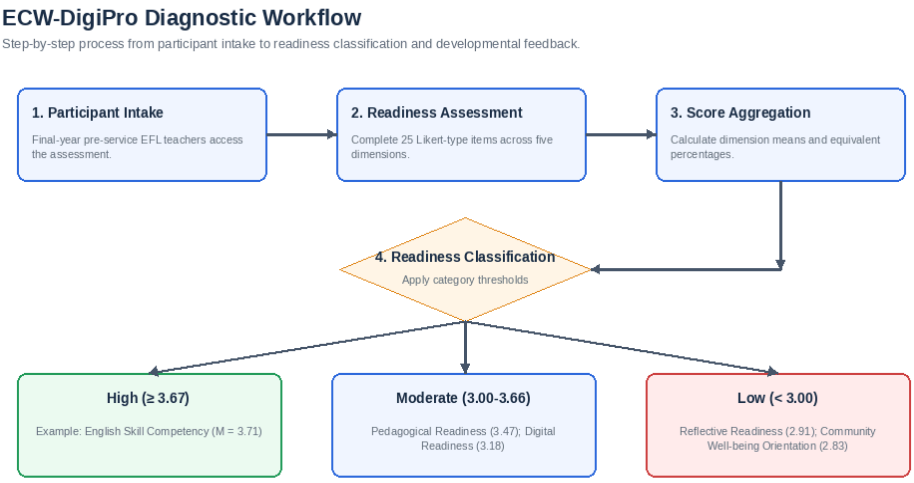


Figure 4. *Diagnostic workflow from participant intake to readiness classification*

Figure 4 presents the ECW-DigiPro Diagnostic Workflow with four steps, consisting of recruitment of the participants, filling of 25-item readiness questionnaire by means of Likert-type scale

comprising five readiness dimensions, calculation of the mean scores and proportions by readiness dimension, and then readiness grouping. The participants' readiness was mainly defined as highly prepared (≥3.67), sufficiently prepared (3.00–3.66), or unprepared (<3.00), according to their mean (dimensional, M) readiness scores. For instance, their preparedness on their language skill was deemed to be high (M = 3.71), while their preparedness in being pedagogically ready was at a moderate level (M = 3.47), as were their being digitally ready (M 3.18), whereas their being integratively ready was a low (M =2.91) and the participants' community well-being orientation was also a low level (M =2.83).

The user interface (UI) of the web-based ECW-DigiPro diagnostic tool that the participants were exposed to while collecting data is captured in Figure 5.

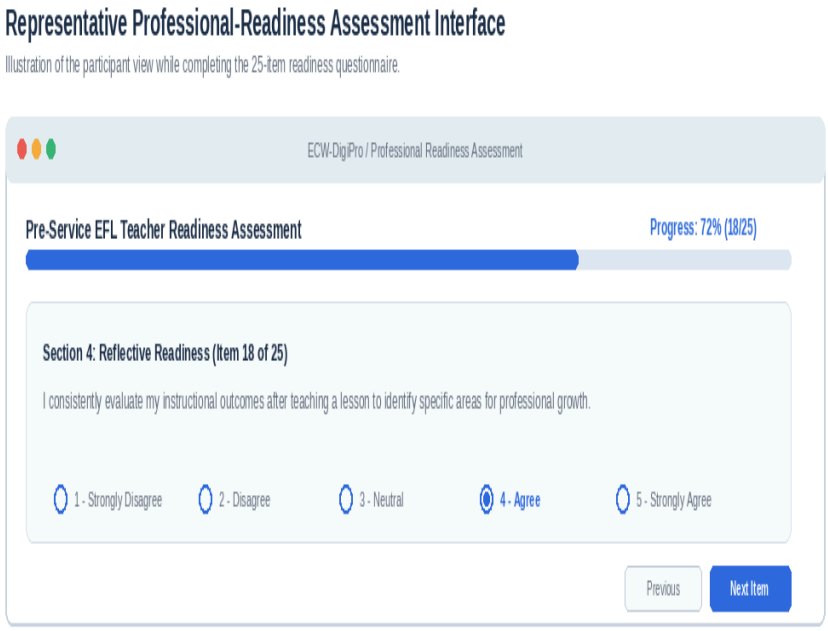


Figure 5. *Representative ECW-DigiPro professional-readiness assessment interface*

The figure highlights several distinctive features of the online instrument intended for the enhancement of data integrity and user experience. To begin with, a progress bar is shown which indicates

the completion of the questionnaire by the participant (e.g., 72% [18/25]). It serves to help participants know where they stand. In addition, the items of the questionnaire are organized in a sectional presentation, moving sequentially across the five readiness indicators (e.g., Section 4: Reflective Readiness). Lastly, a five-point Likert scale (from 1 = Strongly Disagree to 5 = Strongly Agree) with a series of questions gives participants the means to express and rate their level of agreement with each item through a simple set of options. They just have to decide whether to move back or forward using the Previous and Next buttons without having to re-open the entire tool at once.

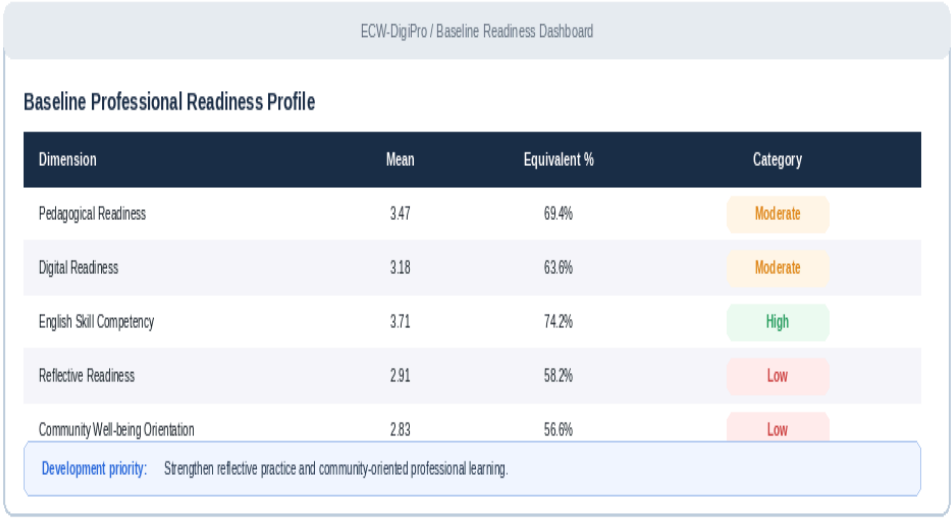


Figure 6. *Baseline professional-readiness dashboard generated from the five dimensions*

Figures 5 and 6 show the assessment interface along with the baseline readiness profiles that ECW-DigiPro has generated for each of the participants. From the results it is evident that the readiness of the teachers was different along the five professional readiness dimensions. English Competency of Skills has the highest average score showing that the participants were more or less familiar with the English language through and large.

Level of teaching-readiness and that of readiness for digital environments were moderate implying that further development of

pedagogical decision-making and conscious incorporation of technology are still needed at both levels. In contrast, Reflective Readiness and Community Well being Orientation scores were the lowest suggesting that the reflective aspect needs to be strengthened and that the understanding of the social and community responsibilities of English teachers as a teaching profession needs to be deepened.

The results from the study became the foundation for developing a digital prototype of the ECW. Instead of just providing a set of scores to indicate one's readiness level, the prototype included five interconnected features to support further professional development: the professional profiling dashboard; adaptive readiness assessment engine, reflective feedback generator; competency-based recommendation module; and contextual professional growth planner. Taken together, these five features were meant to be the interface that links assessments with reflections, recommendations, and planning of professional development.



Figure 7. *Initial ECW-DigiPro application prototype integrating the five dimensions of professional readiness*

RQ2: Expert Validation of ECW-DigiPro

Three experts in English language education, educational technology, and educational assessment evaluated ECW-DigiPro using a five-point rating scale. Their judgments covered content relevance, construct accuracy, interface usability, instructional alignment, and system logic. The Aiken's *V* results are summarized in Table 2.

Table 2. *Expert validation results for ECW-DigiPro*

Validation Aspect	Aiken's V	Interpretation	Summary of Expert Judgment
Content Relevance	0.92	Very valid	Highly relevant to the professional-readiness objectives and conceptually appropriate.
Construct Accuracy	0.88	Very valid	Strong alignment between the theoretical constructs and operational design components.
Interface Usability	0.87	Very valid	Practical and accessible, with minor navigation and layout refinements recommended.
Instructional Alignment	0.91	Very valid	Strong alignment with intended learning and reflective professional-development processes.
System Logic	0.90	Very valid	Coherent assessment sequence, recommendation flow, and system functionality.
Overall	896	Very valid	Strong overall expert agreement, with minor revisions recommended before broader implementation.

Table 2 provides information on the outcome of the expert evaluation of ECW-DigiPro and consists of five criteria for the evaluation and a summary of it. Measures for all criteria according to

Aiken's *V* have fallen into the category "*Very valid*," which means that high content validity and experts' consensus exist in this case. The evaluation criteria breakdown is:

a) *Content Relevance* (Aiken's *V* = 0.92): The highest among other evaluation criteria. Experts assessed the content relevance and conceptual accuracy regarding readiness goals.
b) *Construct Validity* (Aiken's *V* = 0.88): Very valid. The connection between theoretical constructs and design components has been proven.
c) *Usability of the Interface* (Aiken's *V* = 0.87): Usable, but some changes in the navigation and design of the interface have been suggested by the experts.
d) *Instructional Alignment* (Aiken's *V* = 0.91): This criterion shows the good alignment of the system to the process of learning and reflection in professional development.
e) *System Logic* (Aiken's *V* = 0.90): The logical correlation of the system to the process of evaluation and recommendations.
f) *Summary of the Evaluation* (Aiken's *V* = 0.896): "Very valid" is the general evaluation according to all criteria.

Expert ratings were consistently high across the five evaluated aspects. Content relevance obtained the highest coefficient (*V* = 0.92), followed by instructional alignment (*V* = 0.91), system logic (*V* = 0.90), construct accuracy (*V* = 0.88), and interface usability (*V* = 0.87). The overall coefficient was *V* = 0.896, indicating strong agreement among the validators regarding the content and design adequacy of the system.

The validators particularly endorsed the relevance of the content and its alignment with the intended professional-readiness outcomes. They also judged the assessment and recommendation flow to be logically coherent and the instructional support to be appropriately connected with reflective professional development.

The comparatively lower, although still strong, ratings for construct accuracy and interface usability generated concrete revision priorities. The experts recommended clarifying selected indicators

and explanations, simplifying navigation, improving layout consistency, and making user guidance more concise and accessible.

These results support expert-judged content and design validity of ECW-DigiPro. However, expert validation should not be interpreted as complete psychometric validation of the 25-item readiness scale; additional evidence such as internal-consistency estimates and factor-structure testing would strengthen future validation studies.

Following expert validation, the prototype was revised by simplifying dashboard navigation, strengthening reflective prompts, and refining recommendation logic. Figure 8 presents the revised application design and highlights these changes.



Figure 8. *Revised ECW-DigiPro application design following expert validation*

RQ3: Pretest-Posttest Changes in Professional Readiness

The quasi-experimental phase provided preliminary evidence of changes in professional readiness associated with the ECW-DigiPro implementation. The results are interpreted using the reported within-group tests and descriptive comparisons of mean change, N-gain, effect size, and posttest readiness distribution.

Pretest-Posttest Mean Scores

The experimental group increased from a pretest mean of 3.08 to a posttest mean of 4.15, a mean increase of 1.07 points. The control group increased from 3.12 to 3.44, a smaller mean increase of 0.32 points. The descriptive pattern therefore shows substantially greater improvement in the group that used ECW-DigiPro (Figure 9).

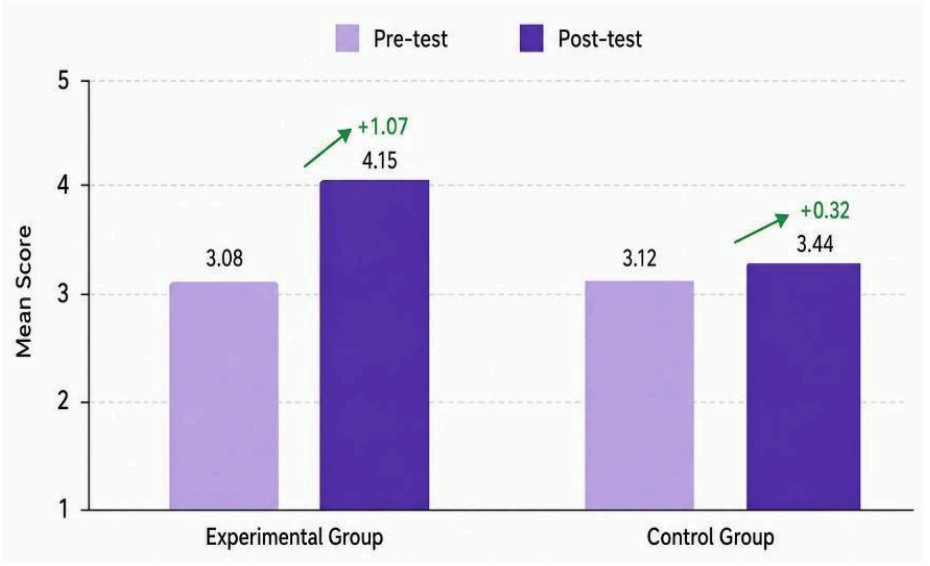


Figure 9. *Pretest and posttest mean professional-readiness scores by group*

Normalized-gain analysis showed the same pattern. The experimental group obtained an *N*-gain of 0.46, categorized as moderate, whereas the control group obtained an *N*-gain of 0.14, categorized as low (Figure 10).

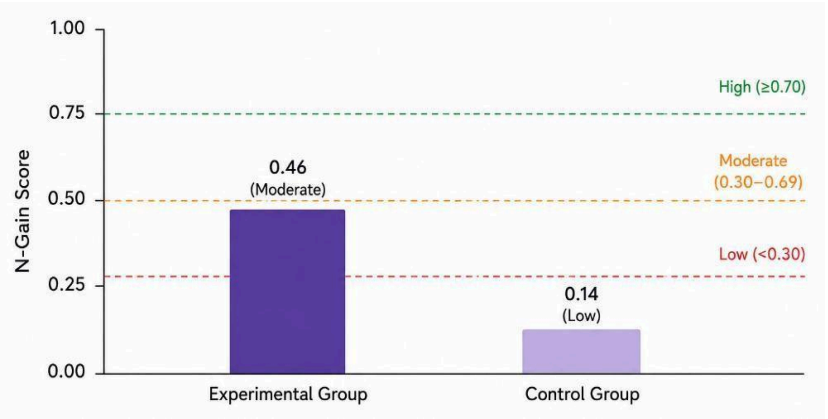


Figure 10. *Normalized-gain comparison between the experimental and control groups*

The *N*-gain results indicate that the experimental group achieved a larger proportion of the possible improvement from pretest to posttest. Because *N*-gain is descriptive, however, it should be interpreted together with the inferential test results rather than as a stand-alone test of between-group effectiveness.

Effect Size

The reported effect-size estimates were d=1.06 for the experimental group and d=0.28 for the control group, corresponding to large and small effects, respectively (Figure 11). This difference in magnitude is consistent with the larger mean increase observed in the experimental group.

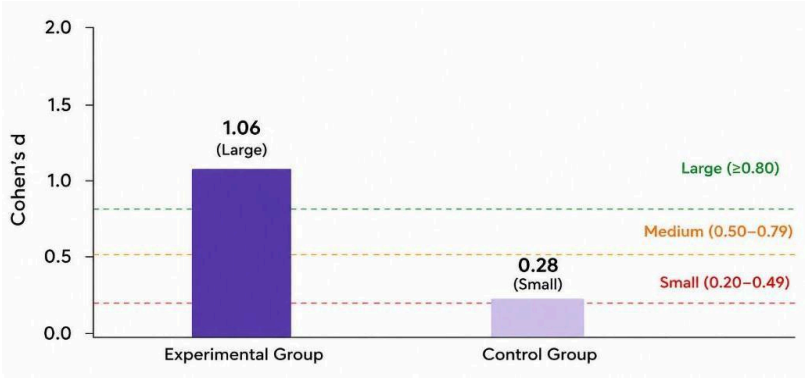


Figure 11. *Reported Cohen's d effect sizes for pretest-posttest change by group*

Paired-Samples t Tests

The experimental group showed a statistically significant pretest-posttest increase, $t(24) = 6.89$, $p < 0.001$. The control-group increase was not statistically significant, $t(24) = 1.78$, $p = .083$ (Figure 12). In practical terms, the experimental group showed both statistical evidence of within-group improvement and a substantially larger reported effect size, whereas the control group's change was comparatively small.

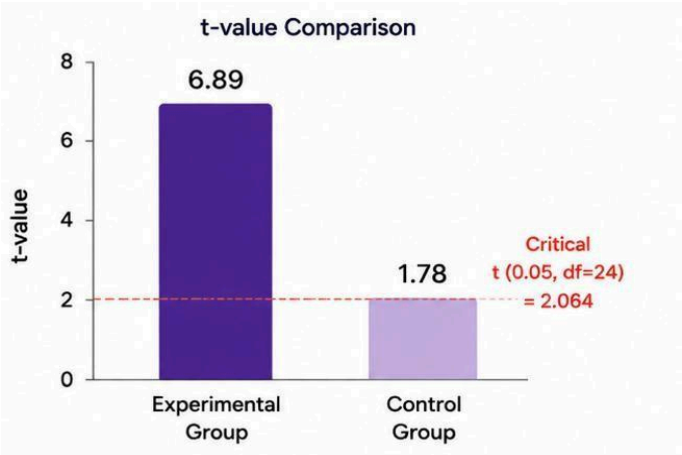


Figure 12. *Paired-samples t-test statistics reported for the experimental and control groups*

These paired-samples results support the conclusion that professional readiness improved over time within the experimental group. They do not establish that the change in the experimental group was statistically greater than the change in the control group. A direct between-group test of change scores or a group-by-time model would be required for that stronger causal inference.

Posttest Readiness Distribution

At posttest, 72% of participants in the experimental group were classified in the high-readiness category, compared with 36% of the control group (Figure 13). The experimental group also had a smaller proportion of participants in the low-readiness category (4% vs. 16%).

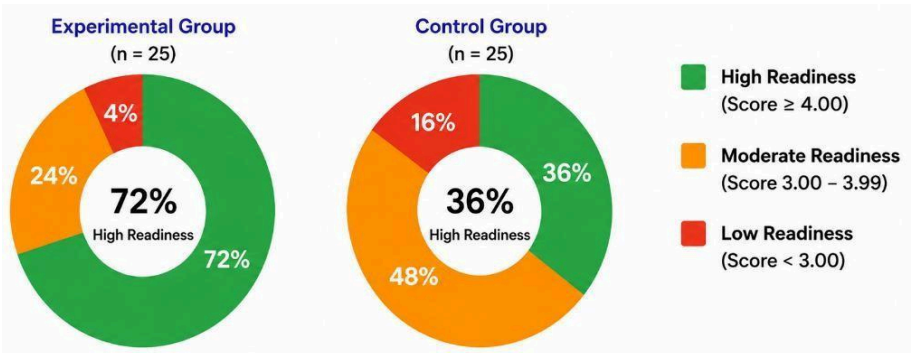


Figure 13. *Posttest distribution of professional-readiness categories by group*

The posttest distribution is consistent with the mean-score and N-gain patterns, showing a larger shift toward high readiness among ECW-DigiPro users. This pattern is promising, although the categorical comparison is descriptive and should not be interpreted as definitive evidence of a treatment effect without a direct between-group significance test.

Taken together, the experimental group's larger mean increase, moderate N-gain, large reported effect size, significant within-group *t*-test, and higher proportion of participants reaching the high-readiness category provide converging preliminary evidence that ECW-DigiPro may support professional-readiness development. The findings are best interpreted as evidence from a small-scale developmental evaluation rather than as a definitive causal estimate.

DISCUSSION

The baseline findings reveal a clear imbalance across the five dimensions of professional readiness. In particular, the highest baseline dimension among all was the English Skill Competency dimension (M = 3.71, *High*), followed by Pedagogical Readiness (M = 3.47, *Moderate*) and Digital Readiness (M = 3.18, *Moderate*). The lowest baseline dimensions were Reflective Readiness (M = 2.91, *Low*) and Community Well-being Orientation (M = 2.83, *Low*). The current imbalanced baseline is consistent with the findings of recent studies concerning teacher readiness (e.g., Nguyen & Nguyen, 2026). Pre-service language teachers usually reveal high competence in

fundamental skills and ethics but lack readiness in the practical execution of these dimensions. This situation is caused by the fact that teacher preparation programs focus more on technical skills, lesson planning, and technologies rather than the self-reflective analysis of these skills and integration into the community. Korthagen (2017) argues that reflective professional learning requires deliberate structures that move teachers beyond routine performance toward examination of the assumptions underlying their actions. Similarly, Biesta's (2020) account of educational purpose suggests that professional preparation should extend beyond qualification to the social and subject-forming dimensions of education. The lower scores in the two dimensions therefore point to areas that may be less explicitly cultivated in conventional preparation.

The expert review revealed that there was a very high content validity index (Aiken's V = 0.896, *Very valid*) on all of the criteria, which was the highest on Content Relevance ($V = 0.92$) and Instructional Alignment (V = 0.91). Moderately high ratings of Construct Accuracy (V = 0.88) and Interface Usability (V = 0.87) became the grounds for further application improvements, such as dashboard navigation simplification and the improvement of reflective questions. The results found here are similar to those that can be seen in design-based research (DBR) on educational technology (Reeves, 2006; Fernández-Batanero et al., 2026), in which expert review helps to connect theoretical constructs and user interface usability of formative digital tools. The initial mismatch between a high level of content relevance and a moderate level of interface usability is connected with the inherent complexity of translating multidimensional theoretical constructs (TPACK framework in combination with reflective and community orientation) into a digital user interface.

The results also clarify how ECW-DigiPro complements TPACK. TPACK remains central for understanding the integration of technology, pedagogy, and content knowledge (Mishra & Koehler, 2006; Koehler et al., 2015), but the present model adds two developmental emphases that are not foregrounded in TPACK:

reflective professional judgment and community-oriented professional purpose. Therefore, ECW-DigiPro does not replace TPACK; rather, it uses TPACK-related competence as part of a broader readiness profile and connects that profile to structured reflection and socially responsive professional growth. This extension is consistent with Jonassen's (2004) view that educational technology is most meaningful when it supports active and reflective knowledge construction.

The expert-validation results further indicate that the model is conceptually coherent and practically usable. High Aiken's V coefficients across content relevance, instructional alignment, system logic, construct accuracy, and interface usability suggest strong expert agreement on the suitability of the prototype. At the same time, the validators' recommendations led to meaningful design changes, particularly simpler navigation, clearer reflective prompts, and more precise recommendation logic. This iterative link between evaluation and redesign is consistent with the purpose of DBR (Reeves, 2006). The validation evidence remains primarily content- and design-oriented. Future research should add psychometric evidence for the readiness scale and usability testing with larger and more diverse user groups.

The quasi-experimental findings provide preliminary support for the developmental value of this approach. The group of participants in the experiment, working with ECW-DigiPro, presented a considerably larger increase in the mean score (M = +1.07, pretest score 3.08 to posttest score 4.15), a medium normalized gain ($N - gain = 0.46$), a large effect size ($d = 1.06$), and a statistically significant change within the group, $t(24) = 6.89, p < .001$. At the same time, the group of control participants showed a smaller, not statistically significant change in scores ($M = + 0.32$, $N - gain = 0.14$, $d = 0.28$, $t(24) = 1.78, p = .083$). As a result, 72% of the group in the experiment reached the level of High Readiness, while 36% did so in the control group. These results agree with the conclusions made by Ahangama (2026) and Fernández-Batanero et al. (2026) about the importance of continuous

feedback-based, interactive, and adaptive digital applications for self-regulated learning and professional development in comparison with traditional ways of instruction. Contextual Explanation: The considerable increase in the experimental group was explained by the fact that ECW-DigiPro functions as an active diagnosis and development system rather than as a passive scoring dashboard

For teacher-education practice, ECW-DigiPro is most defensible at this stage as a formative self-assessment and mentoring tool. Teacher-education programs could integrate periodic readiness profiling into microteaching or teaching-practicum courses, use dashboard results to identify dimensions requiring targeted support, and pair low Reflective Readiness scores with structured reflective journaling or mentoring. Curriculum developers could also use aggregated profiles to identify recurring gaps across cohorts and strengthen community-responsive tasks alongside digital-pedagogy coursework. Because the present study is a small developmental trial, ECW-DigiPro should not yet be used as a high-stakes licensing or accreditation instrument. Such use would require stronger evidence of reliability, construct validity, measurement invariance, and predictive validity.

Several limitations qualify the findings. The study relied substantially on self-report data, which may be affected by social-desirability and self-perception bias. The purposive sample was small (N = 50) and geographically limited to four higher education institutions in Jombang, restricting generalizability. The implementation period was short and did not include longitudinal classroom observation, so the study cannot determine whether improved readiness scores translate into sustained teaching practice. The reported analysis also used within-group paired-samples tests rather than a direct inferential comparison of change between groups. Finally, the manuscript reports expert validation of the instrument and system but does not provide a full psychometric evaluation of the 25-item readiness scale. These limitations position the present study as an initial developmental and feasibility evaluation.

CONCLUSION

This study examined ECW-DigiPro as a digital assessment framework for profiling and supporting the professional readiness of pre-service English teachers across five dimensions: pedagogical readiness, digital readiness, English skill competency, reflective readiness, and community well-being orientation. Expert validation indicated a high level of content and conceptual appropriateness, while the quasi-experimental findings showed greater pre–post improvement in the experimental group than in the control group. Within the context of this study, the moderate N-Gain, large effect size, and statistically significant pre–post difference suggest that ECW-DigiPro has potential as a diagnostic and developmental tool for supporting reflective and context-sensitive professional preparation among pre-service English teachers.

The findings should be interpreted within the scope of the study. The research involved 50 purposively selected participants from four higher education institutions in one geographical area, relied primarily on self-reported measures, and covered a relatively short implementation period. Future studies may examine ECW-DigiPro with larger and more diverse samples, multiple sources of evidence such as classroom observation and mentor assessment, and longitudinal designs. Such research may provide further evidence regarding the model's applicability across contexts and its contribution to the longer-term development of professional readiness in authentic teaching settings.

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DECLARATION OF AI AND AI-ASSISTED TECHNOLOGIES

During the preparation and revision of this manuscript, the authors used DeepL and ChatGPT (OpenAI) to assist with language editing, grammar, and readability. The authors reviewed and edited all AI-assisted output and took full responsibility for the study's content, analyses, interpretations, and conclusions.

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