

Development of a Mobile Learning-Based Education and Training System to Enhance the Professional Competence of Vocational High School Teachers

Zahra Akira Maheswari^{1✉}, Rini Kusumawardani², Noor Hudallah²

¹E-Guru Digital, Indonesia

²Graduate Program, Universitas Negeri Semarang, Indonesia

Article Info	Abstract
<p>Article History :</p> <p>Received June 2024</p> <p>Accepted August 2024</p> <p>Published December 2024</p>	<p>This research addresses the gap between the professional competence of vocational high school teachers and the competency standards set forth in the Regulation of the Minister of National Education No. 16 of 2007 and the Decree of the Directorate General of Teachers and Education Personnel No. 2626/B/HK.04.01/2023 regarding the Teacher Competency Model, along with the limited access to conventional education and training for teachers. The objective of this study is to develop a mobile learning-based training system using multi-platform integration that is engaging, effective, and adaptive, aimed at enhancing the professional competence of vocational high school teachers.</p>
<p>Keywords:</p> <p>Mobile Learning; Professional Competence; Vocational High School Teachers; Education and Training System; ADDIE</p>	<p>The development model applied is the ADDIE framework, executed in a comprehensive and phased approach: (1) the analysis stage involved a needs survey revealing an urgent demand for technology-based training; (2) the design stage focused on developing and structuring various components of the mobile learning-based training system; (3) the development stage involved expert validation, where the system was rated as “Highly Feasible” by media experts; (4) the implementation stage was conducted online and involved 230 vocational high school teachers; and (5) the evaluation stage demonstrated an increase in the average score from 15.62 (pretest) to 18.84 (posttest), yielding an N-Gain score of 0.74, categorized as high. Furthermore, the system was rated as “Very Engaging” by participants, with an attractiveness score of 3.6 out of 4, or 90%. These findings suggest that the mobile learning-based education and training system developed in this study is effective in improving the professional competence of vocational high school teachers.</p>

✉ Correspondence:
Cluster Inara No.3, Pakintelan, Kec. Gn. Pati, Kota Semarang,
Jawa Tengah 50227, Indonesia
E-mail: zahramaheswari@students.unnes.ac.id

INTRODUCTION

In addressing the challenges posed by the Fourth Industrial Revolution (Industry 4.0), the competence of Vocational High School graduates has become a central focus due to its critical role in preparing a globally competitive workforce. The government has reformed the vocational education curriculum to better align with the demands of business and industry. However, vocational schools continue to account for the highest unemployment rates in Indonesia, with approximately 12.5% of the national unemployment total. This highlights the need for optimization in several areas (Afrina et al., 2018). Despite the implementation of strategic policy measures, practical challenges still persist, affecting the success of vocational high school graduates in entering the workforce.

To address this issue, Presidential Instruction No. 9 of 2016 was issued to revitalize vocational education, emphasizing workforce demand mapping and the improvement of curricula to incorporate new skills such as coding, big data, and artificial intelligence, alongside essential 21st-century competencies required to meet the demands of the modern job market (Nasir, 2018).

The most recent initiative, Presidential Regulation No. 68 of 2022, was introduced to accelerate the transformation of vocational education across all sectors. The regulation includes six main components: competency-based education, industry linkages, future-oriented training and courses, and the assurance of educational quality and competency certification (Muhamad Yahya, 2018). This initiative aims to enhance the relevance and quality of vocational education so that vocational high school graduates are highly competitive and capable of adapting to technological advancements and the global labor market. Furthermore, this revitalization requires a transformation in the role of vocational teachers, who must embrace technology, design contextualized learning experiences, and act as learning facilitators and mentors to guide students in becoming creative, innovative, and productive independent learners (Triyono, 2017).

However, studies have revealed a gap between the established professional competency standards for teachers and the reality on the ground, particularly in pedagogical and professional skills. This gap negatively impacts the quality of education and leads to low levels of technology proficiency among teachers (Pusat Asesmen Pendidikan, 2024).

The Teacher Competency Test results show that many Vocational High School teachers do not meet the expected competency standards, with an average score well below the ideal benchmark of 54.77 out of 100, particularly in technology mastery and the application of digital learning methods (Pusat Asesmen Pendidikan, 2024). Several factors, such as an inadequate educational background, teacher age, and limited access to training, contribute to this gap (Nurhayati, 2019). Additionally, many schools lack the infrastructure and institutional support required to enable a transition to modern, digital learning methods. To address these issues, strategic efforts involving individuals, institutions, the government, and professional teacher organizations are necessary to foster continuous professional development and adaptation to technology (Darmawan, 2017).

A potential solution is the use of mobile learning-based training, which has been proposed to enhance teachers access to quality training, especially in remote areas that suffer from limited facilities and long distances (Murtadlo, 2021). Mobile learning allows teachers to learn flexibly at any time and from any place using mobile devices such as smartphones or tablets, which is highly efficient in terms of both time and cost. The e-Guru.id platform serves as an example of mobile learning implementation, offering over 600 flexible, certified online training courses covering relevant topics such as information technology, modern teaching methods, and classroom management (e-Guru.id, 2024). However, studies have indicated that the platform still faces challenges, including a lack of integration in the interaction system, insufficient learning monitoring, and limitations in providing quick feedback to participants. Therefore, the development of an integrated mobile learning-based training system is essential to support interactive learning, real-time evaluations, and

collaboration with industry to maintain the relevance of the training content.

Based on this background, this research proposes an innovative project titled “Development of a Mobile Learning-Based Training System to Enhance the Professional Competence of Vocational School Teachers (Case Study on the e-Guru.id Platform).” This initiative seeks to bridge the gap in access to conventional training while providing an innovative solution for the sustainable development of teacher competencies. A systematic approach through the ADDIE cycle (Analysis, Design, Development, Implementation, Evaluation) is expected to significantly improve teachers understanding and skills and contribute to the achievement of professional competency standards necessary to face the challenges and opportunities of the digital era and Industry 4.0.

METHODOLOGY

Research Type

This study adopts the ADDIE approach (Analysis, Design, Development, Implementation, Evaluation) as the primary framework for developing a mobile learning-based training system aimed at enhancing the professional competence of vocational high school teachers.

Research Procedure

The research procedure follows the ADDIE model, beginning with the analysis stage, where the needs of the teachers were identified through a survey of e-Guru.id platform members and an assessment of the alignment between teachers core competencies and training needs. During the design phase, the researcher formulated the training objectives, developed materials in accordance with the vocational high school curriculum, planned interactive methods,

selected instructors, and prepared evaluation instruments, including pretests, midtests, and posttests. The development stage involved converting the design into a system based on Google Sites, integrated with Zoom, YouTube, and Google Forms. The implementation phase was conducted nationally via the e-Guru.id platform, with two stages of meetings: orientation and initial testing, followed by content delivery and portfolio collection. Evaluation was both formative and summative, aimed at assessing the improvement in participant competencies and the system’s effectiveness, involving expert validation (Astuti, 2015). The research procedure is outlined in the Figure 1.

Data Sources, Data Collection Methods, and Data Analysis

Data sources consisted of primary and secondary data. Primary data was collected from teachers who participated in the training through pretests, posttests, questionnaires, and portfolios. Secondary data included literature studies and related documents. The data collection methods were designed to evaluate the effectiveness of mobile learning-based training, using instruments such as tests, questionnaires, and documentation.

Data analysis aimed to interpret the results from various instruments to evaluate the training’s effectiveness. Both quantitative and qualitative approaches were employed, with data triangulation to ensure the validity of the results. Quantitative analysis was conducted using the N-Gain test for pretest and posttest results and to calculate the effectiveness score of the training. In contrast, qualitative analysis utilized the Miles & Huberman approach for participants portfolios. Triangulation among test results, questionnaires, portfolios, and documentation provided a comprehensive view of the training’s effectiveness in improving the professional competence of teachers.

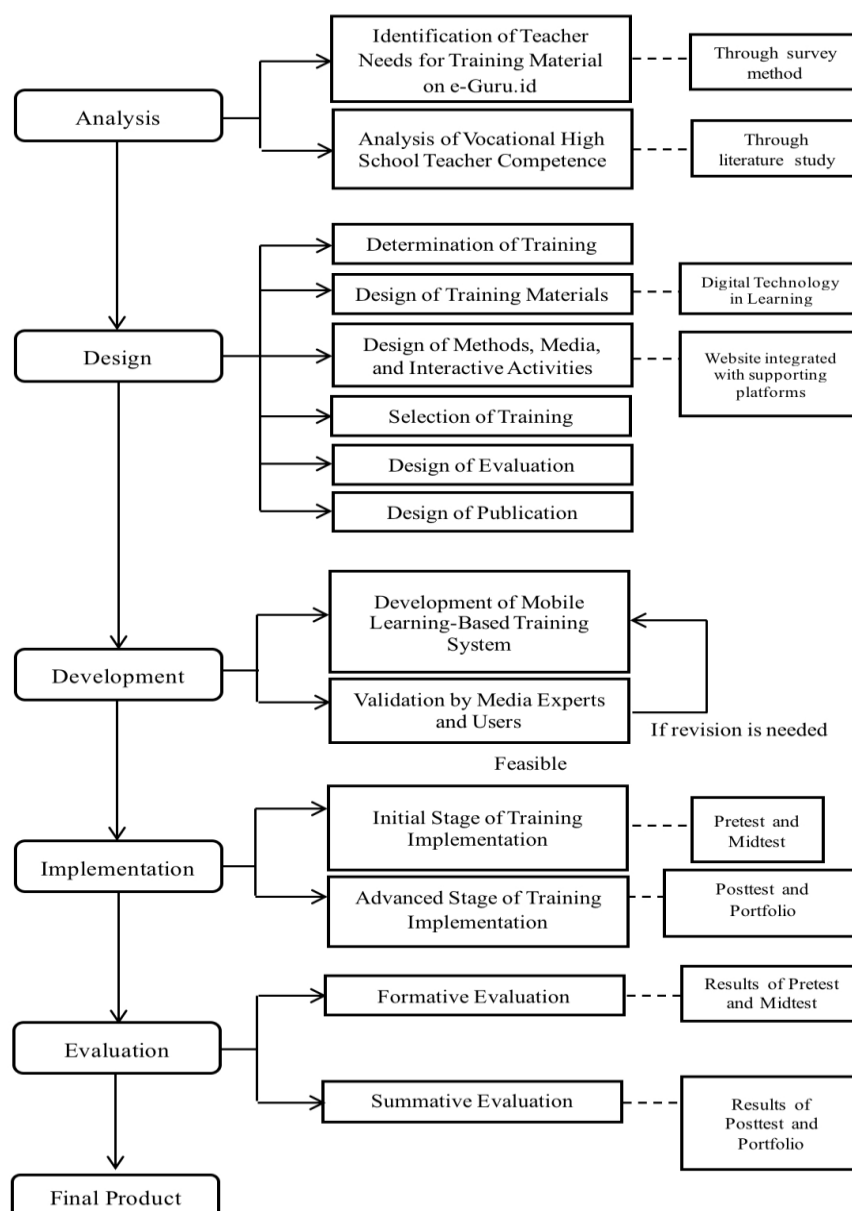


Figure 1. Research Procedure

RESULT AND DISCUSSION

Research Result

Analysis

During the analysis stage, the researcher identified the needs of the training participants through an online survey on the e-Guru.id platform, which involved 98 respondents. The majority of the participants indicated a need for training focused on integrating digital technology into the learning process. The results of the literature review supported this, highlighting key aspects of teacher professional competence, including material mastery and the use of

information and communication technology. Observations on the e-Guru.id platform revealed that the use of information and communication technology by teachers was still largely passive, underscoring the need for training to enhance the professional capabilities of vocational high school teachers in the technology domain.

Design

The design stage involved structured planning, including the formulation of training objectives, organization of materials, selection of teaching methods and media, and the appointment of instructors. The training titled

“Integration of Digital Technology in Vocational High School Learning” aimed to equip participants with the skills to design interactive learning media and incorporate gamification-based learning management systems (LMS) using Google Sites. The materials were organized into four sessions, equivalent to 38 lesson hours, and included PowerPoint modules and instructional videos. The mobile learning method integrated synchronous activities via Zoom and asynchronous activities through YouTube, supported by interactive media such as Google Forms and WhatsApp Group discussion forums. The instructor, Mr. Kukuh C. Adi Putra, S.T., M.T., is experienced in developing technology-based teaching media. Evaluation was carried out through pretests, midtests, posttests, and portfolios to assess cognitive, affective, and psychomotor skills, alongside a digital publication strategy via social media to ensure broad participant reach.

Development

The development phase involved the visualization of the previously designed mobile learning-based training system to support the implementation of flexible, structured, and

accessible online training for vocational high school teachers from various regions, using mobile devices. The platform selected for this purpose was Google Sites, chosen for its ease of use, cost-effectiveness, and integration with digital services such as Zoom, YouTube, Google Forms, and Spreadsheets. The site’s navigation included menus such as Home, Introduction, Training Activities, Facilities, and Closing, which provided access to learning materials, Zoom links, videos, attendance records, interactive quizzes, and portfolio task submissions, all within a single platform. The learning flow was organized in accordance with mobile learning principles, starting with an introduction to the activities, followed by synchronous and asynchronous sessions, and concluding with evaluation in the form of digital portfolios and self-certification. The system’s development also considered user experience factors such as interface design, navigation, consistency, and visually engaging elements. Once the system was developed, all features underwent internal testing and validation by media experts to ensure the system’s effectiveness as an adaptive, easily accessible technology-based learning tool. The following is the visualization of the system design.



Figure 2. System Design Visualization

Feasibility Analysis by Media Experts

The validation process was carried out by three experts with expertise in educational technology and software engineering. They

assessed the system based on 20 indicators, which focused on two main aspects: software engineering and visual communication. The average score from the three experts was 75 out of

80 points, or 93.75%, indicating that the system was classified as “Highly Feasible” for use in the training process. Based on the validation results, the experts concluded that the mobile learning-based training system met the necessary criteria for use and did not require significant revisions. As a result, a second evaluation was not conducted. However, the researcher made minor revisions and improvements to the system based on the feedback provided by the experts to further enhance its quality.

Implementation

During this stage, the system was tested through the implementation of a national training program over four days, from February 26 to 28, 2025. The program was attended by 230 vocational high school teachers from various provinces in Indonesia. The purpose of the implementation was to test the system’s functionality, respond to participant engagement, and collect data for evaluation.

The training consisted of four meetings, divided into two phases: the Initial Phase (Meetings 1 and 2) and the Advanced Phase (Meetings 3 and 4). Three of the meetings were conducted synchronously via Zoom, while one session took place asynchronously through WhatsApp Group. The topics covered included digital technology in learning, the use of interactive media, LMS-based gamification, and reflection. Evaluation was conducted through pretests, midtests, posttests, and portfolio assignments. The synchronous sessions lasted approximately 110 minutes each night, during which material was presented, followed by discussions, test completion, and documentation. The platforms used included Zoom, YouTube, Google Forms, and Google Sites. Participants were able to follow the material live or via recorded sessions, and they could access learning materials and assignments independently.

During the implementation, no significant technical issues were encountered. Data from Google Analytics indicated high enthusiasm, with over 300 daily visits to the mobile learning system and 523 YouTube video views on the first day. Participant involvement was widespread, including from regions outside Java, such as Papua, NTT, and Aceh, demonstrating the system’s broad reach. The training also showcased the effectiveness of mobile learning in addressing the needs of teachers with limited time availability. Discussions were interactive, reflecting the collaborative and transformational spirit of the training. The researcher served as a facilitator, providing support across various communication platforms. Overall, the implementation proceeded smoothly and as planned.

Evaluation

The evaluation phase is a critical component in measuring the effectiveness of the mobile learning-based training system that has been developed and implemented. Evaluation was conducted in three forms: (1) measurement of competency improvement through pretests and posttests, analyzed using the N-Gain method, (2) participant perception evaluation of the training’s attractiveness through a midtest questionnaire, and (3) portfolio analysis to assess the application of the material in practice.

Pretest dan Posttest Result

The effectiveness of the training in improving the competencies of participants was measured through pretests and posttests administered to a sample of 146 vocational high school teachers. The test instrument consisted of 20 multiple-choice questions (Yes/No) designed to assess the mastery of the developed training system. The average scores from these tests were as follows:

Table 1. Average Results of Pretest and Posttest

No.	Test Type	Maximum Score	Score Achieved	Percentage
1.	Pretest	20	15.62	78.12%%
2.	Posttest	20	18.84	94.21 %

Source: Researcher’s Document, 2025

Based on these results, the N-Gain value was calculated as follows:

$$N\text{ Gain} = \frac{\text{Posttest} - \text{Pretest}}{\text{Maximum score} - \text{Pretest}} = \frac{18.84 - 15.62}{20 - 15.62} = \frac{3.22}{4.38} = 0.74$$

With an N-Gain value of 0.74, the improvement in the competencies of participants is categorized as high, according to Hake's classification (1999), where $g > 0.70$. This demonstrates that the developed training system significantly enhanced the competencies of participants in technology-based learning content.

Midtest Results/Training Attractiveness

To evaluate the perceptions of participants regarding the attractiveness and quality of the training, a midtest questionnaire was administered using a 1–4 Likert scale. The average result from all participants yielded a score of 3.6 out of 4 (90%), placing it in the “Very Attractive” category. This result indicates that participants found the training engaging and relevant to their needs as vocational high school teachers. The participants not only understood the material but also felt comfortable and engaged with the media, methods, and mobile learning system used.

Portfolio Results

As part of the final assessment, participants were tasked with developing a portfolio that reflected the application of the training material in a vocational school learning context. Since this task was optional and carried out in an asynchronous session, only about 20% of the total participants (approximately 30 individuals) submitted complete portfolios. Although the number of submissions was limited, qualitative assessment of the portfolios showed that most participants successfully applied mobile learning concepts in real classroom settings, using digital media such as Google Sites, YouTube, and Learning Management Systems (LMS). Participants also developed interactive modules that were well-suited to the characteristics of vocational students. Given the positive evaluation of the portfolios, it can be concluded that participants possessed a solid conceptual understanding and were able to implement the training outcomes in creative ways that were both relevant and aligned with vocational education.

DISCUSSION

This section discusses the research results based on the problem formulation, which includes: (1) the procedure for developing the mobile learning-based training system; (2) the level of attractiveness of the system; and (3) its effectiveness in enhancing the professional competence of vocational high school teachers. The ADDIE development model (Analysis, Design, Development, Implementation, Evaluation) was used, and the outcomes from each phase were analyzed with reference to theory and previous research.

Procedure for Developing the Education and Training System

In the Analysis phase, the researcher identified the needs of participants through an online survey and a literature review. The results showed a gap in the professional competencies of vocational high school teachers when compared to the expected competency standards. Data from the 2024 Teacher Competency Test revealed an average score of 58.4, which is significantly lower than the expected score of 75, particularly in terms of technology mastery for teaching. Previous studies further supported these findings, showing that many teachers have not received adequate digital training, indicating the need for a more applied and contextual training program.

The Design phase produced a flexible and adaptive training system, utilizing Zoom, YouTube, WhatsApp Group, and Google Sites. The training materials were structured to encourage mastery of technology through gamification and LMS-based project approaches. Evaluation instruments included pretests, midtests, posttests, and portfolios. In the Development phase, the training system was built using Google Sites, designed to be user-friendly and to support the principles of mobile learning. Validation from media experts showed a very high feasibility score of 93.75%. Minor revisions were made to improve the navigation and visual

elements of the system, enhancing the user experience.

The Implementation phase took place online over four days, from February 26 to 28, 2025, with 230 participants. The training was delivered both synchronously and asynchronously, with material being presented in stages. The wide distribution of participants across various regions indicated the system's ability to reach users nationally and overcome geographical barriers. In the Evaluation phase, the pretest average score improved from 15.53 to 18.65 in the posttest, with an N-Gain of 0.74, which is categorized as high. The midtest perception survey resulted in a score of 3.56 out of 4, indicating that the training system was engaging and relevant. While only 20% of participants submitted portfolios, the results showed that participants were able to apply LMS-based learning technologies.

Overall, this training system has proven effective in enhancing the competencies of teachers in educational technology, fostering creativity and innovation in developing digital teaching materials, and providing a flexible and accessible learning experience across regions. The systematic application of the ADDIE model resulted in an adaptive and effective training system. The integration of Google Sites as the main platform proved to be efficient, easy to access, and supportive of the achievement of professional competencies for vocational high school teachers, especially in using information and communication technology in a contextual manner.

Attractiveness of the Training System

The mobile learning training system was rated very highly by participants, with an average score of 90% based on the midtest, which used a 15-item Likert scale. Participants showed positive feedback regarding the material presentation, media design, and ease of platform access. The highest-rated aspects included the use of Zoom (95.89%), multimedia content (95.03%), combination of digital media (93.49%), and interface design (93.15%). These results highlight the importance of visualization, interactivity, and media variety in creating an engaging learning experience. However, two aspects received

relatively lower scores: the WhatsApp Group forum (71.06%) and gamification features (70.89%). This indicates that the social and gaming elements were not fully utilized. The WhatsApp Group was primarily used as a passive information tool, rather than an active discussion forum, and gamification was not fully recognized, as it was not integrated early enough in the training.

In response to these weaknesses, adjustments were made during implementation. Discussions were expanded through Zoom and YouTube Live sessions to facilitate synchronous interactions. Meanwhile, the gamification element was strengthened with interactive quizzes, project-based challenges, and a point system in the LMS. The success of the training system was not solely dependent on technology but also on the collaboration between participants, organizers, and instructors. Participants engaged in discussions and shared their experiences, while organizers continuously adjusted materials and learning strategies based on feedback. The mobile learning system acted as the main tool that integrated all learning components. With this adaptive and collaborative approach, the training system not only provided engaging content but also fostered a dynamic, participatory, and effective digital learning environment, supporting the improvement of professional competence among vocational high school teachers.

Improvement in Professional Competence

The implementation of the mobile learning-based training system aimed to address the competency gap among vocational high school teachers in mastering digital technology. The targeted professional competencies for teachers included the ability to develop teaching materials, utilize technology in learning, and engage in continuous professional development.

Based on the pretest and posttest results from a sample of 146 participants, the average score improved from 15.62 to 18.84 (maximum score: 20). The N-Gain value of 0.74 indicates a high level of improvement, signifying the training's effectiveness in enhancing professional competencies. Analysis of the individual test

items showed improvements in all indicators, with the highest increases in:

- a. Understanding of material access: from 71.23% to 100%
- b. Understanding of interactive features: from 73.97% to 93.15%
- c. Ability to use the online test system: from 82.87% to 93.15%

These findings suggest an improvement in the digital literacy of participants, particularly in navigating LMS, accessing media, and engaging in online interactions. However, the indicators related to discussion forums (from 78.08% to 89.72%) and the use of digital references (from 77.39% to 93.83%) indicate the need for further improvement in reflective and exploratory skills. Participants came from over 20 provinces across Indonesia. Provinces with better digital infrastructure, such as Central Java, East Java, and West Java, showed the highest and most consistent increases in competencies. In contrast, regions such as Maluku, Papua, and Sulawesi exhibited lower pretest scores, suggesting regional digital disparities.

The advantage of the mobile learning system, which can be accessed without geographical limitations, makes it a strategic solution for bridging the competency gap among teachers nationwide. In conclusion, the implementation of the mobile learning-based training system has significantly enhanced the professional competencies of vocational high school teachers, both in technology mastery and digital learning development. This model can reach participants across regions, promote educational equity, and serve as a transformative approach to meeting the challenges of 21st century education that is adaptive, collaborative, and technology-driven.

CONCLUSION

This study successfully developed a mobile learning-based training system using the ADDIE model, which includes the stages of Analysis, Design, Development, Implementation, and Evaluation. The Analysis phase identified the needs of vocational high school teachers in improving technology-based competencies,

followed by the design of learning materials and media. Implementation was carried out nationally through digital platforms such as Zoom and YouTube, and evaluated using pretest-posttest assessments and portfolio evaluations. The evaluation results showed that the system is highly feasible, with a feasibility score of 93.75% and an attractiveness score of 90%. Despite some weaknesses, which were addressed during the process, the training implementation demonstrated a significant improvement in the professional competence of vocational high school teachers, with an N-Gain value of 0.74. Thus, the system proved to be effective, engaging, and relevant for the professional development of teachers in the digital age.

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