

GAME-BASED LEARNING USING EDUWISDOM TO IMPROVE INTERFACE DESIGN SKILLS

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Abstract: The rapid advancement of digital technology in education requires innovative instructional approaches that enhance student engagement, motivation, and competency development. In vocational education, particularly in Informatics subjects, students are expected not only to understand theoretical concepts but also to demonstrate practical technical skills aligned with industry standards. However, conventional teacher-centered methods often limit active participation and reduce learning effectiveness. Therefore, this study aims to examine the effectiveness of the Game-Based Learning (GBL) model assisted by EduWisdom media in improving students' competency in designing visual interfaces using Microsoft PowerPoint among tenth-grade students of SMK Teuku Umar Semarang. This study employed a quantitative approach using a quasi-experimental method with a nonequivalent control group design. The research involved an experimental class that received instruction through the GBL model assisted by the EduWisdom educational game and a control class that received conventional instruction. Data were collected through pre-test and post-test assessments and analyzed using Paired Sample t-tests and Independent Sample t-tests. The results revealed significant improvements in learning outcomes in both groups; however, the experimental class demonstrated a significantly higher increase compared to the control class. The findings indicate that the implementation of Game-Based Learning assisted by EduWisdom media is effective in enhancing students' visual interface design competency. This study contributes empirical evidence supporting the integration of context-specific educational games in vocational Informatics instruction.

Keywords: Eduwisdom; game-based learning; user interface design

Abstrak: Kemajuan pesat teknologi digital dalam pendidikan membutuhkan pendekatan pembelajaran inovatif yang meningkatkan keterlibatan, motivasi, dan pengembangan kompetensi siswa. Dalam pendidikan vokasi, khususnya mata pelajaran Informatika, siswa diharapkan tidak hanya memahami konsep teoritis tetapi juga menunjukkan keterampilan teknis praktis yang sesuai dengan standar industri. Namun, metode konvensional yang berpusat pada guru seringkali membatasi partisipasi aktif dan mengurangi efektivitas pembelajaran. Oleh karena itu, penelitian ini bertujuan untuk menguji efektivitas model Pembelajaran Berbasis Game (GBL) yang dibantu media EduWisdom dalam meningkatkan kompetensi siswa dalam mendesain antarmuka visual menggunakan Microsoft PowerPoint di kalangan siswa kelas 10 SMK Teuku Umar Semarang. Penelitian ini menggunakan

pendekatan kuantitatif dengan metode kuasi-eksperimental dengan desain kelompok kontrol non-ekuivalen. Penelitian ini melibatkan kelas eksperimen yang menerima pembelajaran melalui model GBL yang dibantu game edukasi EduWisdom dan kelas kontrol yang menerima pembelajaran konvensional. Data dikumpulkan melalui asesmen pre-test dan post-test dan dianalisis menggunakan uji t sampel berpasangan dan uji t sampel independen. Hasil penelitian menunjukkan peningkatan yang signifikan dalam hasil belajar di kedua kelompok; Namun, kelas eksperimen menunjukkan peningkatan yang jauh lebih signifikan dibandingkan dengan kelas kontrol. Temuan ini menunjukkan bahwa implementasi Pembelajaran Berbasis Game yang dibantu oleh media EduWisdom efektif dalam meningkatkan kompetensi desain antarmuka visual siswa. Studi ini memberikan bukti empiris yang mendukung integrasi game edukasi spesifik konteks dalam pengajaran Informatika vokasional.

Kata Kunci: Eduwisdom; pembelajaran berbasis game; desain antarmuka pengguna

INTRODUCTION

The rapid advancement of technology has occurred at an unprecedented pace, influencing nearly all aspects of human life, including the education sector. Technology is now widely utilized as both a learning medium and a learning resource that supports more effective instructional processes. The use of digital learning media not only facilitates more engaging material delivery but also creates interactive and enjoyable learning experiences. The integration of gamification strategies into digital learning environments has further strengthened the role of technology in education by increasing student engagement and supporting innovative learning practices in the Education 4.0 era.¹ As a result, students become more motivated and enthusiastic in participating in learning activities, which ultimately improves their understanding and learning outcomes.²

One of the technological innovations that has experienced rapid development is digital gaming technology. Currently, digital games have been widely adapted for mobile devices, particularly smartphones. In general, games were initially developed primarily as entertainment tools. However, due to their significant potential, games are now increasingly integrated with educational elements, leading to the

¹ Qurotul Aini et al., "Gamification-Based The Kampus Merdeka Learning in 4.0 Era," *IJCCS (Indonesian Journal of Computing and Cybernetics Systems)* 15, no. 1 (2021): 31, <https://doi.org/10.22146/ijccs.59023>.

² Nur Ayu Annisa, Isti Rusdiyani, and Lukman Nulhakim, "Meningkatkan Efektivitas Pembelajaran Melalui Aplikasi Game Edukasi Berbasis Android," *Akademika* 11, no. 01 (2022): 201-13, <https://doi.org/10.34005/akademika.v11i01.1939>.

development of the serious game concept, which refers to games designed not only for entertainment purposes but also to support learning processes.³

In vocational education, particularly at Vocational High Schools (SMK), Informatics subjects play a strategic role in equipping students with digital literacy and technological competencies relevant to the demands of the workforce. The importance of Informatics instruction at the tenth-grade level is based on several key considerations. First, Informatics education helps students develop computational thinking, problem-solving skills, and logical reasoning abilities that form the foundation for technology-related professions. Second, the modern workforce increasingly depends on digital technology across various industrial sectors, making technological competencies essential for vocational students to prepare for the challenges of the Industry 4.0 era.

However, the implementation of Informatics learning in vocational schools still faces several challenges, particularly related to instructional approaches that are not fully aligned with the learning characteristics of contemporary students. One of the primary challenges is the gap between conventional teacher-centered instructional methods and students' preferences for visual, interactive, and technology-based learning approaches. Traditional lecture-based methods often result in passive learning environments and reduced student motivation, which ultimately affects participation levels and learning outcomes. Previous studies have shown that the use of interactive learning media can improve students' understanding of abstract and complex concepts, thereby facilitating more effective learning processes.⁴

These challenges are also observed at SMK Teuku Umar Semarang, particularly among tenth-grade students of the Accounting and Financial Institution (AKL) program. Based on the analysis of the first formative assessment results in the 2024/2025 academic year, students' learning achievements were still relatively moderate. From 18 students with complete data, the average score of the first formative assessment was 76.6, which was the lowest compared to subsequent assessments that showed improvement and were categorized as good. These findings

³ Traci Sitzmann, "A Meta-Analytic Examination of the Instructional Effectiveness of Computer-Based Simulation Games," *Personnel Psychology* 64, no. 2 (2011): 489–528, <https://doi.org/10.1111/j.1744-6570.2011.01190.x>.

⁴ Rini Novita and Syaiful Zuhri Harahap, "Pengembangan Media Pembelajaran Interaktif Pada Mata Pelajaran Sistem Komputer Di Smk", *Informatika* 8, no. 1 (2020).

indicate that students' initial mastery of fundamental Informatics materials, particularly Microsoft PowerPoint competencies, remains a challenge that requires more effective and engaging instructional approaches.

Based on the problems identified through classroom observations at SMK Teuku Umar Semarang, instructional innovation is needed to help students understand learning materials more easily and effectively. One potential innovation is the integration of educational games into the teaching and learning process. Game-Based Learning (GBL) has been recognized as an effective instructional approach that can support teachers in achieving learning objectives.⁵ Due to its engaging characteristics and ability to enhance students' motivation, the use of educational games in instructional activities can increase students' interest in learning materials and support the development of various essential skills.⁶ This approach enables students to learn through enjoyable interactive experiences, allowing them to actively construct their understanding of the concepts being taught.

Previous studies have consistently demonstrated the positive impact of Game-Based Learning (GBL) on various educational outcomes. Elsherbiny and Raya⁷ found that mobile-based GBL significantly enhanced students' academic achievement, engagement, and participation compared to conventional instruction. Similarly, Chang and Yeh⁸ reported that game-based learning environments improved students' motivation, knowledge sharing, critical thinking skills, and examination performance.

⁵ Aisyah Cinta et al., "Game-Based Learning (Gbl) Sebagai Inovasi Dan Solusi Percepatan Adaptasi Belajar Pada Masa New Normal," *INTEGRATED (Information Technology and Vocational Education)* (2021).

⁶ Komang Agus Widiani et al., "Pengembangan Media Pembelajaran Microsoft Word Berbasis Android," *Jurnal Pendidikan Teknik Elektro Undiksha* 9, no. 1 (2020).

⁷ Mohamed Mohamed K. Elsherbiny and Raya Hamed Raya, "Game-Based Learning through Mobile Phone Apps: Effectively Enhancing Learning for Social Work Students," *Social Work Education* 40, no. 3 (2021): 315–32, <https://doi.org/10.1080/02615479.2020.1737665>.

⁸ Wei Lun Chang and Yu chu Yeh, "A Blended Design of Game-Based Learning for Motivation, Knowledge Sharing and Critical Thinking Enhancement," *Technology, Pedagogy and Education* 30, no. 2 (2021): 271–85, <https://doi.org/10.1080/1475939X.2021.1885482>.

Hartt, Hosseini, and Mostafapour⁹ also revealed that GBL increased student engagement and collaborative learning experiences, while Sitzmann¹⁰, through a meta-analysis, confirmed that simulation-based games contributed positively to self-efficacy, knowledge acquisition, and knowledge retention.

Despite these positive findings, most previous studies have primarily focused on general academic achievement, learning motivation, engagement, or conceptual understanding in general education settings. Research examining the effectiveness of custom-designed educational games that specifically target vocational Informatics competencies remains limited. Furthermore, studies investigating the development of visual interface design skills using Microsoft PowerPoint as a measurable vocational competency are still scarce. Therefore, further research is needed to evaluate the effectiveness of context-specific educational games that are directly aligned with vocational learning objectives and competency standards.

To address this gap, the present study implements EduWisdom, a custom-designed educational game integrated within a Game-Based Learning model to support the development of students' visual interface design competencies in vocational Informatics education. The novelty of this study lies in the implementation of EduWisdom as a learning medium specifically designed to improve visual interface design skills using Microsoft PowerPoint, a competency area that has received limited attention in previous Game-Based Learning research. By focusing on practical technical skills and employing a quasi-experimental design, this study aims to provide empirical evidence regarding the effectiveness of Game-Based Learning in improving vocational students' competency achievement.

Based on the considerations described above, this study entitled "Game-Based Learning Using EduWisdom to Improve Interface Design Skills" aims to examine the effectiveness of the Game-Based Learning model assisted by EduWisdom media in improving students' competencies in designing visual interfaces using Microsoft PowerPoint. The results of this study are expected to provide empirical evidence regarding the contribution of educational game media to improving students'

⁹ Maxwell Hartt, Hadi Hosseini, and Mehrnaz Mostafapour, "Game On: Exploring the Effectiveness of Game-Based Learning," *Planning Practice and Research* 35, no. 5 (2020): 589-604, <https://doi.org/10.1080/02697459.2020.1778859>.

¹⁰ Sitzmann, "A Meta-Analytic Examination."

understanding and learning outcomes, as well as to serve as a reference for the development of innovative instructional models in the digital learning era.

LITERATURE REVIEW

Game-Based Learning in Education

Game-Based Learning (GBL) has emerged as an innovative instructional approach that integrates educational content with game elements to create engaging and interactive learning experiences. Unlike traditional teacher-centered instruction, GBL encourages active student participation, promotes experiential learning, and fosters greater engagement throughout the learning process. By incorporating challenges, rewards, and problem-solving activities, GBL creates a learning environment that motivates students to actively construct knowledge while maintaining high levels of interest and participation.

Several studies have demonstrated the positive impact of GBL on learning processes and student engagement. Elsherbiny and Raya¹¹ reported that mobile-based Game-Based Learning significantly improved students' academic achievement, classroom participation, and engagement compared to conventional teaching approaches. Similarly, Chang and Yeh¹² found that the integration of game-based learning activities enhanced students' learning motivation, knowledge sharing, critical thinking skills, and overall academic performance. Their findings suggest that game elements can facilitate more meaningful learning experiences by encouraging collaboration and active interaction among learners.

In addition, Hartt, Hosseini, and Mostafapour¹³ investigated the implementation of GBL in higher education and found that students showed higher levels of engagement and interaction when learning activities incorporated game elements. The study revealed that students perceived game-based activities as more enjoyable and motivating than traditional instructional methods. Furthermore, the

¹¹ Elsherbiny and Raya, "Game-Based Learning through Mobile Phone Apps."

¹² Chang and Yeh, "A Blended Design of Game-Based Learning."

¹³ Hartt, Hosseini, and Mostafapour, "Game On."

use of GBL promoted peer interaction and collaborative learning, which contributed positively to students' learning experiences.

The findings of these studies indicate that Game-Based Learning has considerable potential to enhance student engagement, motivation, and participation in educational settings. However, most previous studies have focused on general educational contexts and higher education environments. Research examining the implementation of Game-Based Learning in vocational Informatics education remains limited. Therefore, further investigation is needed to explore the effectiveness of GBL in supporting competency-based learning outcomes within vocational education contexts.

The Effectiveness of Game-Based Learning

Numerous studies have investigated the effectiveness of Game-Based Learning (GBL) in improving students' learning outcomes and academic performance. The integration of game elements into instructional activities has been shown to increase student motivation, engagement, and knowledge retention, making learning more meaningful and enjoyable. As a result, GBL has gained considerable attention as an innovative instructional approach across various educational levels and disciplines.

Sitzmann¹⁴, through a meta-analysis of computer-based simulation games, reported that game-based learning significantly improved learners' self-efficacy, declarative knowledge, procedural knowledge, and knowledge retention compared to traditional instructional methods. The study also revealed that simulation games were most effective when used as a complement to other learning strategies rather than as a standalone instructional approach. These findings suggest that game-based learning can contribute positively to both cognitive and affective learning outcomes.

Similarly, Winatha and Setiawan¹⁵ found that the implementation of Game-Based Learning significantly improved students' motivation and academic achievement. Their quasi-experimental study demonstrated that students who participated in game-based learning activities achieved higher learning gains and showed greater enthusiasm toward learning than those who experienced

¹⁴ Sitzmann, "A Meta-Analytic Examination."

¹⁵ Komang Redy Winatha and I. Made Dedy Setiawan, "Pengaruh Game-Based Learning Terhadap Motivasi Dan Prestasi Belajar" (2020).

conventional instruction. These results indicate that game elements can create a more engaging learning environment that supports academic success.

Further evidence was provided by Gunawan, Karim, and Aviyanti¹⁶, who examined the effectiveness of the LUAK educational game in teaching climate change and global warming concepts. Their findings showed significant improvements in students' conceptual understanding, supported by moderate N-Gain scores and a very high effect size. In addition, students responded positively to the implementation of the game-based learning model, indicating high levels of acceptance and engagement during the learning process.

Overall, previous studies consistently demonstrate that Game-Based Learning is effective in enhancing students' motivation, academic achievement, conceptual understanding, and knowledge retention. However, most existing studies focus on general learning outcomes and subject-matter comprehension. Limited research has investigated the effectiveness of Game-Based Learning in improving vocational competencies, particularly practical skills related to visual interface design in Informatics education. Therefore, further research is needed to examine the effectiveness of GBL in supporting competency-based learning within vocational education settings.

Educational Games as Learning Media

Educational games have become increasingly popular as learning media due to their ability to combine instructional content with interactive and engaging learning experiences. Unlike conventional learning media, educational games provide opportunities for students to actively participate in learning activities through challenges, rewards, and problem-solving tasks. This interactive nature can increase students' motivation, attention, and willingness to engage with learning materials, ultimately supporting better learning outcomes.

¹⁶ Selma Dwi Utami Gunawan, Saeful Karim, and Lina Aviyanti, "The Effectiveness of the Games Based Learning Model Using LUAK Game Media (Physics Kid's Ludo) on Understanding Concepts in the Material on Climate Change and Global Warming," *Jurnal Penelitian Pembelajaran Fisika* 15, no. 4 (2024): 378–84, <https://doi.org/10.26877/jp2f.v15i4.884>.

Several studies have demonstrated the effectiveness and feasibility of educational games as instructional media. Kartika et al.¹⁷ developed a role-playing game (RPG)-based learning multimedia application for elementary school students and found that the product achieved high levels of validity and feasibility based on evaluations from instructional design experts, students, and field testing. The findings indicate that educational games can serve as attractive and effective learning media that support student engagement and active participation in learning activities.

Similarly, Diah Aulia Azizatur Rohmah et al.¹⁸ developed an educational game called SIMLA to strengthen students' understanding of Pancasila values and character development. The results showed that the game achieved high validity and practicality scores from experts, teachers, and students. Furthermore, the implementation of the game significantly improved students' learning outcomes, indicating that educational games can effectively facilitate both cognitive and affective learning objectives.

Additional evidence was provided by Alhasir et al.¹⁹, who developed a Scratch-based educational game to improve students' problem-solving abilities. The study reported positive evaluations from subject-matter experts, media experts, and practitioners, demonstrating that the developed game was suitable for classroom implementation. Moreover, students' responses toward the game were highly positive, and the results indicated significant improvements in problem-solving performance after the intervention. These findings suggest that educational games can effectively support the development of higher-order thinking skills while maintaining student engagement throughout the learning process.

¹⁷ I. Made Kartika et al., "Role Play Game-Based Learning Multimedia for Elementary School Students," *Jurnal Pendidikan Dan Pengajaran* 56, no. 1 (2023): 1-10, <https://doi.org/10.23887/jpp.v56i1.60734>.

¹⁸ Diah Aulia Azizatur Rohmah, Sri Untari, and Ade Eka Anggraini, "'SIMLA' Educational Game-Based Learning Media for the Inculcation of Pancasila Symbols and Principles, Augmenting Independent Character," *Jurnal Penelitian Dan Pengembangan Pendidikan* 8, no. 1 (2024): 179-86, <https://doi.org/10.23887/jppp.v8i1.68601>.

¹⁹ Ahmad Alhasir et al., "Development of Scratch Educational Game-Based Learning Media to Improve Students' Problem-Solving Ability," *Jurnal Pendidikan Asatiza: Jurnal Pendidikan* 5, no. 3 (2024), <https://doi.org/10.46963/asatiz>.

Overall, previous studies demonstrate that educational games are effective learning media that can enhance student engagement, learning achievement, problem-solving skills, and learning motivation. However, most existing educational games have been developed for elementary education or general learning contexts. Research focusing on educational games specifically designed to support vocational Informatics competencies remains limited. In particular, studies examining educational games aimed at improving visual interface design skills are still scarce, highlighting the need for further research in this area.

Game-Based Learning and Digital Competencies

The rapid advancement of digital technology has increased the importance of digital competencies as essential skills for students in the twenty-first century. Digital competencies encompass the ability to access, evaluate, create, and communicate information using digital technologies effectively and responsibly. In educational settings, the integration of technology-supported instructional approaches is considered an important strategy for developing these competencies while simultaneously improving learning outcomes.

Game-Based Learning has been recognized as one of the instructional approaches that can support the development of digital competencies. Through interactive learning environments, students are encouraged to engage actively with digital tools, solve problems, make decisions, and collaborate with others while completing game-based tasks. These activities not only promote subject-matter understanding but also contribute to the development of technological literacy and digital skills.

Fadhli et al.²⁰ conducted a systematic review examining the relationship between Game-Based Learning and children's digital literacy development. The study found that Game-Based Learning had a positive and significant impact on students' digital literacy skills, indicating that educational games can serve as effective tools for fostering technology-related competencies. Furthermore, the interactive and technology-rich nature of educational games was found to encourage active learning and increase students' familiarity with digital environments.

²⁰ Muhibuddin Fadhli et al., "Game-Based Learning and Children's Digital Literacy to Support Pervasive Learning: A Systematic Reviews," 25, no. 3 (2023): 386-93, <https://doi.org/10.21009/JTP2001.6>.

The findings of previous studies suggest that Game-Based Learning can contribute positively to the development of digital competencies and technology-related skills. However, most existing research has focused primarily on general digital literacy rather than specific technical competencies required in vocational education. Limited evidence is available regarding the role of Game-Based Learning in developing practical skills related to visual interface design and digital content creation. Therefore, further research is needed to investigate how educational games can support the development of vocationally relevant digital competencies in Informatics education.

Game-Based Learning in Technology-Oriented Learning

Technology-oriented learning emphasizes the development of practical technological skills, problem-solving abilities, and digital competencies that are directly relevant to modern educational and professional environments. As technology continues to evolve, instructional approaches that actively engage students in technology-rich learning experiences have become increasingly important. Among these approaches, Game-Based Learning has gained attention due to its ability to combine technology utilization with active and engaging learning activities.

Several studies have demonstrated the effectiveness of Game-Based Learning in technology-related learning environments. Winatha and Setiawan²¹ reported that Game-Based Learning significantly improved students' motivation and academic achievement in higher education settings. Similarly, Alhasir et al.²² found that Scratch-based educational games effectively enhanced students' problem-solving abilities while maintaining high levels of engagement and positive learner responses. These findings suggest that educational games can facilitate the acquisition of technological knowledge and skills through interactive learning experiences.

Furthermore, Fadhli et al.²³ highlighted the contribution of Game-Based Learning to the development of digital literacy, indicating that technology-supported game environments can foster students' readiness to engage with digital technologies. The integration of educational games into technology-oriented learning contexts

²¹ Winatha and Setiawan, "Pengaruh Game-Based Learning."

²² Alhasir et al., "Development of Scratch Educational Game-Based Learning Media."

²³ Fadhli et al., "Game-Based Learning and Children's Digital Literacy."

therefore offers opportunities to develop both cognitive and practical competencies required in contemporary educational settings.

Although previous studies have reported promising outcomes regarding the implementation of Game-Based Learning in technology-related education, research focusing specifically on vocational Informatics competencies remains limited. In particular, studies investigating custom-designed educational games intended to improve visual interface design skills have received relatively little attention. This gap highlights the need for further research on the implementation of EduWisdom as a Game-Based Learning medium to support competency-based vocational Informatics education

METHOD

Research Design

This study employed a quantitative research approach with an experimental method. Quantitative research is defined as a systematic investigation that utilizes statistical analysis to test hypotheses and examine relationships among variables (Tanzeh, in Susanti, 2022). In this study, the researcher intentionally introduced a specific treatment to observe its effect, with the primary aim of evaluating the effectiveness of the intervention.

The research adopted a quasi-experimental design, specifically the nonequivalent control group design. This design was selected because it involves two groups—an experimental group and a control group—but does not assign participants randomly. Similar to a pretest-posttest control group design, this approach allows for the comparison of learning outcomes between groups that receive different instructional treatments (Sugiyono, 2013). The experimental group received instruction using the Game-Based Learning (GBL) model assisted by the EduWisdom educational game, while the control group was taught using conventional lecture-based methods.

Research Setting and Participants

This research was conducted at SMK Teuku Umar Semarang during the even semester of the 2024/2025 academic year, specifically from May 1 to June 1, 2025, over three instructional meetings. The accessible population consisted of 190 tenth-grade students. A non-probability sampling technique, specifically purposive sampling, was employed to select the sample based on specific criteria relevant to the research objectives. The sample comprised two intact classes: the experimental group, consisting of 18 students from the Accounting and Financial Institution (AKL) program, and the control group, consisting of 28 students from the Light Vehicle Engineering (TKR 1) program.

Variables

Two primary variables were identified in this study:

1. Independent Variable (X): The instructional model, specifically the Game-Based Learning (GBL) approach assisted by the EduWisdom educational game media.
2. Dependent Variable (Y): Student learning outcomes, measured through their competency in visual interface design using Microsoft PowerPoint.

Data Collection Techniques

Data were collected using both test and non-test techniques to ensure comprehensive coverage of the research objectives.

1. Test Technique: A written test was administered to measure student learning outcomes. The instrument consisted of 15 multiple-choice questions aligned with the learning objectives, competency indicators, and the characteristics of the Microsoft PowerPoint material. Both the experimental and control groups received a pre-test before the instructional intervention to assess initial abilities, and a post-test after the intervention to measure the improvement in learning outcomes.
2. Non-Test Techniques:
 - Interview: An unstructured interview was conducted with the Informatics subject teacher (Mrs. Diana, S.Pd.) during the preliminary study to identify existing learning problems and conditions in the classroom.
 - Expert Validation: The teaching module and test instruments were validated by two subject-matter experts (Informatics teachers) to assess content feasibility, instructional structure, and alignment with learning objectives. The validation used a Likert scale (1-4). The results were

converted into percentage scores with the following feasibility criteria (Widoyoko, 2012):

Table 1 Likert scale

81–100%	Very Feasible
61–80%	Feasible
41–60%	Fairly Feasible
≤40%	Not Feasible

- Documentation: Photographs, videos, and records of the learning activities were collected to document the implementation process, student participation, and overall classroom interactions.

Data Validity and Reliability

To ensure the validity of the data, several measures were implemented:

1. Instrument Validity (Expert Judgment): The content validity of the teaching module and the pre-test/post-test questions was established through expert judgment by two qualified Informatics teachers (Arikunto, 2013). The experts evaluated the alignment between the test items, the learning indicators, and the curriculum standards.
2. Data Triangulation: For non-test data (such as interview results and observational documentation), a triangulation technique was applied. This involved cross-verifying information obtained from multiple sources: teacher interviews, direct observation, and documentation of learning activities. This approach enhanced the credibility of the qualitative data and minimized potential bias.

Data Analysis Techniques

The collected quantitative data were analyzed using a series of statistical procedures.

1. Normality Test: A Chi-square test was conducted to determine whether the data from both the experimental and control groups were normally distributed. The decision criterion is that if the calculated χ^2 value is less than the critical χ^2 table value at a significance level of $\alpha = 0.05$, the data are considered normally distributed.
2. Homogeneity Test: Levene's test was used to assess the equality of variances between the two groups. The variances are considered homogeneous if the

significance value > 0.05. This step is a prerequisite for conducting the independent t-test.

3. N-Gain Analysis: The Normalized Gain (N-Gain) score was calculated to determine the effectiveness of the instructional intervention. The formula proposed by Hake (1999) was used:

$$\text{N-Gain} = \frac{\text{Skor Post-test} - \text{Skor Pre-test}}{\text{Skor Maksimal} - \text{Skor Pre-test}}$$

4. Hypothesis Testing (t-test): To test the research hypothesis and determine whether there was a significant difference in learning outcomes between the experimental and control groups, an Independent Sample T-test was performed using SPSS version 23. Additionally, a Paired Sample T-test was used to compare the pre-test and post-test scores within each group individually. The t-test formula for separated variances or pooled variances was applied depending on the homogeneity test results.

RESULTS AND DISCUSSION

Implementation of Game-Based Learning in Informatics Learning

The Game-Based Learning (GBL) model implemented in this study was designed to support competency-based learning in Informatics subjects, particularly in developing students' interface design skills using Microsoft PowerPoint. The instructional model was structured through a sequence of learning stages consisting of stimulation, problem identification, challenge resolution, reflection, and evaluation. These stages were systematically developed to ensure that students were not only exposed to theoretical knowledge but were also actively engaged in practice-based learning activities that supported the development of technical competencies.

The integration of the EduWisdom educational game into the instructional model was intended to function as a structured reinforcement mechanism within the learning process. Rather than using the game solely as an entertainment tool, the learning activities were designed to align the gameplay elements with instructional objectives and competency indicators. The educational game was developed based on a digital snakes-and-ladders concept integrated with instructional challenges and contextual problem-solving tasks. Each challenge presented within the game required students to apply the knowledge and skills acquired during the instructional sessions, thereby supporting experiential learning processes.

The structured design of the Game-Based Learning model ensured that students progressed through learning activities in a sequential manner, beginning with conceptual understanding and followed by guided practice and independent application. This structured learning sequence allowed students to gradually develop their competencies while receiving continuous feedback throughout the learning process. The design also emphasized the importance of reflection and evaluation stages, which provided opportunities for students to review their learning outcomes and identify areas requiring improvement. Consequently, the integration of the EduWisdom educational game within the structured learning model created a learning environment that supported both cognitive and practical skill development.

Design and Implementation of Game-Based Learning Model Assisted by EduWisdom

The implementation of the EduWisdom-assisted Game-Based Learning model was conducted over three instructional sessions, each focusing on specific competencies in Microsoft PowerPoint interface design. The learning process combined instructional explanation, guided practice, collaborative learning activities, and evaluation exercises. During the implementation phase, students in the experimental class actively participated in learning activities through interactive practice sessions and game-based evaluation tasks, while students in the control class followed conventional lecture-based instructional methods.

Observational findings indicated that students in the experimental group demonstrated higher levels of participation, enthusiasm, and interaction compared to students in the control group. The use of the educational game created a dynamic learning atmosphere that encouraged students to actively engage in learning tasks, collaborate with peers, and participate in competitive yet constructive learning activities. Students were more willing to explore learning materials independently and showed increased persistence when completing practice-based assignments. This increased engagement was particularly evident during game-based evaluation sessions, where students demonstrated strong motivation to achieve higher scores and complete learning challenges successfully.

During the implementation of the EduWisdom-assisted Game-Based Learning model, students demonstrated a high level of enthusiasm and active participation throughout the learning activities. The game-based environment created a more enjoyable and engaging learning atmosphere, encouraging students to become more involved in completing learning tasks and challenges. Many students expressed

positive reactions toward the learning process, indicating that the integration of educational game elements increased their interest and motivation to participate in classroom activities.

Student interaction was also observed to improve significantly during the implementation process. Since EduWisdom was designed to support multiplayer gameplay, students were able to interact directly with their peers while participating in learning activities. This feature encouraged communication, discussion, and collaborative problem-solving among students. The multiplayer mechanism not only increased engagement but also facilitated peer-assisted learning, allowing students to exchange ideas, share knowledge, and support each other in completing learning challenges.

The player-versus-player (PvP) feature incorporated into EduWisdom further contributed to the learning process by creating a healthy competitive environment. Students were motivated to improve their performance and demonstrate their understanding of the learning materials in order to achieve better results within the game. This competitive element encouraged students to pay closer attention to instructional content, participate more actively in learning activities, and repeatedly practice the competencies being taught.

Although several technical challenges were encountered during the implementation process, such as variations in students' working speeds and limitations related to device availability, these challenges were effectively addressed through collaborative learning strategies and teacher facilitation. Students were encouraged to work in small groups when necessary, enabling peer-assisted learning and ensuring that all students could participate in the learning activities. The teacher's role as a facilitator also contributed significantly to the effectiveness of the implementation by providing continuous guidance, clarification, and feedback throughout the learning process. Hermawan²⁴ also emphasized that the successful implementation of Game-Based Learning is strongly influenced by the teacher's ability to facilitate learning activities, provide guidance, and ensure that students remain actively engaged throughout the instructional process. These implementation strategies ensured that the learning objectives were achieved despite technical limitations.

²⁴ Wawan Hermawan, "Sosialisasi Pemanfaatan Game Base Learning (GBL) Dalam Pembelajaran Di SMP N 2 Ngronggot," *Communnity Development Journal* 5, no. 1 (2024): 1263–69.

Feasibility of EduWisdom Media and Teaching Module

As presented in Table 1, the feasibility evaluation conducted by subject-matter experts, instructional design experts, and media experts demonstrated that the EduWisdom instructional modules and learning media met the pedagogical and technological standards required for effective classroom implementation. The expert validation results indicated that the learning materials were aligned with curriculum requirements, competency-based learning standards, and instructional objectives. Furthermore, the instructional modules were considered effective in supporting structured learning processes by providing clear learning objectives, activity guidelines, assessment procedures, and competency indicators.

The media validation results also demonstrated that the EduWisdom application fulfilled the usability, accessibility, and visual design requirements necessary for an effective multimedia learning environment. Its intuitive navigation system, well-structured user interface, and compatibility with mobile devices enhanced the application's usability, enabling students to interact with the learning media more easily. This finding is also supported by Aula et al.²⁵, who demonstrated that educational games developed using digital platforms can provide interactive learning experiences and facilitate students' understanding of instructional materials through engaging game mechanics. These characteristics are essential for supporting effective multimedia learning environments, as well-designed digital learning media reduce cognitive load, enhance students' focus on learning tasks, and improve overall learning efficiency. These findings are also consistent with those reported by Haloho et al.²⁶, who reported that educational game-based learning media can create more interactive learning experiences and support the achievement of learning objectives by improving students' engagement and participation in classroom activities.

The validation results presented in Table 1 also indicate that the quality of instructional media plays an important role in supporting the success of technology-

²⁵ Sulaiman Aula et al., "Analisa Dan Perancangan Game Edukasi Student Adventure 2D Menggunakan Scratch 2.0 Pada SMK Negeri 1 Al-Mubarkeya," *Jurnal Pendidikan Teknologi Informasi* 4, no. 1 (2022).

²⁶ Yenni mesilina Haloho, I Kadek Suartama, and I Komang Sudarma, "Educational Game-Based Thematic Learning Media to Improve Student Learning Competence," *Mimbar Ilmu* 28, no. 1 (2023): 106–15, <https://doi.org/10.23887/mi.v28i1.58764>.

enhanced learning environments. The high feasibility ratings demonstrate that the EduWisdom application was designed to present learning materials in a clear, organized, and visually appealing manner, enabling students to focus more effectively on learning tasks. Furthermore, its intuitive navigation and interactive features help reduce unnecessary cognitive load, allowing students to concentrate on understanding and applying the learning materials more efficiently.

Furthermore, the validation results indicate that the integration of teaching modules with the EduWisdom application provides a systematic learning framework that effectively guides both teachers and students throughout the instructional process. The availability of structured learning objectives, activity guidelines, and assessment procedures ensures that the educational game functions as an integral component of the learning strategy rather than merely as a supplementary activity. This alignment between the instructional media and learning objectives contributes to the effective implementation of competency-based learning.

Table 2 Summary of media and teaching module validation result

Aspect	Assessment Source	Score (%)	Category
EduWisdom Media	Media Expert	93,75%	Very Worthy
Teaching Module	2 Module Experts	83,5%	Very Worthy
Microsoft PowerPoint Material	2 Module Experts	84,5%	Very Worthy

Effectiveness of Game-Based Learning Assisted by EduWisdom on Learning Outcomes

As presented in Table 2, the experimental group achieved a higher mean post-test score (84.00) than the control group (72.79). Similarly, the experimental group obtained a higher mean N-Gain (0.55) compared with the control group (0.31), indicating greater improvement in students' competencies following the instructional intervention.

Furthermore, the statistical analyses confirmed that these differences were statistically significant, demonstrating that the implementation of the EduWisdom-assisted Game-Based Learning model had a measurable positive effect on students' learning outcomes.

Table 3 Comparison of Post-test Scores and N-Gain

Group	Mean Post-test	Mean N-Gain	N-Gain Category
Experimental	84,00	0,55	Moderate
Control	72,79	0,31	Moderate

The improvement in students' learning outcomes observed in this study can be attributed to the pedagogical characteristics of the Game-Based Learning environment, which promotes active participation, repeated practice, and immediate feedback. The integration of competitive elements and progressive challenges into the learning activities enhanced students' intrinsic motivation and engagement, both of which are essential factors influencing effective learning. Furthermore, students were encouraged to actively participate in classroom activities, explore learning materials independently, and apply their knowledge through repeated practice, ultimately contributing to improved competency achievement and learning performance.

The findings of this study are consistent with previous research demonstrating the positive contribution of Game-Based Learning to students' academic achievement and learning engagement. Elsherbiny and Raya²⁷ reported that mobile-based Game-Based Learning significantly improved students' participation and learning outcomes compared with conventional instructional methods. Similarly, Chang and Yeh²⁸ found that the integration of game elements into learning activities enhanced students' motivation, knowledge sharing, and critical thinking skills. Aulia Yolanda et al.²⁹ also reported that the implementation of Game-Based Learning supported by interactive

²⁷ Elsherbiny and Raya, "Game-Based Learning through Mobile Phone Apps."

²⁸ Chang and Yeh, "A Blended Design of Game-Based Learning."

²⁹ Sylvi Aulia Yolanda et al., "Game-Based Learning: A Solution for Improving the Quality of Learning Processes and Outcomes in Elementary Schools," *International Journal of Islamic Teaching and Learning* (2025), <https://journal.staisni.ac.id/index.php/ijiting>.

media significantly improved students' learning outcomes and classroom participation. These findings further strengthen the evidence that educational games can create more engaging learning environments and contribute positively to students' academic achievement. The present study supports these findings by showing that students who participated in the EduWisdom-assisted learning activities demonstrated better competency achievement and greater enthusiasm throughout the instructional process.

The effectiveness of EduWisdom can also be attributed to the learning experiences created through the integration of interactive challenges, immediate feedback, and competitive game elements. These features encouraged students to repeatedly practice the targeted competencies while receiving timely feedback on their performance. This continuous learning process enabled students to identify mistakes, improve their understanding, and progressively strengthen their practical skills. Furthermore, the competitive yet enjoyable learning environment fostered by the educational game enhanced students' intrinsic motivation to actively participate in classroom activities and successfully complete learning tasks.

findings of this study are also consistent with the meta-analysis conducted by Sitzmann³⁰, which concluded that simulation-based educational games positively influence self-efficacy, knowledge acquisition, and knowledge retention. In the context of this study, the use of EduWisdom not only supported the acquisition of theoretical concepts but also facilitated the development of practical competencies in visual interface design using Microsoft PowerPoint. Through repeated practice and active participation in game-based learning activities, students had greater opportunities to apply their knowledge in authentic learning situations, thereby strengthening both their conceptual understanding and practical competencies.

From a vocational education perspective, these findings have important practical implications. Vocational learning requires students to master practical and technical competencies that cannot be developed effectively through lecture-based instruction alone. The implementation of EduWisdom demonstrates that educational games can serve as an alternative instructional medium that supports competency-based learning by promoting active participation, collaborative learning, and repeated skills practice. Therefore, integrating Game-Based Learning into vocational Informatics education

³⁰ Sitzmann, "A Meta-Analytic Examination."

may provide an effective strategy for improving students' readiness to meet the technological demands of the modern workplace.

Beyond improving students' technical competencies, the implementation of EduWisdom also supports the development of twenty-first-century skills that are increasingly essential in vocational education. During the learning activities, students were encouraged to communicate, collaborate, and make decisions while solving game-based challenges. These learning experiences not only enhanced students' technical competencies but also fostered essential soft skills, including teamwork, problem-solving, and adaptability. Such competencies are increasingly important in vocational education, as modern workplaces require graduates who can collaborate effectively, solve problems, and adapt to rapid technological advancements.

In addition, the use of digital game-based learning media provides teachers with opportunities to create more flexible and student-centered learning environments. Rather than relying solely on one-way knowledge delivery, the Game-Based Learning approach enables students to actively construct their own understanding through exploration, interaction, and repeated practice. This learning process helps students become more independent and confident in applying their knowledge to practical situations. Therefore, integrating educational games into vocational Informatics instruction has the potential to enhance both students' academic achievement and the development of vocational competencies in visual interface design using Microsoft PowerPoint.³¹

Moreover, the collaborative learning interactions observed during the implementation of EduWisdom contributed to enhanced knowledge sharing and peer-assisted learning. Students actively engaged in discussions, exchanged ideas, and supported one another during practice-based activities, thereby enriching the overall learning experience. Such collaborative learning processes are particularly valuable in vocational education, where teamwork, communication, and collaborative problem-solving are essential competencies for professional practice.

Overall, the findings of this study indicate that the integration of the Game-Based Learning model supported by the EduWisdom educational game provides an effective instructional strategy for improving students' interface design competencies in

³¹ Natalis Sukma, Permana Stkip, and Widya Yuwana, "Game Based Learning Sebagai Salah Satu Solusi Dan Inovasi Pembelajaran Bagi Generasi Digital Native," *Jurnal Pendidikan Agama Katolik (JPak)* 22, no. 2 (2025): 2085–0743, <https://doi.org/10.34150/jpak.v22i1.433>.

vocational Informatics education. The implementation of this approach not only enhances students' learning outcomes but also promotes active learning behaviors, collaborative learning interactions, and increased learning motivation, which collectively contribute to improved competency development.

CONCLUSION

This study demonstrates that the implementation of the Game-Based Learning (GBL) model assisted by EduWisdom media is effectively able to improve learning outcomes and student competencies in Microsoft PowerPoint material for class X students of SMK Teuku Umar Semarang. The integration of the GBL model designed through five learning stages into an interactive digital game media based on snakes and ladders makes the learning process more meaningful, challenging, and centered on student activity. The results of the study show that students in the experimental class not only experienced a significant increase in learning outcomes compared to the control class, but also showed higher cognitive and emotional engagement during the learning process.

The findings of this study also provide practical implications for teachers and educational institutions. The integration of educational games into classroom instruction can serve as an alternative strategy to complement conventional teaching methods, especially for technology-oriented subjects that require intensive practice and active student participation. By utilizing interactive digital media, teachers can create more meaningful learning experiences that support both cognitive understanding and practical skill development.

Nevertheless, this study has several limitations. The implementation was conducted in a single vocational school with a relatively limited number of participants, which may affect the generalizability of the findings. In addition, the intervention was implemented within a limited instructional period, so the long-term impact of the EduWisdom-assisted Game-Based Learning model could not be fully examined. Future studies are recommended to involve larger samples, different educational settings, and longer implementation periods to further investigate the effectiveness and sustainability of educational game integration in vocational education.

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