Implementation of the Experiential Learning Model in Adventure Game-Based Learning Media to Improve Logical Thinking

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Abstract *: Algorithm and programming learning media are commonly developed as quizzes or puzzles that emphasise content delivery rather than meaningful learning experiences. This study aims to design and evaluate an adventure game-based learning medium integrating the Experiential Learning model to improve students' logical thinking skills in algorithm and programming instruction. The study employed Research and Development (R&D) using the ADDIE model, comprising analysis, design, development, implementation, and evaluation. The trial involved 32 Year 11 students in a one-group pre-test post-test design. Data were collected through expert validation, logical thinking tests, and student response questionnaires. The results showed that the medium achieved a high feasibility level. Students' logical thinking skills improved significantly, indicated by a paired-samples t-test with a significance value below 0.05 and a moderate N-Gain score. Students responded positively to ease of use, learning engagement, and effectiveness. These findings indicate that integrating Experiential Learning into an adventure game effectively supports meaningful learning experiences and students' logical thinking skills.*

Keywords : *Learning, Adventure Game, Learning Media, Logical Thinking, Algorithms and Programming*

Abstrak : Media pembelajaran algoritma dan pemrograman umumnya dikembangkan dalam bentuk kuis atau teka-teki yang lebih menekankan penyampaian materi daripada pengalaman belajar bermakna. Penelitian ini bertujuan merancang dan mengevaluasi media pembelajaran berbasis *adventure game* yang mengintegrasikan model *Experiential Learning* untuk meningkatkan kemampuan berpikir logis siswa dalam pembelajaran algoritma dan pemrograman. Penelitian menggunakan metode *Research and Development* (R&D) dengan model ADDIE yang meliputi analisis, desain, pengembangan, implementasi, dan evaluasi. Uji coba dilakukan terhadap 32 siswa kelas XI menggunakan desain *one-group pretest-posttest*. Data diperoleh melalui validasi ahli, tes kemampuan berpikir logis, dan angket respons siswa. Hasil penelitian menunjukkan bahwa media memiliki tingkat kelayakan sangat tinggi. Kemampuan berpikir logis siswa meningkat secara signifikan berdasarkan uji *paired sample t-test* dengan nilai signifikansi < 0,05 dan skor *N-Gain* kategori sedang. Siswa juga memberikan respons sangat positif terhadap kemudahan penggunaan, keterlibatan belajar, dan efektivitas media. Temuan ini menunjukkan bahwa integrasi *Experiential Learning* dalam *adventure game*

efektif mendukung pengalaman belajar bermakna dan kemampuan berpikir logis siswa.

Kata Kunci : Pembelajaran, *Adventure Game*, Media Pembelajaran, Berpikir Logis, Algoritma dan Pemrograman.

INTRODUCTION

The rapid advancement of digital technology has transformed educational practices by encouraging the adoption of innovative learning media that promote active and meaningful learning experiences. Among these innovations, educational games have attracted considerable attention because they combine entertainment with instructional objectives, creating engaging learning environments that increase students' motivation and participation (Ramadaniati, 2021). Unlike conventional digital learning media, educational games provide interactive experiences in which students actively explore problems, receive immediate feedback, and construct knowledge through gameplay. Consequently, game-based learning has become one of the promising approaches for teaching complex subjects, particularly those requiring higher-order thinking skills such as Informatics.

In Informatics education, algorithms and programming are considered fundamental competencies that require students to think logically, systematically, and analytically. However, these topics remain difficult for many senior high school students because understanding programming logic involves abstract reasoning and sequential problem solving. Although numerous educational games have been developed to support programming instruction, most existing applications primarily rely on quizzes, puzzles, or drill-based activities that focus on content delivery rather than meaningful learning experiences (Arpiansah, 2021). Such approaches often reduce students' engagement because the learning process resembles completing conventional tests rather than solving authentic problems. In contrast, adventure games provide richer learning environments by integrating narratives, exploration, and contextual challenges that encourage students to actively construct knowledge while solving problems (Damayanti, 2020; Yunus Anis, 2023).

To maximize the educational value of game-based learning, instructional strategies that emphasize authentic learning experiences are required. One approach that has received considerable attention is Experiential Learning, proposed by Kolb, which emphasizes learning through concrete experience, reflective observation, abstract conceptualization, and active experimentation. Rather than positioning students as passive recipients of information, this model encourages learners to construct knowledge through direct experience, reflection, and continuous application (Ridho, 2021). Previous studies have reported that Experiential Learning improves students' motivation, conceptual understanding, and higher-order thinking skills because it bridges theoretical knowledge with authentic learning situations (Hariri, 2018).

Several studies have demonstrated the effectiveness of Experiential Learning in secondary education. Hidayati et al. (2022), for example, reported significant improvements in students' logical thinking and problem-solving abilities after implementing project-based Informatics learning using an Experiential Learning approach. Similarly, Li (2021) proposed an educational game design framework consisting of introduction, demonstration, operation, and verification modules, showing positive effects on students' motivation and problem-solving performance. These findings indicate that both educational games and Experiential Learning have substantial potential to improve learning outcomes.

Nevertheless, previous studies have generally examined educational games and Experiential Learning separately. Existing educational games for programming education mainly emphasize quizzes or puzzle-solving activities, whereas studies on Experiential Learning rarely integrate the complete experiential learning cycle into adventure game environments. As a result, students have limited opportunities to experience authentic learning situations that systematically develop logical thinking during algorithms and programming instruction. This gap suggests the need for learning media that not only increase engagement but also embed meaningful learning experiences throughout gameplay.

This need is further supported by the preliminary study conducted in a senior high school in West Java. Classroom observations, interviews with an Informatics teacher, and student questionnaires revealed three major issues. First, students experienced considerable difficulty in understanding algorithms and programming, particularly loop control structures, because of insufficient logical thinking and conceptual understanding. Second, classroom instruction remained predominantly teacher-centered, relying on lectures and example-based project activities that provided limited opportunities for independent exploration. Third, the existing learning media were perceived as insufficiently interactive and engaging, resulting in low learning motivation and high dependence on school computer facilities.

Therefore, this study develops an Experiential Learning-based adventure game designed specifically for algorithms and programming instruction in senior high schools. Unlike previous educational games, the proposed learning media integrates the four stages of Kolb's Experiential Learning cycle into gameplay activities, enabling students to learn programming concepts through authentic experiences, structured reflection, conceptual understanding, and practical application. The study aims to investigate the effectiveness of the developed learning media in improving students' logical thinking and to examine students' responses toward its implementation in Informatics learning.

RELATED WORK

Educational Games in Informatics Education

Educational games have emerged as one of the most extensively implemented learning media in technology-supported education due to their ability to integrate instructional goals with interactive learning experiences. Compared with conventional learning approaches, educational games encourage students to actively engage in learning activities through exploration, problem-solving, and immediate feedback, thereby increasing motivation and learning involvement (Arpiansah et al., 2021). In Informatics education, where abstract concepts such as algorithms and programming require structured reasoning, educational games provide an opportunity for students to visualize computational processes and practice computational thinking within an engaging learning environment.

Among various types of educational games, adventure games have gained significant attention because they are capable of combining storytelling, exploration, challenges, and contextual problem-solving into the learning process. Unlike quiz-based or drill-oriented applications, adventure games allow students to interact with virtual environments, overcome authentic challenges, and make decisions that affect the development of the game. These characteristics support active learning experiences and help reduce students' perceptions that programming is a difficult and monotonous subject (Damayanti et al., 2020; Yunus Anis et al., 2023).

Previous studies have consistently shown that educational games contribute positively to students' motivation, engagement, and academic achievement. However, many existing educational games for programming education still rely heavily on quizzes and puzzle-solving activities that primarily measure conceptual understanding rather than facilitating meaningful learning experiences. As a result, students may focus on memorizing solutions without developing a deeper understanding of the logical processes underlying programming concepts. This limitation highlights the importance of developing educational games that provide authentic experiences while simultaneously strengthening students' logical thinking skills throughout the learning process.

Experiential Learning for Logical Thinking Development

Experiential Learning, introduced by Kolb (1984), is a learner-centered educational approach that emphasizes knowledge construction through direct experiences. This model consists of four interconnected stages: Concrete Experience, Reflective Observation, Abstract Conceptualization, and Active Experimentation. Instead of positioning students as passive receivers of information, Experiential Learning encourages learners to build knowledge by engaging in real experiences, reflecting on those experiences, developing conceptual understanding, and applying

acquired knowledge to solve new problems. Through this cycle, students can achieve deeper understanding while enhancing higher-order thinking abilities.

In Informatics education, Experiential Learning is highly relevant because programming requires students to comprehend abstract concepts through repeated practice, experimentation, and reflection. Activities such as designing algorithms, identifying errors, debugging programs, and testing solutions naturally correspond with Kolb's experiential learning cycle. Students are not only required to understand programming syntax but also to develop logical reasoning by analyzing problems systematically and evaluating alternative solutions before implementation. Therefore, Experiential Learning has strong potential to support the development of logical thinking skills in programming instruction.

Several previous studies have confirmed the effectiveness of Experiential Learning in enhancing students' cognitive abilities. Hidayati et al. (2022) found that the implementation of Experiential Learning in Informatics learning significantly improved students' logical thinking abilities, problem-solving skills, and academic performance through authentic project-based activities. Similarly, Li (2021) developed an educational game framework based on experiential learning principles and demonstrated that meaningful learning experiences positively affected students' motivation, engagement, and problem-solving abilities. These findings indicate that Experiential Learning provides a strong pedagogical foundation for designing interactive learning media that support students' cognitive development.

Research Gap and Research Contribution

Although previous research has demonstrated the effectiveness of educational games and Experiential Learning in improving learning outcomes, these two approaches have generally been explored separately. Existing educational games for programming education mostly emphasize quizzes, puzzles, or gamified exercises that focus on task completion rather than authentic learning experiences. Meanwhile, studies applying Experiential Learning have primarily utilized classroom activities, simulations, or project-based learning without incorporating the complete experiential learning cycle into digital game environments. Therefore, limited research has examined how Kolb's four-stage Experiential Learning cycle can be systematically integrated into an adventure game specifically designed for algorithms and programming instruction. This gap presents an opportunity to develop learning media that not only enhances students' motivation and engagement but also provides meaningful learning experiences that strengthen logical thinking skills in programming education.

To address this gap, this study develops an adventure game-based learning medium that integrates the four stages of Experiential Learning into gameplay activities for senior high school Informatics learning. Unlike previous educational games that mainly focus on answering questions or completing isolated programming exercises, the proposed learning media guides students through authentic programming experiences involving exploration, reflection, conceptual understanding, and practical implementation. Furthermore, this study evaluates the effectiveness of the developed learning media in improving students' logical thinking abilities and investigates students' responses toward its implementation in algorithms and programming learning.

RESEARCH METHOD

This research utilized a Research and Development (R&D) methodology combined with a quantitative approach to design and evaluate an adventure game-based learning medium that integrates the Experiential Learning model. The primary objective was to develop an interactive learning tool and examine its effectiveness in enhancing students' logical thinking skills in algorithms and programming. The study applied a one-group pretest posttest pre-experimental design, where a single group of students was assessed before and after participating in learning activities using the developed media. This research design was selected to identify changes in students' logical thinking abilities resulting from the implementation of the proposed learning media.

The development process followed the ADDIE instructional design model introduced by Lee and Owens (2004), which includes five systematic stages: Analysis, Design, Development,

Implementation, and Evaluation. In the Analysis stage, learning requirements were identified through classroom observations, interviews with Informatics teachers, student questionnaires, and curriculum reviews. The Design stage focused on formulating learning objectives, designing the game narrative, developing gameplay mechanisms, creating the user interface, and incorporating the four stages of the Experiential Learning model into the adventure game environment. During the Development stage, the learning media was produced and evaluated by experts to ensure its quality and appropriateness. The Implementation stage involved classroom application, while the Evaluation stage examined the feasibility of the media through expert assessments, students' learning outcomes, and students' responses toward the developed learning experience.

The study was conducted at SMA NU Kaplongan, Indramayu, West Java, Indonesia. The research population included all eleventh-grade students from the Science and Social Sciences (IPAS) and Mathematics and Natural Sciences (MIPA) programs. The research participants consisted of 30 eleventh-grade IPAS students enrolled in the Informatics subject. Participants were selected through purposive sampling, based on their completion of prerequisite learning materials and identified difficulties in understanding algorithmic concepts and programming logic, particularly loop control structures. Before classroom implementation, the developed learning media underwent an expert validation process conducted by specialists in instructional media and Informatics education. The validation focused on several aspects, including content suitability, instructional design, technical functionality, and usability. Feedback and suggestions from the experts were subsequently used as a basis for revising and improving the learning media to ensure its readiness for classroom application.

Data collection was performed using multiple instruments, including interviews, questionnaires, expert validation forms, and logical thinking assessments. The preliminary study instruments consisted of teacher interview guidelines, student learning-needs questionnaires, and an initial logical thinking assessment containing 15 questions related to algorithms and programming concepts. To measure the effectiveness of the developed media, students completed a pretest before using the adventure game and a posttest after completing the learning activities. The logical thinking assessment was designed based on three main indicators: sequential reasoning, argumentation, and conclusion drawing (Andriawan, 2014). The collected data were analyzed using descriptive and inferential statistical methods. Expert validation scores and student response questionnaires were analyzed descriptively using percentage calculations to determine the feasibility, usability, and acceptance level of the developed learning media. Before conducting hypothesis testing, the normality distribution of pretest and posttest data was examined using the Shapiro Wilk test. Differences between students' pretest and posttest scores were analyzed using a paired-sample t-test with a significance level of $\alpha = 0.05$. In addition, the effectiveness of the learning media in improving students' logical thinking skills was measured using the Normalized Gain (N-Gain) score, which indicates the level of improvement achieved after the implementation of the adventure game-based learning media.

RESULTS AND DISCUSSION

Analysis Phase

The Analysis Phase was conducted to identify and formulate the research problems through two main activities: field investigation and literature analysis. This stage aimed to obtain a detailed understanding of students' learning needs, current instructional practices, and theoretical considerations required for the development of an effective learning medium.

Field Study

The field study was carried out to examine the existing learning environment, particularly the implementation of instructional approaches and learning media in Informatics education, with a specific focus on Algorithms and Programming materials for Grade 11 students. The research was conducted at SMA NU Kaplongan as the selected research location. Data were collected through classroom observations to analyze the teaching and learning process, interviews with the Informatics teacher to identify instructional obstacles and current teaching strategies, and student questionnaires to explore their understanding of concepts, learning motivation, and challenges in

comprehending algorithmic and programming topics. The findings from this field study served as the foundation for determining the needs, features, and development requirements of the proposed learning media.

Literature Review

Following the field study, a literature review was conducted to establish the theoretical framework and strengthen the conceptual basis of the research. This activity involved examining various academic references, including scholarly articles, textbooks, and educational documents related to Informatics learning, especially in the areas of algorithms and programming education. The review also investigated the principles of Experiential Learning, the characteristics of adventure game-based learning media, and relevant indicators of logical thinking skills within the context of twenty-first-century learning. The results of this analysis were used to formulate learning objectives, organize instructional materials, select appropriate learning strategies, and design a learning medium that matched the characteristics and requirements of students at SMA NU Kaplongan.

User Analysis

User analysis was conducted to identify the characteristics, roles, and needs of the individuals involved in the learning process. The main users of the developed learning media were **Grade** 11 students in the Science and Social Sciences (IPAS) program at SMA NU Kaplongan, who directly participated in the learning activities using the developed media. Meanwhile, the researcher acted as both the learning facilitator and system manager, responsible for coordinating implementation activities, monitoring students' interactions with the media, and assessing the effectiveness of the learning experience provided.

Design Phase

The Design Phase focused on developing a structured plan for both the instructional framework and the adventure game-based learning media. The instructional design was developed by adopting the Experiential Learning approach to ensure that learning activities were aligned with the research objectives, particularly in improving students' logical thinking abilities in algorithms and programming. The adventure game-based learning media was designed by embedding Kolb's four stages of Experiential Learning concrete experience, reflective observation, abstract conceptualization, and active experimentation into the gameplay process. Each stage was translated into various missions, challenges, and problem-solving activities that enabled students to directly engage with programming concepts, reflect on their experiences, develop conceptual understanding, and apply acquired knowledge to solve real-world problems. In addition, this phase involved designing the storyline, gameplay flow, user interface, learning scenarios, and evaluation components to create an interactive, engaging, and meaningful learning environment.

Development Phase

The Development Phase involved transforming the design framework into a functional adventure game-based learning medium. At this stage, various components were developed, including learning materials, programming activities, evaluation instruments, game scenarios, and interactive features integrated into the learning platform. Prior to implementation in the classroom, the developed learning media and instructional materials underwent an expert validation process involving experts in educational media and Informatics education. The validation process aimed to assess the quality, content relevance, instructional effectiveness, technical functionality, and usability of the developed media. Suggestions and evaluations provided by experts were used as references for revising and refining the learning media.

The final product of this phase was a validated adventure game-based learning medium that integrated the Experiential Learning model and was considered suitable for use in Informatics education. The developed media was designed to facilitate meaningful learning experiences and contribute to the enhancement of students' logical thinking skills in algorithms and programming.

Figure 1. Main Menu

Figure 2. Concrete Experience Stage

Figure 4. Abstract Conceptualization Stage

Figure 5. Active Experimentation Stage

Implementation Phase

After the instructional materials and the adventure game-based learning media "Rise of the Coder" successfully passed the expert validation stage and were declared feasible for

implementation, the next stage involved applying the developed media in the learning process. The implementation was conducted with Grade 11 students from the Science and Social Sciences (IPAS) program at SMA NU Kaplongan. A total of 30 students participated in this stage by utilizing the developed learning media during Informatics learning activities.

This research employed a pre-experimental design using a one-group pretest posttest method, in which a single group of students participated in the learning intervention without involving a comparison group. Prior to the implementation of the learning media, students completed a pretest to identify their initial level of logical thinking skills. Subsequently, students engaged in learning activities using the Experiential Learning-based adventure game media. After completing the learning activities, a posttest was administered to measure the improvement and changes in students' logical thinking abilities following the implementation of the developed learning approach.

The implementation process was conducted through three learning sessions, with each session requiring approximately 2 3 class periods according to the Informatics subject timetable. All activities were carried out in the school computer laboratory to provide students with direct access to the adventure game-based learning media. Through this environment, students were able to actively participate in experiential learning activities, explore programming concepts, solve challenges, and construct knowledge through meaningful learning experiences.

Figure 6. Learning Implementation

The implementation of the adventure game-based learning media was designed by integrating the entire cycle of the Experiential Learning model into the instructional process. Each learning session was arranged systematically to reflect the four stages of Experiential Learning: Concrete Experience, Reflective Observation, Abstract Conceptualization, and Active Experimentation. This integration enabled students to participate in direct learning experiences, evaluate and reflect on their understanding, construct conceptual knowledge, and apply programming concepts to address contextual challenges presented within the game environment.

Evaluation Phase

Following the completion of the learning activities using the adventure game-based learning media, the researcher conducted data collection and analysis based on the information obtained throughout the research process. The collected data included students' pretest and posttest results, as well as response questionnaires designed to identify students' perceptions and acceptance of the developed learning media based on the Experiential Learning approach. In the Evaluation Phase, all collected data were analyzed systematically to determine the effectiveness, feasibility, and usability of the developed learning media. The findings from the analysis were then utilized to interpret the research outcomes and establish conclusions regarding the implementation of the learning media. The effectiveness of the media in enhancing students' logical thinking skills was assessed by examining differences between students' abilities before and after the learning

intervention. Statistical analysis was performed using a paired-sample t-test to identify whether significant differences existed between pretest and posttest scores. Additionally, the Normalized Gain (N-Gain) analysis was conducted to measure the extent of students' improvement after participating in learning activities using the adventure game-based media. Before applying the paired-sample t-test, a normality test was carried out to ensure that the data distribution satisfied the assumption of normality.

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
PRE_TEST	.190	30	.007	.954	30	.210
POST_TEST	.180	30	.014	.939	30	.085

a. Lilliefors Significance Correction

Figure 7. Normality Test Results

The normality test was conducted using SPSS version 27 to verify whether the pretest and posttest scores met the assumption of normal data distribution. The results indicated that the significance value obtained for the pretest data was 0.210, while the posttest data produced a significance value of 0.085. Because both values were greater than the significance level of 0.05, the null hypothesis (H_0) was accepted. These findings confirm that the pretest and posttest data were distributed normally, thereby satisfying the prerequisite for applying parametric statistical analysis, particularly the paired-sample t-test.

Paired Samples Test

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1 PRE_TEST - POST_TEST	-34.933	14.051	2.565	-40.180	-29.686	-13.617	29	.000

Figure 8. Paired-Sample t-Test Results

The paired-sample t-test analysis demonstrated a mean difference of -34.93 between students' pretest and posttest scores, with a 95% confidence interval ranging from -40.18 to -29.68. The statistical output showed a value of $t(31) = -13.617$ with a significance level of $p < 0.001$ (Sig. 2-tailed = 0.000), indicating that the difference between students' performance before and after the intervention was statistically significant. Based on the descriptive analysis, the mean score obtained in the pretest was 42.40, whereas the posttest average increased significantly to 77.33 after students engaged in learning activities using the adventure game-based learning media. The score improvements among students ranged between 29 and 40 points, indicating a consistent enhancement in logical thinking abilities across the participants. Because the significance value obtained was lower than the established significance level ($\alpha = 0.05$), the null hypothesis (H_0), which stated that there was no significant difference between pretest and posttest results, was rejected. Therefore, the findings provide empirical evidence that the implementation of the Experiential Learning-based adventure game media effectively contributed to improving students' logical thinking skills in algorithms and programming learning.

Discussion

Implementation of the Experiential Learning Model Supported by Adventure Game-Based Learning Media to Improve Logical Thinking Skills

The application of the Experiential Learning model integrated with adventure game-based learning media was implemented through three learning sessions. The first session was conducted

to identify students' initial logical thinking abilities through a pretest and to introduce the developed adventure game media. The following two sessions focused on learning activities structured around Kolb's four-stage Experiential Learning cycle, consisting of Concrete Experience, Reflective Observation, Abstract Conceptualization, and Active Experimentation. The implementation followed the Informatics subject schedule for Grade 11 students at SMA NU Kaplongan. Throughout the learning process, observations were carried out to examine students' engagement, learning behavior, participation levels, and the development of logical thinking indicators during each stage of the experiential learning process.

The integration of the Experiential Learning model with adventure game-based learning media created an interactive, learner-centered, and exploratory learning environment. This approach encouraged students to construct knowledge independently through exploration, experimentation, and problem-solving activities. In contrast to traditional learning methods that primarily position students as passive recipients of information, the developed media enabled students to encounter programming concepts directly through contextual missions and challenges embedded within the game. As a result, students were able to relate abstract algorithmic concepts to practical situations, producing more meaningful and relevant learning experiences. These findings align with Kolb's Experiential Learning Theory (1984), which explains that effective learning occurs when students transform direct experiences into reflection, conceptual understanding, and practical application.

Improvement of Students' Logical Thinking Skills Through Experiential Learning-Based Adventure Game Implementation

The findings of this study indicate that the integration of the Experiential Learning model with the Rise of the Coder adventure game-based learning media successfully enhanced students' logical thinking skills in algorithms and programming. The quantitative analysis showed a notable improvement in students' learning outcomes, with the mean pretest score increasing from 42.40 to 77.33 in the posttest, resulting in an average gain of 34.93 points. Furthermore, the paired-sample t-test revealed a statistically significant difference between students' pretest and posttest scores ($t(29) = -13.617$, $p < 0.001$). These results confirm that the developed learning media had a significant contribution to improving students' logical thinking abilities.

The improvement in students' logical thinking performance was influenced by the characteristics of both the Experiential Learning approach and the adventure game-based learning environment. During gameplay, students were actively involved in analyzing problems, identifying alternative solutions, making logical decisions, and evaluating the outcomes of their actions. These activities provided continuous practice in essential logical thinking processes, including sequential reasoning, conditional analysis, pattern identification, and systematic problem-solving, which are important competencies in learning algorithms and programming.

Moreover, the adventure game environment transformed conventional programming exercises into contextual and engaging learning activities through interactive missions, challenges, and scenarios. Instead of simply completing programming tasks or memorizing theoretical concepts, students explored the virtual environment, solved problems, achieved specific objectives, and reflected on their decisions throughout the gameplay. This process represents the fundamental principles of Experiential Learning, where knowledge is developed through direct involvement, reflection, conceptual development, and repeated experimentation.

The results support previous research conducted by Li (2021), which demonstrated that educational games based on experiential learning principles could improve students' motivation and problem-solving abilities by providing meaningful and contextual learning experiences. Similarly, Hidayati et al. (2022) found that experiential learning activities effectively enhanced students' higher-order thinking skills, particularly logical reasoning and analytical abilities, through active involvement in authentic problem-solving tasks. This study extends previous findings by demonstrating that embedding the complete Experiential Learning cycle within an adventure game specifically designed for algorithms and programming instruction can effectively facilitate the development of logical thinking skills among senior high school students.

Students' Responses Toward Experiential Learning-Based Adventure Game Media in Informatics Education

At the end of the implementation process, students completed a response questionnaire to evaluate their perceptions of the developed adventure game-based learning media. The analysis showed that the media obtained an average response score of 88.96%, which was categorized as "Very Good." This result indicates that students perceived the developed media as attractive, easy to use, and beneficial in supporting their understanding of algorithms and programming concepts. During the initial use of the media, several students experienced minor difficulties in navigating the game interface due to limited familiarity with the system. However, these challenges gradually decreased as students became more accustomed to the gameplay structure and interaction mechanisms. The incorporation of interactive missions, immediate feedback, and reward-based features successfully maintained students' motivation and active participation throughout the learning process. Furthermore, the game-based learning environment helped reduce students' perceptions of programming as a difficult subject by presenting complex concepts in a more enjoyable, accessible, and engaging manner.

These findings are consistent with previous studies highlighting the positive impact of game-based learning environments on students' motivation, engagement, and satisfaction. The high level of student acceptance demonstrates that combining the Experiential Learning model with adventure game mechanics not only contributes to improving logical thinking skills but also creates a meaningful and enjoyable learning experience. Therefore, the developed learning media has strong potential as an alternative instructional strategy to support active learning participation and improve learning outcomes in Informatics education, particularly in algorithms and programming topics.

CONCLUSIONS

This study investigated the development and effectiveness of Rise of the Coder, an adventure game-based learning medium integrated with the Experiential Learning model, aimed at improving senior high school students' logical thinking skills in algorithms and programming. The findings demonstrate that the developed learning media is suitable for classroom implementation by facilitating a learning process that incorporates direct experiences, reflective activities, conceptual development, and practical application. The integration of adventure game elements with the Experiential Learning approach successfully created an interactive, engaging, and meaningful learning environment that encouraged students to actively construct knowledge through contextual problem-solving experiences.

The empirical results confirmed that the developed learning media effectively enhanced students' logical thinking abilities. The students' average scores increased from 42.40 in the pretest to 77.33 in the posttest, with an N-Gain value of 0.60, indicating a moderate improvement in learning outcomes. Moreover, the paired-sample t-test analysis revealed a statistically significant difference between students' pretest and posttest scores ($p < 0.001$), demonstrating that the implementation of the learning media had a significant positive effect on students' logical thinking development. Furthermore, students showed highly favorable responses toward the developed media, reflected by an average response score of 88.96%, categorized as "Very Good." These findings indicate that Rise of the Coder not only contributes to improving logical thinking skills but also provides an enjoyable, accessible, and effective learning experience for students.

This research provides a contribution to Informatics education by highlighting the effectiveness of combining the Experiential Learning model with adventure game-based learning media to support the development of logical thinking through experience-oriented and contextual learning activities. Nevertheless, this study has several limitations, including the involvement of only one class and the application of a one-group pretest posttest design without a control group. Future research is recommended to involve larger and more diverse samples, implement experimental designs with comparison groups, and investigate the long-term impact of adventure game-based learning on students' higher-order thinking skills and broader educational achievements.

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REFERENCES

Arends, R. I. (2012). *Learning to Teach* (9th ed.). McGraw-Hill.

Brookshear, J. G. (2012). *Computer Science: An Overview* (11th ed.). Pearson.

Budiwaluyo, H., & W. (2021). Manfaat bermain papercraft dalam meningkatkan kreativitas berpikir pada anak usia dini. *Pedagogi: Jurnal Anak Usia Dini dan Pendidikan Anak Usia Dini*, 76 93.

Caulfield, J., &. (2013). Experiential learning: Exploring its long-term impact on socially responsible behavior. *Journal of the Scholarship of Teaching and Learning*, 31 48.

Damayanti, D. A. (2020). Game edukasi pengenalan hewan langka berbasis Android menggunakan Construct 2. *Jurnal Teknologi Informasi dan Ilmu Komputer*, 275 282.

Dantes, N. (2012). *Metode Penelitian*. Andi Offset.

Denning, P. J. (2005). Is computer science science? *Communications of the ACM, 48*(4), 27 31.

Hariri, C. A. (2018). Penerapan model experiential learning untuk meningkatkan pemahaman materi cahaya dan sifat-sifatnya peserta didik kelas 5 SD. *Jurnal Ilmu Pendidikan dan Kependidikan*, 1 15.

Hidayati, N., Suyitno, H., & Kartono. (2022). The implementation of experiential learning to improve students' logical thinking and problem-solving skills in informatics learning. *Jurnal Pendidikan Informatika, 7*(2), 145 156.

Jamun, Y. M. (2018). Dampak teknologi terhadap pendidikan. *Jurnal Pendidikan dan Kebudayaan Missio*, 48 52.

Joyce, B., & Weil, M. (2011). *Models of Teaching* (9th ed.). Pearson.

Kemendikbudristek. (2021). *Buku Panduan Guru: Kurikulum Merdeka*. Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi.

Kolb, D. A. (1984). *Experiential Learning: Experience as the Source of Learning and Development*. Prentice Hall.

Kuchkarova, M. A., & Ganiyeva, S. (2023). Features of logical thinking. *Open Access Repository, 4*(3), 674 679.

Lee, W. W., & Owens, D. L. (2004). *Multimedia-Based Instructional Design: Computer-Based Training, Web-Based Training, Distance Broadcast Training, Performance-Based Solutions*. John Wiley & Sons.

Li, Y. (2021). Educational game design based on experiential learning theory. *International Conference on Information and Education Technology.*

Manurung, P. (2021). Multimedia interaktif sebagai media pembelajaran pada masa pandemi Covid-19. *Al-Fikru: Jurnal Ilmiah, 14*(1), 1 12. https://doi.org/10.51672/alfikru.v14i1.33

Mudlofir, H. A. (2021). *Desain Pembelajaran Inovatif: Dari Teori ke Praktik*. PT RajaGrafindo Persada.

Nashiroh, P. K. (2017). The effectiveness of web-programming module based on scientific approach to train logical thinking ability for students in vocational high school. *AIP Conference Proceedings, 1887*(1), 020068.

Nuraida, D. (2019). Peran guru dalam mengembangkan keterampilan berpikir kritis siswa dalam proses pembelajaran. *Jurnal Pendidikan, 4*(1).

Ramadaniati, S., & Arifin, D. (2021). Rancang bangun mobile game Adventure of Studies sebagai media pembelajaran. *INTEGER: Journal of Information Technology, 6*(2), 1 8.

Ridho, A. M. (2021). *Model Outdoor Education Berbasis Experiential Learning dalam Pendidikan Karakter untuk Sekolah Menengah Pertama*. Universitas Negeri Jakarta.

Sumarmo, U. (2012). *Berpikir Logis, Kritis, dan Kreatif serta Disposisi Matematik Siswa SMA*. Universitas Pendidikan Indonesia.

Wahyono. (2021). *Buku Panduan Guru Informatika untuk Kelas X*. Pusat Kurikulum dan Perbukuan, Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi.

Wahyono, T. S. (2021). Pengembangan keterampilan berpikir komputasional melalui pembelajaran pemrograman. *Jurnal Pendidikan Teknologi Informasi, 15*(1), 45 56.

Wibawanto, W. (2024). *Board Game Edukasi*. Nas Media Pustaka.

Wibawanto, W. (2024). *Board Game Edukasi*. Nas Media Pustaka.

Wulandari, A. P., Salsabila, A. A., Cahyani, K., Nurazizah, T. S., & Ulfiah, Z. (2023). Pentingnya media pembelajaran dalam proses belajar mengajar. *Journal on Education, 5*(2), 3928 3936. https://doi.org/10.31004/joe.v5i2.1074

Yulianto, F. U. (2019). Game edukasi pengenalan buah-buahan bervitamin C untuk anak usia dini. *Jurnal Nasional Pendidikan Teknik Informatika (JANAPATI)*, 242 251.

Yunus Anis, A. B. (2023). Perancangan game sederhana menggunakan Scratch Programming sebagai media pembelajaran visual bagi anak usia dini. *Bulletin of Information Technology (BIT)*, 320 327.