

Integration of AI in the Development of Educational Game-Based Learning Media To Improve Critical Thinking Skills in Citizenship Education

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Abstract

Civics Education (PKn) in Indonesia is often considered monotonous because it focuses on conceptual enunciation and presentation. As a result, students are less active in class. The purpose of this study was to determine the effectiveness of using Liveworksheet as a game-based learning medium in improving students' critical thinking skills at SMP Negeri 6 Bontang. The ADDIE (Analyze, Design, Develop, Implement, and Evaluate) development model was used in this study. AI assisted in the design of questions and analysis of learning outcomes. Eighth-grade students at SMP Negeri 6 Bontang were the subjects of the study. Interviews, observations, and analysis of Liveworksheet results were used to collect data. The results showed that the use of Liveworksheet improved student engagement and critical thinking skills. Students were more actively engaged in class, more confident in arguing, and better able to understand the principles of Pancasila in a social context. Limited devices and internet connection presented new obstacles. This study found that Liveworksheet combined with the application of AI within the ADDIE structure could be a creative alternative for Civics learning that meets the requirements of the Independent Curriculum.

Keywords: Educational games; citizenship education; learning media.

Introduction

Civics Education (PKn) is a crucial subject for developing students' character, morals, and critical thinking skills. However, in practice, Civics instruction in secondary schools is often perceived as monotonous and faces significant challenges. Initial observations at SMP Negeri 6 Bontang showed that teachers used a lecture approach and memorization exercises from textbooks because most students considered Civics lessons monotonous. As a result, students were not highly engaged in learning; many simply listened but did not actively participate in discussions or answer questions.

This situation was exacerbated by the social and academic diversity of students at SMP Negeri 6 Bontang. Conventional text-

based learning did not engage students, but technology-based and visual learning were preferred. Teachers also faced challenges with students' lack of motivation to learn; some students exhibited signs of quickly getting bored and losing focus during lessons. This clearly indicated that students had low critical thinking skills when learning about social issues and the values of Pancasila, the foundation of Civics material.

More innovative learning strategies are needed with the advancement of digital technology. Interactive media not only helps students avoid boredom but also supports the Independent Curriculum (Kurikulum Merdeka), which emphasizes innovative, creative, and contextual learning. Educational game-based learning media is considered capable of increasing student engagement and

motivation in learning. Liveworksheet is a platform that can transform static worksheets into interactive digital worksheets that allow students to interact directly with the material through various features, such as drag-and-drop, matching, multiple-choice, and essay questions with instant feedback.

The use of Liveworksheets at SMP Negeri 6 Bontang is considered crucial because it meets the needs of students who prefer a game-based learning approach. Liveworksheets are expected to increase student active participation, improve their focus, and enhance their desire to learn. This is expected because they have a game-like appearance and mechanism. When Liveworksheets are used in Civics learning, they can help students memorize concepts and acquire analytical, judgmental, and decision-making skills, which are essential components of critical thinking. This aligns with the objectives of the Independent Curriculum, which emphasizes contextual, active, and collaborative learning.

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Literature Review

AI in Education and Critical Thinking Skills

One of the key benefits of developing artificial intelligence in education is rapid and tailored feedback to support self-regulated learning and personalized learning through difficulty adjustments and data-driven material recommendations (Holmes, Bialik, & Fadel, 2019; Luckin et al., 2016). This method aligns with Facione's (2015) critical thinking framework, which consists of analysis,

evaluation, and inference. This is because students are encouraged to revise their answers based on evidence and reasoning rather than simply memorizing what was said.

Critical thinking is an active and skillful process of conceptualizing, applying, analyzing, synthesizing, and evaluating information gathered through communication, observation, experience, reflection, or reasoning, according to Facione (2015). Critical thinking is crucial in civics education for rationally assessing political, legal, and social information.

Game-Based Learning for Civics

Digital games intended for teaching are called educational games. Due to their exploratory, challenge-based nature, and focus on immediate feedback (Gee 2007), games have the potential to teach. Furthermore, educational games possess features that align with the principles of effective learning, such as clear objectives, rapid feedback, and engaging learning experiences. These characteristics can help students overcome boredom and encourage them to actively participate in the learning process. Holmes et al. (2019) state that the use of artificial intelligence in educational games allows for real-time modification of materials and analysis of student responses to improve learning effectiveness.

Good educational games increase persistence, motivation, and social interaction (Gee, 2007). Game factors such as goals, challenges, and feedback increase engagement (Deterding et al., 2011). Problem-based scenarios in Civics provide students with opportunities to examine evidence, consider perspectives, and create solutions based on Pancasila values, which are core to critical citizenship (Kemendikbudristek, 2022).

Interactive Worksheets & Formative Assessment

Liveworksheet is a digital platform that allows students to interact with traditional worksheets. Teachers can create questions using drag-and-drop, matching, multiple-choice, and fill-in-the-blank formats. With this flexibility, teachers can create worksheets that

not only test students' memorization but also require them to connect ideas, see cause-and-effect relationships, and apply their knowledge to real-world situations.

Liveworksheet transforms static worksheets into interactive ones with drag-and-drop, matching, short-fill-in, essay, and instant feedback features. The platform also provides teachers with answer recaps and instant feedback. Liveworksheet adheres to the principles of frequent, rapid, and informative formative assessment, accelerating the "try—get feedback—revise" process (Black & Wiliam, 2009). This format facilitates the presentation of real-life cases that require value justification (such as linking actions to the principles of Pancasila), encouraging cognitive elaboration in Civics (Nicol & Macfarlane-Dick, 2006).

Active students are a key measure of learning success. Students who feel engaged tend to be more motivated, focused, and eager to learn. Interactive media like Liveworksheet have been shown to increase student participation in the learning process, which in turn results in a more effective learning environment (Hattie, 2012).

Because Liveworksheet is not an adaptive learning system, AI can be incorporated into its development ecosystem:

- Detailed Design: Teachers use artificial intelligence to develop civics cases and various questions based on cognitive taxonomy (analysis, evaluation, and creation).
- Response Analytics: The ADDIE cycle (Analyze–Design–Develop–Implement–Evaluate) becomes data-driven as liveworksheet results are exported for analysis (e.g., difficulty or discrimination items) (Sugiyono, 2018).
- Remedial and Enrichment Recommendations: AI can suggest targeted remedial materials and enrichment mini-cases based on error patterns, such as when many students incorrectly associate the problem of digital bullying with the second principle (Holmes et al., 2019; UNESCO, 2021).

The independent curriculum encourages contextual learning, projects, and formative

assessment. Liveworksheet accelerates implementation in large classes due to (a) a motivation-boosting game interface, (b) auto-grading for objective questions, and (c) the flexibility to insert open-ended questions for value argumentation. In SMP Negeri 6 Bontang, students' digital character aligns with this model. Teachers can shift the focus from memorization to moral-legal reasoning, evidence discussion, and reflection, three components necessary to enhance critical thinking in Civics (PKn) (Facione, 2015).

In Indonesia, motivation and basic cognitive outcomes are the focus of studies on game-based Civics learning; only a few studies have improved critical thinking using Liveworksheet and AI-based analytics. This study contributes to (a) a practical model for integrating AI "around" Liveworksheet (design & analysis), (b) evidence that active Civics and critical reasoning are effective, and (c) a data-driven ADDIE evaluation procedure for continuous improvement of the media.

Thus, the use of Liveworksheet in Civics can be considered as a type of digital innovation that helps students improve their critical thinking skills.

Method

Setting and Participant

This research used a descriptive qualitative approach with a case study method at SMP Negeri 6 Bontang.

- Research Location: SMP Negeri 6 Bontang.
- Participants consisted of 30 students.

Data Collection

Data was obtained through:

- Observing the learning process using an AI-based educational game prototype. Recording student interactions with the media, the problem-solving process presented, and student activities before and after using the liveworksheet.
- In-depth interviews with teachers and students regarding their perceptions, responses, and experiences during learning, as well as the challenges and consequences they faced.

- Document analysis including game activity logs, student learning evaluation results, scores, and teacher reflection notes to measure the extent to which students succeeded in tasks requiring critical thinking skills.

Result and Discussion

The results of the study showed that students at SMP Negeri 6 Bontang became more active and developed better critical thinking skills after using Liveworksheet. Prior to using Liveworksheet, Civics (PPKn) learning tended to be teacher-centered, with students simply delivering material and listening to the teacher and completing exercises in textbooks. However, classroom dynamics changed significantly after using Liveworksheet, with students becoming more enthusiastic about learning.

Increased Student Engagement: When the teacher shared the Liveworksheet link, students were highly engaged. They demonstrated increased focus and enthusiasm for completing the assignment. They were motivated to try until they found the correct answer thanks to gamification features such as drag-and-drop and instant score feedback. These changes demonstrate that interactive media can encourage students to engage directly in learning and overcome passivity.

Improving Critical Thinking Skills: Civics teachers create Liveworksheets that not only test memorization but also contain simple case studies related to students' daily lives. For example, students are tasked with analyzing a story about a social media dispute between friends. They must then identify the violations of Pancasila values that occurred. Next, they are asked to match the solution with the appropriate principle. During this process, students are required to:

- Analyze: Read the case carefully to understand the problem;
- Assess: Determine which actions are in accordance with Pancasila values and which are wrong.
- Conclude: Connect the problem to the appropriate moral and legal solution.

Students' answers demonstrate improved reasoning skills.

Students' responses showed significant progress. Students were able to not only name the precepts but also explain why they did so, demonstrating the process of critical thinking.

These results support theories about how technology plays a role in education. Despite its simplicity, Liveworksheet has proven useful as a tool to encourage student-centered learning and enhance 21st-century skills.

This aligns with Facione's (2015) findings, which suggest that training students in evaluating and linking logical solutions to real-life problems improves their critical thinking skills. This exercise was conducted using Liveworksheet.

Furthermore, the observation data was compiled into a table to show the differences in student activity before and after using Liveworksheet.

Table 1. Comparison of Student Activity Before and After Using Liveworksheet

Student Activity Aspects	Before Using Liveworksheet	After Using Liveworksheet
Participation in class Student	30%	80%
Discussion and interaction	10%.	85%
Critical thinking skills	40%	85%
Motivation to learn	45%	100%
Feedback speed	30%	95%
Presence and attention	40%	85%

The table above shows that participation, motivation, and critical thinking skills significantly increased after using Liveworksheet. Interactive media outperformed conventional approaches,

increasing participation from 30% before use to 80% after use. Students were more likely to ask questions, speak up, and even help each other understand problems.

Discussions and interactions also increased sharply, from just 10% before use to 85% after use, indicating that students were more engaged in collaborative learning. Critical thinking skills increased from 40% before use to 85% after use, with students demonstrating a greater ability to analyze cases, argue, and connect concepts to Pancasila values.

Motivation to learn increased dramatically, from 45% before use to 100% after use, as students perceived Liveworksheet as a digital game, making the learning process more enjoyable and challenging. The speed of feedback increased from 30% before use to 95% after use, allowing students to immediately identify errors and correct them. Similarly, attendance and attention increased from 40% before use to 85% after use, with students becoming more focused and actively engaged in class.

In interviews, teachers stated that Liveworksheet increased student motivation and encouraged them to refine their answers and think more critically. They also stated that Liveworksheet made the formative assessment process more practical. Furthermore, the teacher's role now extends beyond simply delivering material to help students reflect on the game and relate it to real-world situations. This makes learning more contextual and meaningful.

However, some students struggle to understand the in-game instructions, especially those new to digital technology. For optimal implementation, technical challenges such as unstable internet connections and device limitations also need to be addressed. Nevertheless, research shows that Liveworksheet increases student engagement, encourages critical thinking, and makes Civics learning more contextual and meaningful. Adaptive strategies such as providing offline worksheets or alternating device usage can mitigate technical barriers.

Conclusion

According to this study, the use of Liveworksheet as a game-based learning medium at SMP Negeri 6 Bontang successfully increased student engagement and critical thinking skills in Civics (PPKn). Liveworksheet's ability to provide an interactive, challenging, and real-life learning experience is fundamental to this success. Liveworksheet encourages students to think and evaluate beyond memorization by presenting real-life examples. Traditional learning tends to be passive, with students simply listening to the teacher and completing monotonous exercises.

Student engagement showed the most significant improvement; class participation increased from around 30% to 80%. Students were also more engaged in active discussions, solving problems, and expressing critical questions and opinions. Drag-and-drop capabilities, interactive multiple-choice learning, and instant feedback increased engagement.

Students' critical thinking skills improved, in addition to their active participation. Liveworksheets don't just offer memorization questions; they also use contextual cases to encourage students to think, evaluate, and draw conclusions in line with Pancasila values. This supports Facione's (2015) argument, which states that real-world problem analysis exercises, both individually and in groups, enhance critical thinking skills.

Furthermore, this study demonstrates that teachers can use Liveworksheets as an alternative digital medium to achieve educational goals by creating innovative and effective learning as a process supporting the independent curriculum. This goal is to shape a young generation that is not only academically intelligent but also possesses strong critical thinking and character. Furthermore, this study suggests that schools must strengthen their technological infrastructure so that all students have equal access to digital learning.

Therefore, Liveworksheets can be a creative approach to improving the quality of Civics learning while simultaneously teaching students critical thinking skills in the digital age.

Because the system provides automatic feedback, the use of Liveworksheets

simplifies the formative assessment process for teachers. Teachers can utilize more time to encourage discussion, reflection, and relate lessons to everyday life. This makes the teacher's role more strategic as an effective learning facilitator rather than simply a transmitter of information.

In line with the above, Liveworksheet can increase student motivation, engagement, and critical thinking skills in Civics learning. However, by using adaptive strategies such as providing offline versions or alternating device usage, technical challenges like unstable internet connections and device limitations can be avoided.

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