

Development of Innovative Learning Based on Design Problem Solving and Cognitive Empathy through the Educational Game "Rancang & Refleksi"

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ABSTRACT

The rapid advancement of digital technology demands a transformation in higher education to produce graduates who are not only technologically proficient but also possess strong soft skills. Generation Z, as digital natives, often faces challenges in social interaction and contextual problem-solving. This study aimed to develop an innovative learning medium in the form of a serious board game titled "Rancang & Refleksi" to enhance Design Problem Solving and Cognitive Empathy skills. The research utilized a development approach (R&D) using the Design Thinking framework adopted from UGM MOOCs, encompassing the stages of Empathize, Define, Ideate, Prototype, and Test. The results indicated that the game effectively stimulated high-level cognition through cooperative gameplay mechanics. The "Persona Cards" feature trained perspective-taking (empathy) by revealing hidden needs, while resource management in the "Action Cards" trained strategic decision-making under pressure. This medium bridges the gap between conventional teaching methods and the interactive learning preferences of Generation Z.

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1. INTRODUCTION

The rapid advancement of digital technology demands a fundamental transformation in higher education systems, requiring institutions to provide more flexible and adaptive learning models. In the era of Industrial Revolution 4.0 and Education 4.0, university graduates are expected to master not only technological literacy but also human literacy, which includes critical thinking, creativity, complex problem-solving, and effective social interaction [4], [5].

Generation Z (born between 1995 and 2010) possesses unique characteristics as digital natives who are highly accustomed to instant feedback and practical exploration. However, a significant challenge arises as their high dependency on digital interaction often creates a gap in face-to-face interpersonal skills and contextual engagement. There is a fundamental problem regarding the lack of effective and engaging soft skills learning methods that can bridge the gap between industry competency needs and the interactive learning preferences of Gen Z. Conventional, abstract, and lecture-based teaching methods tend to be less attractive and less impactful for this generation [1], [2], [26].

In response to these challenges, Universitas Bina Darma collaborated with Universitas Gadjah Mada through the Massive Open Online Courses (MOOC) platform to develop educational innovations [12]. This research adopted the Design Thinking methodology—a human-centered approach focused on empathy and iterative solution-finding to design a specialized learning medium in the form of a Serious Board Game titled "Rancang & Refleksi" [3], [13]. Unlike traditional entertainment games, serious games are purposefully designed to achieve pedagogical goals through immersive simulations where players can experiment with real-world scenarios in a safe environment [18].

The primary objective of this development is to cultivate two essential competencies: Design Problem Solving and Cognitive Empathy. Problem-solving is defined as the ability to recognize, formulate, and apply effective solutions

to complex issues [10]. Meanwhile, cognitive empathy is the intellectual ability to understand others' perspectives and predict behaviors through mental attribution, which is vital for professional social functioning [9], [15]. This development is expected to contribute to the educational psychology literature by providing an evidence-based method for soft skills development through interactive game media.

2. RESEARCH METHOD

This study employs the Research and Development (R&D) method, adapting the Design Thinking framework. The procedure follows five systematic phases [14]:

- 1) Empathize: identifying the learning preferences of Gen Z students who require interactive methods.
- 2) Define: Formulating the gap in soft skills learning and the need for safe social simulation.
- 3) Ideate: Conceptualizing a cooperative Serious Board Game focused on social-academic dilemmas without negative competition.
- 4) Prototype: Developing the physical components of the game consisting of The Canvas (Game Board), Case Cards, Persona Cards, Action Cards, Reflection Cards, and Resource Tokens.
- 5) Test: Conducting simulations to test game mechanics in stimulating empathy and problem-solving, followed by reflection through a Logbook [30].

3. RESULTS AND DISCUSSION

The primary outcome of this research is the physical prototype of the "Rancang & Refleksi" Educational Game. A physical board game format was deliberately chosen over a digital platform to foster direct face-to-face interaction, which is essential for addressing the interpersonal skill deficits often found in digital-native generations [21].

3.1. Description of Game Components

The primary output of this development is the "Rancang & Refleksi" educational board game. The central element of the game is "The Canvas" board, which features a circular path representing the iterative stages of the Design Thinking cycle. The visual integration of the game components, including the board, tokens, and various card decks, is illustrated in Figure 1.



Figure 1. The Physical Prototype of "Rancang & Refleksi" Board Game Components

The game utilizes a systematic set of components designed to bridge theoretical knowledge with practical simulation. Each component is mapped to a specific psychological or educational function as detailed in Table 1.

Table 1. Components and Functions in the "Rancang & Refleksi" Game

Component	Psychological & Educational Function
Case Cards	Act as problem triggers featuring current student issue narratives (e.g., burnout, ghosting).
Persona Cards	Empathy testing instruments with a dual-layer mechanism (Front: Observable Behavior, Back: Hidden Psychological Need).
Action Cards	Media for decision experimentation using a resource trade-off system (balancing Time and Stress tokens).
Reflection Cards	Metacognition tools used to evaluate players' internal mindsets and collaborative decisions.

3.2. Competency Stimulation Analysis

The discussion on the effectiveness of the game focuses on three main aspects according to the learning objectives:

- 1) Cognitive Empathy Stimulation: During the Empathize Phase in the game, players are "forced" by the rules to spend Time Tokens to flip the Persona Card and see the "Secret Info" (Hidden Need). Psychologically, this trains players not to judge someone solely by their external behavior (symptoms) but to understand their internal motivations. This aligns with the definition of cognitive empathy as the ability to take another's perspective [9], [15].
- 2) Design Problem Solving Stimulation: In the Ideate Phase, the team is faced with Action Card choices that have mathematical consequences. Players must negotiate to choose the best solution while considering resource constraints (Time Tokens) and risks (Stress Tokens). This mechanism simulates real-world problem-solving that demands critical analysis and decision-making under pressure [10], [17].
- 3) Metacognition and Reflection: The final phase of the game requires filling out a Reflection Journal (Logbook). This activity facilitates the process of "thinking about thinking" (metacognition), ensuring that the playing experience is transformed into documented permanent learning [28].

4. CONCLUSION

The development of the "Rancang & Refleksi" Educational Game has successfully integrated the Design Thinking methodology into a concrete and structured learning medium. The game serves effectively as an intervention tool to enhance Problem Solving and Cognitive Empathy skills in Generation Z students

The game mechanics, which combine role-playing through Persona Cards and strategic management through Action Cards, have proven valid in stimulating high-level cognition. It is recommended that educational institutions adopt game-based learning (gamification) in curricula or soft skills training sessions to create a more immersive and impactful learning environment.

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