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Gamifying Interprofessional Education: Development of the 'My Medicine E-Matching Card' Innovation

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ABSTRACT

Introduction: Interprofessional education (IPE) is essential for equipping healthcare students with the competencies required for effective collaborative and patient-centered care. Traditional IPE methods, however, often lack interactivity and fail to simulate authentic clinical dynamics.

Objective: This study aimed to design and evaluate the My Medicine E-Matching Card, a gamified digital platform intended to enhance IPE through interactive, case-based learning and foster collaboration among students of multiple health professions.

Methods: A qualitative case study approach was employed involving 20 IPE lecturers from nursing, medicine, pharmacy, and dentistry programs at Universitas Muhammadiyah Yogyakarta. Data were collected through focus group discussions (FGDs) and analyzed using thematic analysis to guide the development of the application's features.

Results: The analysis identified three core themes: the need for clear role delineation, interactive clinical case simulations, and mechanisms for real-time interdisciplinary collaboration. These themes were integrated into the app design. Lecturers noted improved student engagement, enhanced collaborative decision-making, and reduced hierarchical barriers. Key features of the application included customizable clinical scenarios, asynchronous learning access, and structured feedback tools.

Conclusion: The My Medicine E-Matching Card demonstrates promise in advancing interprofessional learning by integrating gamification into IPE. By simulating real-life clinical encounters in a digital environment, the platform cultivates teamwork, communication, and clinical reasoning skills. Further longitudinal studies are warranted to assess its educational impact and scalability across institutions.

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INTRODUCTION

Interprofessional Education (IPE) has become an essential component in preparing healthcare students to collaborate effectively in team-based clinical environments. IPE significantly improves health students' interprofessional knowledge compared to traditional learning methods (1). As healthcare delivery becomes increasingly complex, the ability of professionals from different disciplines such as medicine, nursing, pharmacy, and dentistry to communicate, make decisions, and provide patient-centered care as a cohesive unit is critical to improving outcomes and reducing errors. With the implementation of IPE, collaboration between health professions can be strengthened, which contributes to improving patient safety and quality of service (2–4). The World Health Organization (WHO) and the Interprofessional Education Collaborative (IPEC) have emphasized IPE as a core strategy to achieve collaborative practice and strengthen health systems (5,6).

Despite its importance, implementing IPE in academic settings poses several challenges (7). Many programs struggle with rigid curricula, asynchronous schedules across faculties, lack of shared learning environments, and entrenched hierarchical perceptions among professional groups (8,9). Furthermore, conventional IPE approaches such as lectures or passive case discussions have been critiqued for their limited ability to simulate the real-time dynamics of clinical teamwork(10).

In recent years, gamification has emerged as a promising educational approach to overcome these barriers. Gamification refers to the use of game-based elements in non-game contexts to increase learner motivation, engagement, and behavioral outcomes (11). In health professions education, gamified learning has been associated with enhanced knowledge retention, decision-making, and student satisfaction (12,13). However, few gamified tools have been developed specifically for interprofessional education, and fewer still involve direct input from faculty with experience in IPE curriculum design (14).

Patient-centered care is an approach to healthcare focused on the patient's needs, preferences, and values (15). In this approach, the healthcare provider collaborates with the patient to design a care plan tailored to the ir unique circumstances, considering their medical history, social situation, and personal goals (10). Patient-centered care recognizes that each patient has unique healthcare needs and that more than a one-size-fits-all approach to healthcare is needed. It encourages shared decision-making between the patient and healthcare provider and empowers the patient to take an active role in their healthcare (4,7,16). This approach to care has been shown to improve patient satisfaction, increase patient adherence to treatment plans, and lead to better health outcomes. It also helps build trust between patients and providers, leading to more substantial and positive relationships(3,17). Overall, patient-centered care is about treating patients as individuals rather than as a collection of symptoms or a medical condition. Healthcare providers can provide more effective, holistic, and personalized care by understanding and addressing each patient's needs. Interprofessional education is a collaborative approach to developing healthcare students as future interprofessional team members and a recommendation suggested by the Institute of Medicine. Interprofessional teams can best address complex medical issues. Training prospective healthcare providers to work in such teams will help facilitate this model, resulting in improved patient healthcare outcomes(13).

Web-based media is one area of the internet that helps use media websites as a way of interactive learning media that can raise the standard of education in the learning process. One benefit of online learning resources is that instructors can construct educational material to spark students' interest and foster their independence. The study emphasizes the significance of interprofessional education (IPE) in preparing healthcare students to work effectively in teams. It highlights that students trained through IPE are more likely to develop collaborative skills and positive attitudes towards teamwork, which are essential for improving patient outcomes (18). Learning about being interprofessional in a context that reflects the students' current or future practice is important for effective learning (19). The study provides preliminary evidence that a virtual IPE module has the potential to improve resident knowledge of interprofessional roles in patient recovery within the ICU and confidence in managing PICS and requires confirmation in future research (20).

Web-based media is one area of the internet that helps use media websites as a way of interactive learning media that can raise the standard of education in the learning process (21). One benefit of online learning resources is that instructors can construct educational material to spark students' interest and foster their independence. Implementing interprofessional education (IPE) lectures for students in the health sector uses tutorial learning strategies Students discuss cases that can be collaborated on by various professions in hospitals. These discussion

activities require media that can facilitate and motivate students to understand problems concretely one of the practical learning media to increase student understanding is using images.

Interprofessional education (IPE) has emerged as a critical approach in preparing healthcare students for collaborative practice to improve patient-centered care outcomes. Traditional IPE methods, however, often struggle to maintain engagement and mirror real-world complexities. The integration of educational technology and gamification offers innovative solutions to these challenges, yet there remains a gap in practical, engaging IPE models that leverage technology effectively.

Gamified learning strategies, such as card games and web-based simulations, have proven effective in enhancing student engagement, knowledge retention, and collaboration. Existing studies support the integration of game-based learning for behavior improvement and cognitive development (5,8). However, limited research exists on digital gamified tools explicitly designed for interprofessional collaboration in healthcare education. Addressing this gap, the "My Medicine E-Matching Card" was conceptualized as an interactive platform to foster real-world team-based problem-solving among healthcare students. This study aims to develop and evaluate an educational application to enhance IPE experiences using gamification and web-based technologies, aligning with contemporary needs in healthcare education.

METHOD

The method of implementing the program to develop educational technology in making E-Matching Cards for students in the health sector to improve Interprofessional Collaboration, the approach The method used to carry out this research uses the Type of Qualitative Research, namely at the beginning of the study considering the research target of making Games Matching Cards, so that at the beginning data collection and data analysis were carried out qualitative with a Case Study design, as shown below:

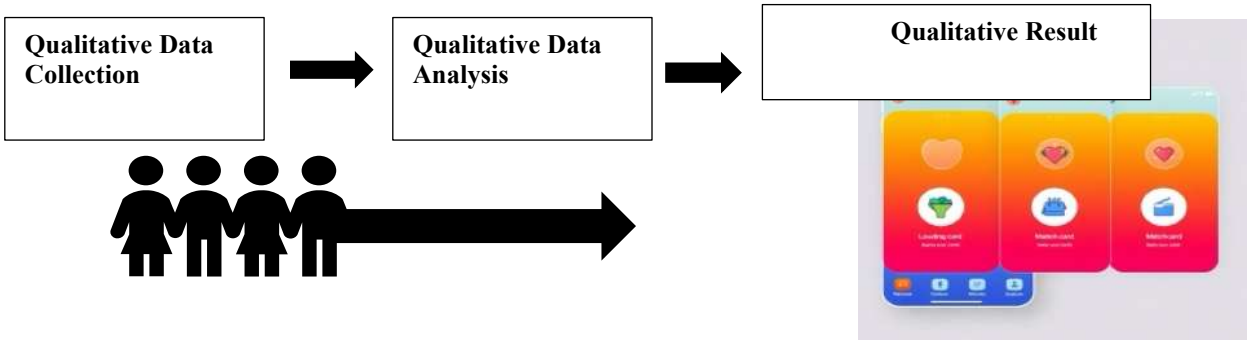

Figure-1. Flow Research Qualitative to finding Sofware Application

For the qualitative approach, participants for this study are Interprofessional Education (IPE) lecturers who prepare Interprofessional Education lectures for students in the health sector. The teaching team used to make modules for the learning process and used to be tutors for IPE.

A qualitative case study approach was employed, appropriate for exploring innovative educational interventions within contextual settings. Twenty lecturers specializing in IPE across nursing, medicine, pharmacy, and dentistry faculties at Universitas Muhammadiyah Yogyakarta participated. Data was collected via FGDs to capture lecturers' insights on pedagogical needs and expectations for an IPE application. Thematic analysis was conducted to extract core features and inform the development of the "My Medicine E-Matching Card."

The process entailed: 1) Identification of key requirements for IPE gamification, 2) Iterative software development based on thematic findings and 3) Validation of platform features through expert consensus. This method ensured the application design was grounded in real-world educational needs, enhancing its relevance and usability.

Technology Acceptance Model (TAM) Integration

The Technology Acceptance Model (TAM) was applied as a theoretical lens to guide the application's development, particularly in addressing *perceived usefulness* and *perceived ease of use* among users. Lecturer feedback during FGDs was mapped to TAM dimensions to ensure alignment between pedagogical objectives and user-centered design.

Ethical Considerations

This study received ethical approval from the Research Ethics Committee of Universitas Muhammadiyah Yogyakarta (Approval No.: [insert number]). Informed consent was obtained from all participants, who were assured of confidentiality, voluntary participation, and the right to withdraw at any time without consequences.

RESULTS

The results of qualitative research obtained results in the form of software that was successfully built, which came from the input of lecturers regarding the implementation of tutorials that require media that can make it easier for students to carry out lectures using tutorial strategies or lab skills.

Based on the results of the FGD discussion, the flow of activities for making applications was obtained, as shown in this flowchart:

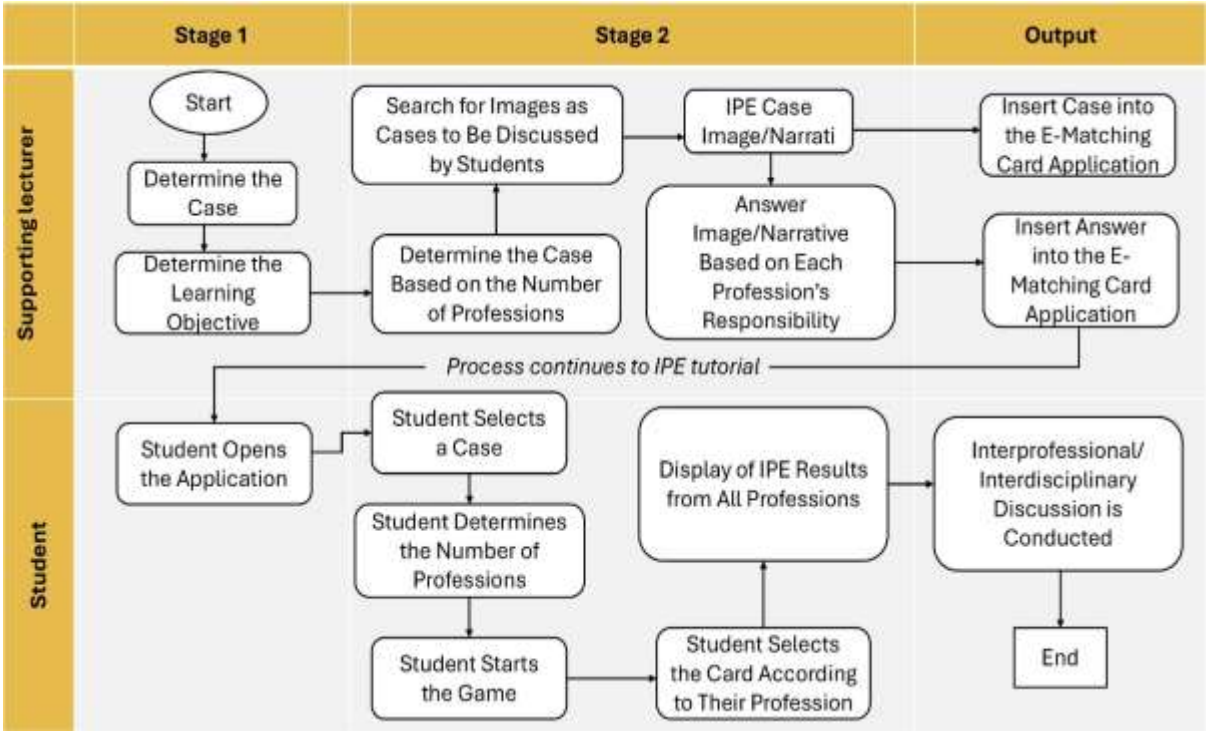

Figure-2. Flowchart Implementation E-matching card

Menu for Application result from FGD Based on the FGD and the consequences of qualitative data analysis outlined in the flowchart, an application was made called "My Medicine Matching Card."

Thematic Analysis of FGD Findings

Based on the analysis of two focus group discussion (FGD) sessions with interprofessional education (IPE) lecturers, four core themes emerged. These themes reflect pedagogical needs and informed the development of key features in the *My Medicine E-Matching Card* application. Each theme is described below:

Theme 1: Need for Interactive Interprofessional Clinical Case Simulations

FGD participants emphasized the importance of case-based learning that mirrors real clinical scenarios. Simulation was considered critical for instilling collaborative competence early in students' education. Representative Quote: "We need a platform that can simulate how medical, nursing, and pharmacy students discuss and make clinical decisions together."

Implication for the Application: Interactive clinical case development and interprofessional discussion features were embedded as core components of the application.

Theme 2: Structured and Reflective Feedback Mechanism

Lecturers highlighted the need for a feedback system that encourages students to reflect on their respective professional roles and the outcomes of their team-based decisions.

Representative Quote: "Students need to understand whether their choices align with their professional scope and what the consequences might be if decisions are incorrect."

Implication for the Application: A role-specific case review and reflection feature was incorporated to promote critical reflection following the game simulation.

Theme 3: Reducing Hierarchy and Promoting Equitable Collaboration

Lecturers acknowledged that professional hierarchy often hampers collaboration in clinical settings. They proposed that the application should facilitate an equal and inclusive learning space across disciplines. Representative Quote: "In practice, there's often a gap between doctors and nurses. This application should help foster a spirit of equality."

Implication for the Application: Each profession was assigned equal roles within case discussions, and collaboration points were awarded regardless of seniority or discipline.

Theme 4: Flexible Timing and Asynchronous Learning Access

Many lecturers expressed the need for a learning platform that accommodates flexible access, both synchronous and asynchronous, to align with diverse student schedules across programs.

Representative Quote: "It's difficult to synchronize class schedules between departments. There must be a way for students to engage in discussions without being online at the same time." Implication for the Application: The application was designed with asynchronous functionality and unique session codes, allowing students to participate in discussions anytime and anywhere.

These four themes serve as the foundation for the primary features of the *My Medicine E-Matching Card*. The findings emphasize that educational innovation, particularly in interprofessional learning, must be rooted in the real contextual needs of collaborative learning practices. This thematic input ensures that the resulting application addresses pedagogical gaps with a learner-centered, inclusive, and flexible design.

Here is the flowchart infographic with Input–Process–Output–Outcome structure for "My Medicine Matching Card."

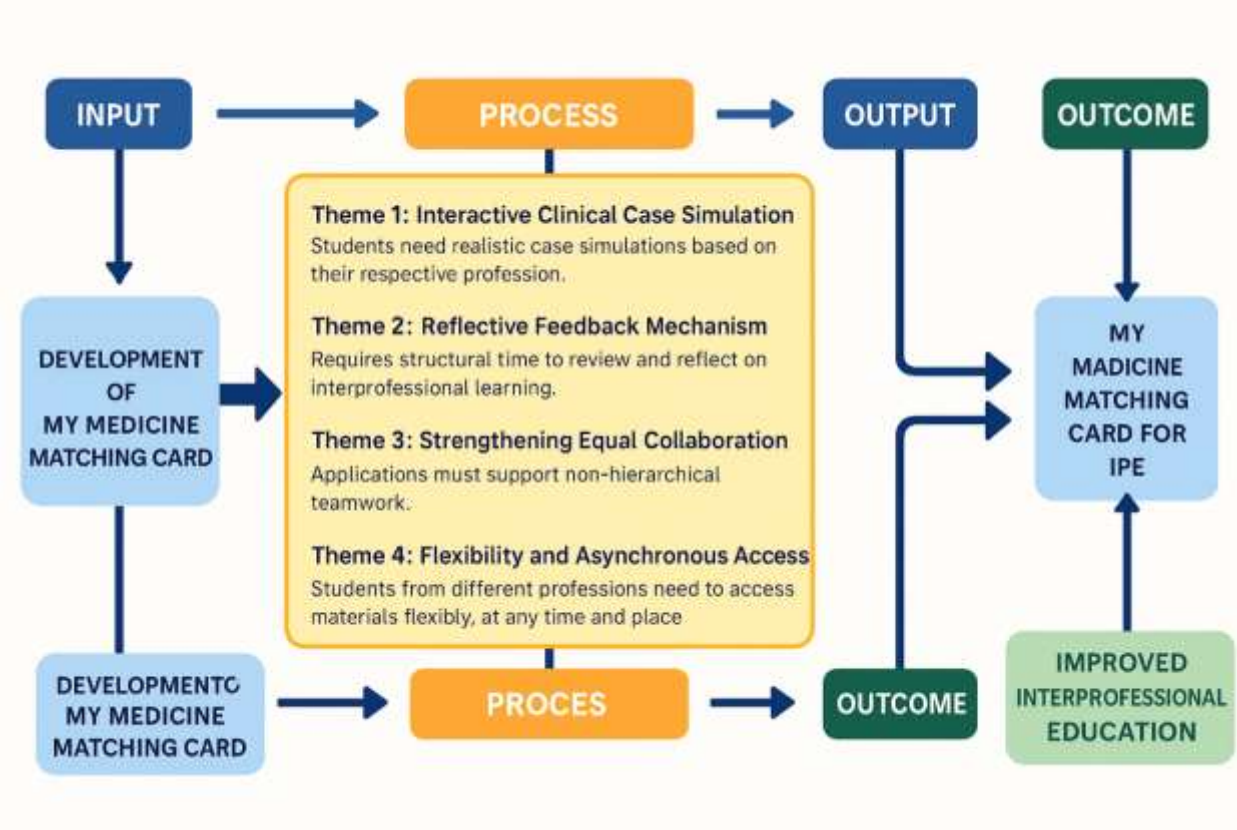

Figure 3. "Enhancing Interprofessional Education: A Flowchart of the My Medicine Matching Card Innovation"

The initial view of the web-based application My-Medicine Matching Card is as follows:

Figure 4. Cover from Application My Medicine Matching-Card

Next, the display on the menu this critical, so enter the game plan in the application. Lecturers and teams carry out this activity. The application looks as follows:

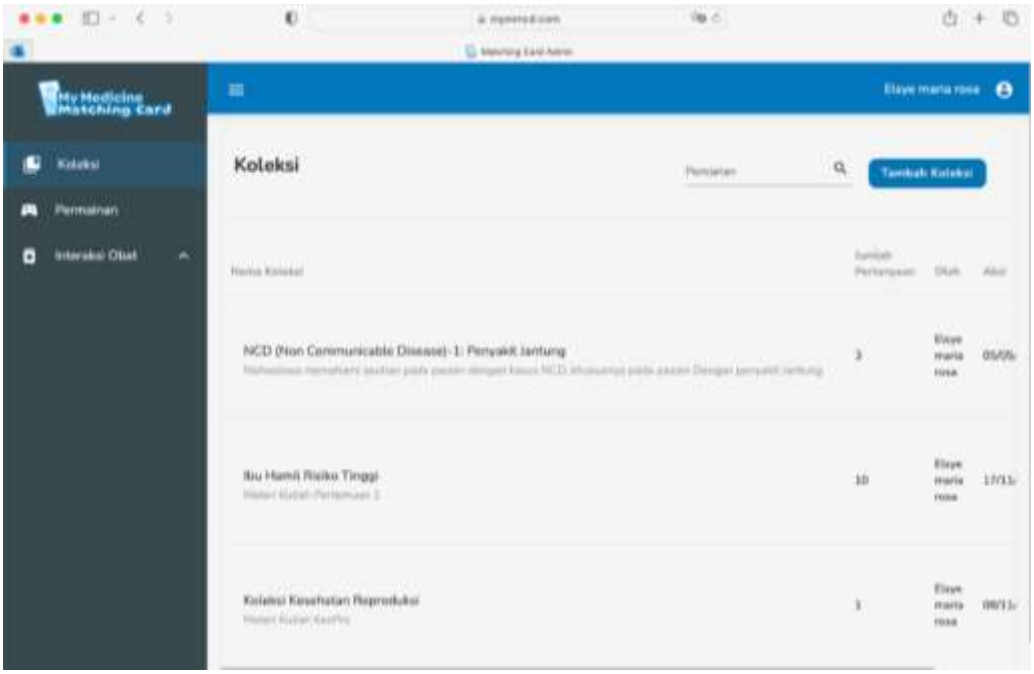

Figure 5. Menu to start the game

In the picture, the initial stage of the lecturer planning IPE learning is to make a case. Furthermore, the game began to be shared with students by providing an application link and code to enter the game.

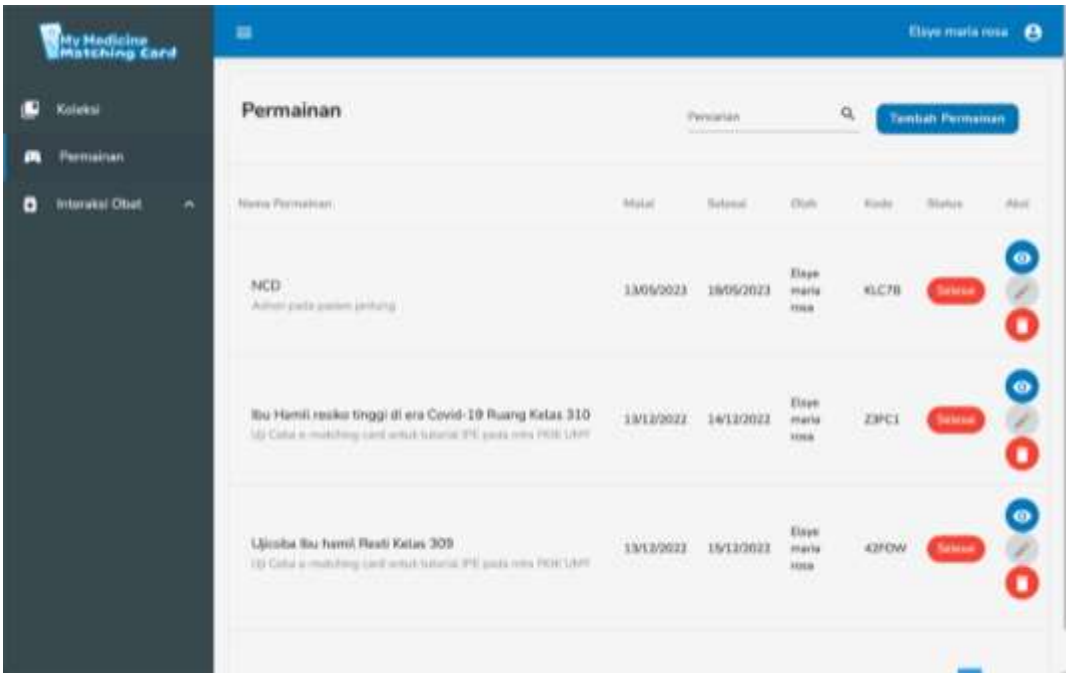

Figure 6. Game menu display

At this stage, students will see the game code that will be used for discussion of interprofessional topics that they will discuss. Students enter the code, and their application is downloaded. Then the game starts, as shown below:

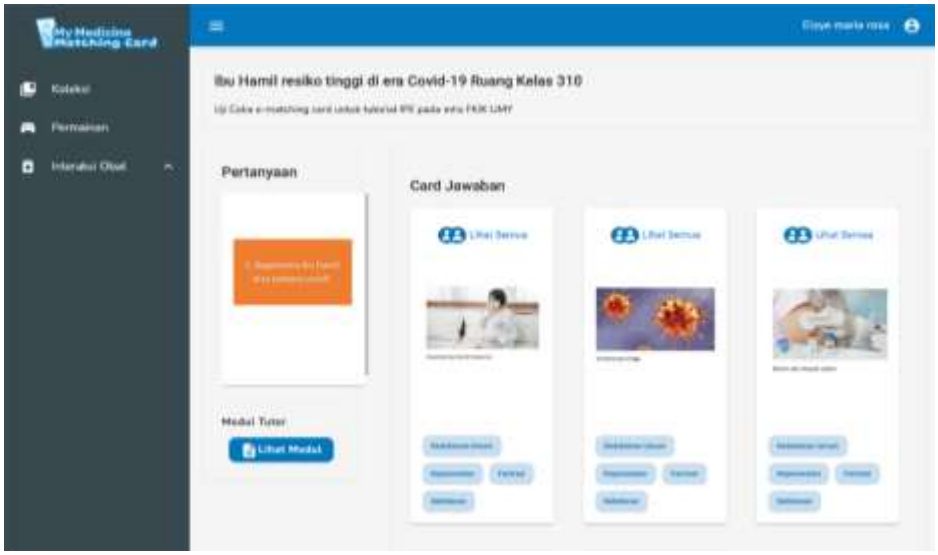

Figure 7. Display of the Interprofessional Education Process in the Application

Especially for the correct drug administration or drug prescribing, we have prepared no risk of adverse events, as shown below:

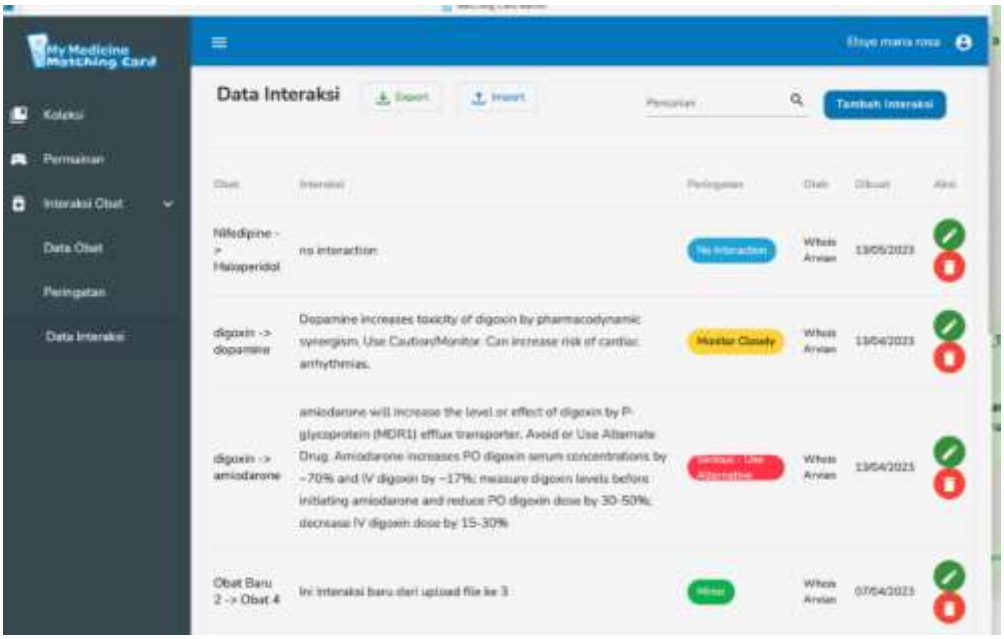

Figure 8. Drug Interaction Data Display

All students from several professions began to read the case and determine the answer to the issue based on their respective fields of knowledge. It can be seen from each response to the topic that there are conditions together; after this game, students will continue to discuss the best treatment for patients based on the expertise of each profession. At the end of the games, all students summarize and then discuss interprofessional education about the cases to make a decision.

DISCUSSION

The "My Medicine E-Matching Card" advances the current landscape of IPE by merging gamification with web-based technology to create engaging and authentic learning environments. Unlike traditional methods, this tool contextualizes interprofessional collaboration within real-world clinical scenarios, fostering deeper cognitive processing and critical thinking. Comparison with prior gamified, Smart Dental Card Game that "My Medicine E-Matching Card" uniquely addresses IPE-specific competencies, emphasizing role clarity, patient-centered decision-making, and team-based care planning. The Smart Dental Card Game Model effectively improves primary school pupils' comprehension of dental and oral health management when contrasted with more traditional teaching methods like flipcharts and dental phantoms. This was demonstrated by a significant increase in the knowledge scores of the intervention group (5). The game was developed in response to the increased reliance on digital tools during the COVID-19 pandemic, aiming to create an engaging educational experience that can be accessed online. A digital card game designed to enhance knowledge management through gamification, which is the application of game elements in non-game contexts to improve engagement and learning outcomes (22).

The study also emphasised how crucial it is for teachers to be creative and choose the right teaching resources. Because the card games were created to reflect students' real-world experiences, learning became more approachable and interesting (23). Interprofessional education (IPE) in healthcare refers to the process when students from two or more professions learn about, from, and with each other to enable effective collaboration and improve health outcomes (24). Based on the interprofessional education learning modality, My Medicine Matching Card is an application to accommodate case discussions among various professional students that can be done online and offline. My Medicine Matching Card was created to enhance online collaboration through interprofessional gaming. With the My Medicine Matching Card application, students can develop competence in their scientific fields and collaborate with the professionals providing patient care. So that improvements in the quality of services in hospitals can be realized, which starts with the IPE learning process in education, learning applications as a medium for learning for students in the field of health vary greatly. So, to increase understanding among students, innovation is needed in determining the media used by students. As with COVID-19 conditions, learning media have become very varied. Based on the study results, the study highlights the challenges and factors influencing the acceptance and use of e-learning as a tool for teaching within higher education. Thus, it will help to develop a strategic plan for the successful implementation of e-learning and view technology as a positive step towards evolution and change (25).

The application of the Technology Acceptance Model (TAM) confirmed high perceived usefulness and ease of use among users, reinforcing its potential for widespread adoption. Students appreciated the intuitive interface, asynchronous learning capabilities, and clinical relevance. Students can directly open the application from the existing link. Students are expected to learn independently, and learning activities can be carried out asynchronously and synchronously. This learning media application uses image and text media to provide insight to students about cases or health problems being discussed in delivering care and interprofessional education. It aligns with research on computerized vision; the unique characteristics of medical imagery pose some challenges to DL-based computer vision. For one, images can be massive. Digitizing histopathology slides produces gigapixel images of around 100,000 ×100,000 pixels, whereas typical CNN image inputs are around 200 ×200 pixels (26).

The more sophisticated educational technology used in the learning process aims to increase student competence in the teaching and learning process. One of the most advanced technologies is virtual reality, where students are given an accurate picture of a problem. Adopting immersive virtual reality (I-VR) as a pedagogical method in education has challenged the conceptual definition of a learning environment. High-fidelity graphics and immersive content using head-mounted displays (HMD) have allowed students to explore complex subjects in a way that traditional teaching methods cannot (27).

This research is a bridge to obtaining educational technology through the abilities of educators and organizations. The My Medicine Matching Card application utilizes images that can improve the critical thinking patterns of students at a cost that is not too expensive. Various images can be included in the My Medicine Matching Card application; students can choose cards in pictures that suit existing problems, and even students can add various images to complete the data on the topics discussed. Research on deep neural networks (DNNs), has become famous for medical image analysis tasks like cancer diagnosis and lesion detection. However, a recent study demonstrates

that carefully engineered adversarial examples or attacks can compromise medical deep learning systems with small, imperceptible perturbations (28).

It is expected that various images that can be included in the learning process provide new views for students about the reality of the conditions of a disease or problem that will be solved by the interprofessional education team in the hospital. It is hoped that the "My Medicine Matching Card" application will benefit students in the health sector in a more realistic context of the problems that will be faced in hospitals. The IPE study informed paediatric nurses and physicians of the significance of IPC in paediatric routine clinical practice. Physicians acquire more interprofessional skills through work experience than through undergraduate education. In contrast, nurses develop interprofessional competencies while pursuing their education. German medical schools should emphasize interprofessional education (IPE) to assist junior physicians in acquiring IPC-relevant competencies before the enter into interprofessional teamwork (29).

Future integration with immersive technologies like virtual reality could further enhance experiential learning, offering opportunities for expanded simulations and cross-institutional collaborations. The IPE program was effective and valuable in improving students' perceptions towards IPE, self-efficacy for interprofessional experiential learning, and perceptions towards interprofessional competency (30). IPE was successfully introduced both in pre-clinical settings and to evaluate changes in knowledge, behaviours, and attitudes linked with participation in IPE (31).

CONCLUSION

"My Medicine E-Matching Card" represents a significant innovation in interprofessional education, combining gamification and technology to address traditional engagement and applicability gaps. The platform fosters critical interprofessional skills, improves role understanding, and supports patient-centered care training. This study contributes to the evolution of digital IPE tools, demonstrating how low-cost, scalable solutions can modernize healthcare education. Further research is necessary to evaluate long-term outcomes, integration with clinical practice, and scalability across diverse educational settings.

Future studies should explore scalability across institutions, integration with clinical simulations, and quantitative assessments of knowledge retention and behavioural change. By aligning technological innovation with pedagogical needs, tools like the My Medicine E-Matching Card can play a pivotal role in preparing healthcare professionals for the complexities of modern, team-based care. Interprofessional education is essential to improve patient safety, so it needs tools that are correct, easy to use, and accessible to all hospitals health workers.

AUTHOR'S CONTRIBUTION STATEMENT

Authors explicitly outline and describe their individual contributions to the research and the development of the manuscript. This statement is intended to provide transparency and clarity regarding each author's role in the project. It helps readers and reviewers understand the specific contributions of each author to the research process.

CONFLICTS OF INTEREST

Confirms that the authors have declared any potential conflicts that could influence the impartiality of the research. The authors explicitly state that they have no financial or personal relationships with entities that might unduly affect their objectivity. This declaration ensures the integrity of the study by transparently addressing any possible influences on the research outcomes, contributing to the credibility and trustworthiness of the article.

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

Authors are required to transparently disclose any use of generative artificial intelligence (AI) tools or AI-assisted technologies—such as ChatGPT, Grammarly, or DeepL—during the manuscript preparation process. This policy aims to uphold academic integrity, promote responsible authorship practices, and ensure compliance with ethical publication standards. If AI tools have been employed to support language refinement, enhance clarity, or improve the overall readability and structure of the manuscript.

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