



Empowering high school students' banking literacy through QR Code-based Snakes and Ladders Game

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ABSTRACT

A 2024 national survey by the Financial Services Authority (FSA) revealed that 43 percent of Gen Z still lack an understanding of banking institutions. One high school facing similar challenges in banking education is SMA 17 Agustus 1945 (SMATAG) Surabaya. Student performance in the banking section of economics remains suboptimal, with average scores among 11th-grade social science students ranging from 6.0 to 6.2. Teachers currently lack interactive learning media to help students effectively grasp the material. To address this issue, the community service team from Hayam Wuruk Perbanas University implemented an interactive educational approach using a QR Code-based snakes and ladders game. The program employed a Community-Based Participatory Research (CBPR) method involving three economics teachers and 86 students. The stages included coordination, game board design and development, trials, further refinement, lectures and gameplay, and evaluation. The results showed a significant improvement in students' banking knowledge, with average scores increasing from 42.70 (pre-test) to 86.14 (post-test). The overall program was well received, earning an average score of 4.07. These findings indicate that interactive, technology-based games can serve as effective educational tools and enhance students' motivation to learn.

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1. INTRODUCTION

The Indonesia economic system consists of financial institutions, both banking and non-banking. The main role of these financial institutions is to act as intermediaries by gathering funds from surplus parties and channeling them to deficit parties in the form of loans (Wahyuni, 2025). The banking financial institutions in Indonesia refer to Law No. 10, 1998, which defines banks as financial institutions that collect funds and redistribute them to the community, as well as provide other financial services. Based on this explanation, banks play an important role in the macroeconomy. Banks products, including saving, checking accounts, deposits, short and long-term loans, and other financial services such as transfer, Save Deposit Box (SDB), are crucial for the public to understand. Public funds are the main source for loan distribution, making banks key intermediaries operating on the principle of trust.

Referring to knowledge of financial institutions, the 2024 National Survey of Financial Literacy and Inclusion reveals that individuals in the age group of 15-17 years have a financial literacy index of 51.68 percent for conventional banks (Otoritas Jasa Keuangan & Badan Pusat Statistik, 2025). The survey results indicate that 57 out of 100 young individuals have a fairly good understanding of conventional bank products and services. However, 43 percent still lack a general understanding of bank products and services.

The age group of 15-17 years still has a long-life journey ahead, making it crucial to acquire banking knowledge related to financial management that has long-term implications (Sumardi & Habibi, 2022). Demographically, this age group belongs to Generation Z (Gen Z), generally born between the mid-1990s and the early 2000s (Csobanka, 2016; Dolot, 2018; Tata et al., 2023). In this context, Gen Z was born in the digital era, making them closely connected to internet technology. Social networking sites serve as the primary platforms for communication, and they are skilled in using various electronic devices (Csobanka, 2016; Francis & Hoefel, 2018). This generation is also predominantly still engaged in general or secondary education, which is considered to have enabled them to think and act wisely, including in managing finances (Lestari & Trenggana, 2017). Understanding the elements of age, education, and the characteristics of this generation is crucial when considering educational media for Gen Z. According to the general characteristics of Gen Z, it is necessary to consider the role of technology in the literacy process of banking products and services.

One of the private public high schools in Surabaya is SMA 17 Agustus 1945, commonly known as SMATAG. The school is located on Semolowaru 45, within the campus complex of the 17 Agustus 1945 University (UNTAG), Sukolilo, Surabaya. SMATAG has been established since July 1, 1948, with the vision of becoming a favored school. The total number of students at the school is 577. The majority of the students are female, totaling 310, while the remaining 267 are male. The school employs 30 teachers. The infrastructure available at the school includes 14 classrooms, four laboratories, and one library. SMATAG offers two major fields of study in grade XI through an Intelligence Quotient (IQ) test. For the 2024-2025 academic year, the Social Sciences department opened three classes. Each class has an average of 30 students, bringing the total number of students in this department to around 90. The condition of SMATAG is shown in Figure 1.

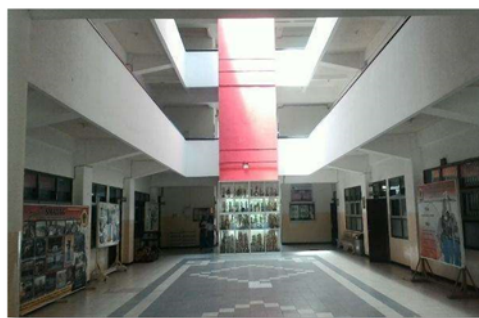


Figure 1. SMATAG's environment

Based on an interview with the school counselor at SMATAG, it was found that the average score of 11th grade Social Sciences students in Economics remains relatively low, ranging between 6.00-6.20. Formative evaluation results provided by Economics teachers also indicate that students scored lowest-between 5.00-6.00-on the topic of banking institutions, particularly in the subtopic covering banking products and services. According to one of the Economic teachers, these low scores may be linked to the

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lack of available interactive learning media (Tiara et al., 2024). Students are still engaged in conventional learning methods, mainly listening to the teacher's explanations and completing assignments (Riska et al., 2024). The school counselor, together with the Economic teaching team, intends to encourage and improve students' motivation to learn, especially concerning the topic of banking products and services.

In response to this issue, the community service team from Hayam Wuruk Perbanas University-an institution with a strong focus on banking-has designed a solution in the form of banking education supported by interactive learning media. This media serves as a key component in making the learning process more engaging and innovative (Mualif et al., 2024). This concept explains that one of the attractive educational approaches is based on games, as it has the potential to enhance learning effectiveness (Ali et al., 2024) by up to 40 percent compared to conventional teaching methods (Ali et al., 2024). Another benefit of game-based education is its ability to improve problem-solving skills among students (Ali et al., 2024; Ardi & Desstyra, 2023). Students' attention becomes more focused on learning material, creating direct interaction between students and their environment, which in turn motivates their learning intentions (Aini & Purwaningsih, 2024; Satriani & Anwar, 2023). Game-based education, in its application, addresses three aspects of the teaching and learning process, including cognitive, psychomotor, and affective domains (Aliatin & Susilowibowo, 2016), thereby fostering an active learning atmosphere.

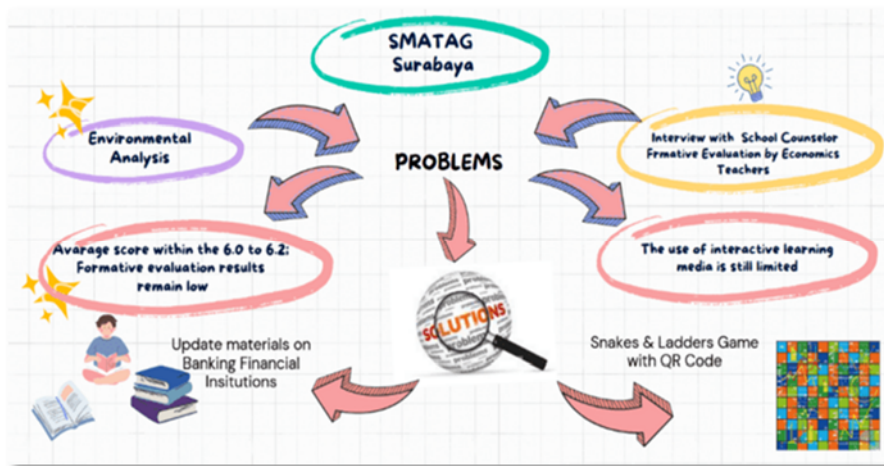


Figure 2. Framework for problem solving solution

One of the educational games is Snake and Ladders. The number of players in this game is at least two or more. The game board generally consists of several boxes, with images of ladders and snakes that connect to other boxes (Rohmatan, 2016). This game has been widely applied in various subjects and has proven to motivate and even cultivate students' interest in learning (Novita & Sundari, 2020). The advantage of this game is that it provides each student with the opportunity to build knowledge independently and flexibly, as it can be reused anytime and anywhere (Rohmatan, 2016; Setyorini & Wulandari, 2021). Snakes and Ladders, as an interactive learning medium, can be developed using Quick Response (QR) Codes as part of technology innovation, aligning with the behavior of Gen Z in general and specifically with certain Social Sciences students at SMATAG. Based on the issues identified by the partner, the solution proposed by the community service team of UHW Perbanas is to provide education for banking institutions with the Snakes and Ladders QR Code game as the interactive learning media. The Snakes and Ladders game as a learning medium is designed traditionally as part of local wisdom on the game board, while several questions on the boxes of the Snake and Ladders board use QR Codes

(Saputro et al., 2024). This technology is a type of two-dimensional code that stores data information and is designed to be read by smartphones, with the code's content being decoded very quickly at high speed (Tiwari, 2016). A summary of the partner's issues and the solutions offered by the community service team is shown in Figure 2.

Based on interviews with the school counselor and the results of formative evaluations in Economics, the community services team identified the main problems faced by SMATAG: a low level of banking literacy among students and the absence of learning media that support interactive learning processes. To address these issues, the proposed solution is to enhance the banking knowledge of 11th grade students at SMATAG through an interactive learning approach using a QR Code-based snakes and ladders game. Therefore, this community service program was conducted at SMATAG Surabaya because the school counselor and the Economics teaching team are committed to developing fun and interactive learning methods for their students, particularly in the area of banking.

2. METHODS

The community service activity, which focused on education about banking financial institutions, was carried out collaboratively by a team of lectures from the Faculty of Economics and Business and the Faculty of Engineering and Design, along with a librarian and six students. The implementation method was designed to be effective and straightforward, making it easy for partner institutions to adopt. This included the development of a QR Code-based snakes and ladders game tailored to the characteristics of SMATAG students, aimed at motivating and encouraging active learning (Ardi & Dessty, 2023; Mualif et al., 2024; Riska et al., 2024).

Participants

The total number of SMATAG students in the odd semester of the 2024/2025 academic year was 577, spanning grades 10 to 12. The selection of participants for the educational activity followed the school counselor's recommendation using a cluster sampling approach—characterized by high diversity within each group, but greater similarity between groups (Sekaran & Bougie, 2016). The focus was on 11th grade social science students who had already taken Economics but scored below 80 in their evaluations. Most of these Gen Z students tend to have low intrinsic motivation to study, get bored easily, and are highly engaged with gadgets. Based on these criteria, a total of 95 students were selected.

Materials and Tools

The snakes and ladders game generally requires game board and dice. For this activity, a large board measuring 5x5.5 meters was used to accommodate the number of students and ensure good visibility. The board serves as the stepping area, so it was made from vinyl material to ensure durability and water resistance. Additionally, two large dice were created using one-meter-sized polystyrene foam, which are thrown to determine the number of steps. Besides these main materials, several tools were also used, including the Canva and Bitly applications. Canva was used to design the question formats, while Bitly was used to generate QR Codes that could be scanned using smartphone cameras. Each QR Code directed students to questions they were required to answer, as shown in Figure 3. Additional supporting tools included a utility knife for cutting patterns, a ruler to ensure accurate measurements and symmetrical design, and glue for assembling the components.

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Figure 3. Design of questions and QR code

Implementation Stages

The implementation of this community service activity adopted a Community-Based Participatory Research (CBPR) approach, which positions academics as researchers and the community as collaborative partners at every stage of the research process (Riska et al., 2024; Rosyidah, 2021). The stages of CBPR were adapted from the concepts proposed by Sánchez et al., (2021) and Wallerstein & Duran (2018), as illustrated in Figure 4.

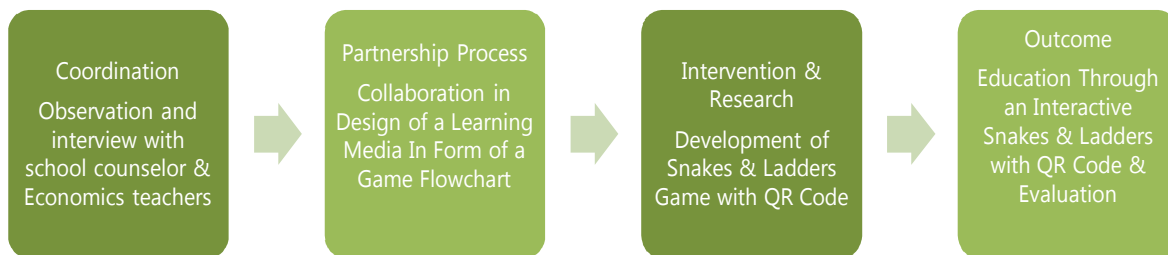


Figure 4. Stages of the CBPR Method

Coordination

The community service activity began with an interview with the school counselor, followed by coordination with the Economics teachers, as well as a site survey at SMATAG to assess the current conditions and partner needs (Rasmila et al., 2021). Based on the identified problems and the proposed solutions, the community service team then conducted internal coordination for task distribution, involving six students and one librarian.

Designing the blueprint of the Snakes and Ladders Game

The visual snakes and ladders game utilizes four primary colors; dark blue, green, orange and light blue. Traditional snakes and ladders are replaced with graph illustration that serves as symbols of economic concepts. Black and orange dots indicate whether a player should move upward or downward. The board consists of 100 question squares and measures 50 x 4 cm. In the top-right corner, a small 20 x 20 cm box is provided to place a QR Code. The game also includes two dice; one is designed with economic math problems, while the other features various national currencies. This design helps train players to quickly calculate the number of steps to move across the board. The design blueprint of the board and dice is shown in Figure 5.

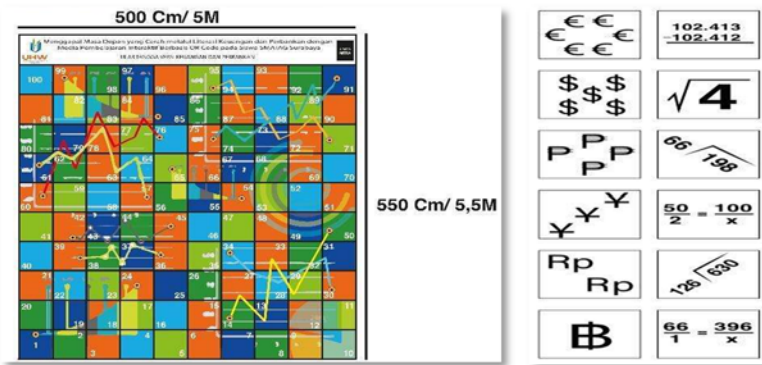


Figure 5. Snakes & Ladders with dice design

Pilot test

The QR Code-based Snakes and Ladders board was pilot-tested on a small group of early-semester students at Hayam Wuruk Perbanas University. This group was chosen because they had recently completed general or equivalent levels of education, making them suitable for initial testing. The purpose of this pilot test was to ensure that the QR Code on the Snakes and Ladders board functioned properly. Responses and feedback from the students were gathered and served as the basis for further analysis and refinement (Riska et al., 2024).

Further development

A mini version of the game board (A2 size/ 42 x 59 cm) was also developed to make it easier for teachers to implement the Snakes and Ladders game in Economics lessons. The community service team also provided a user guidebook to accompany the game

Education and monitoring

The educational material focused on banking financial institutions, specifically their products and services, delivered through lectures and discussions. The activities continued with a team-based Snakes and Ladders game. Participants were divided into three large groups, each represented by three students. One student stood on the Snakes and Ladders board holding a smartphone to move and answer questions, while two other students rolled the dice. The game was facilitated by six university students who acted as the community service support team. Monitoring was conducted through direct observation during the delivery of materials, discussions, and the Snakes and Ladders game sessions.

Evaluation Design

Evaluation of the community service activities conducted at SMATAG Surabaya was carried out to obtain feedback on the educational program implementation (Sihotang et al., 2024). The evaluation process began with a pre-test, followed by a post-test using the same questions after the Snakes and Ladders game was completed. The tests were administered to 86 students to compare their knowledge levels before and after the education session. The pre-test and post-test consisted of 100 multiple-choice questions related to banking products and services in general. Google Forms (G-Form) was used

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as the media for both tests, and students accessed the test via QR codes. Each question was worth one point, and students were required to select one answer from four options. The results of the pre-test and post-test were analyzed using descriptive statistics, specifically the mean and standard deviation. A larger standard deviation indicates greater variability or distance of individual data points from the mean (Christian, 2018). Conversely, a smaller standard deviation suggests that the mean more accurately represents the data, indicating less variation (Ali et al., 2024)

At the end of the educational activities, participants were also to complete a questionnaire to evaluate the overall community service program. The evaluation indicators included the organization of the event, facilities and refreshments, educational materials, and speakers. These four elements were measured using a Likert scale, ranging from one (very poor) to five (excellent) (Sekaran & Bougie, 2016; Tiara et al., 2024). G-Forms was also used as the survey platform. The survey results on the banking education implementation were analyzed using descriptive statistical methods too.

3. RESULTS AND DISCUSSION

Results

The banking education session was held on Tuesday, February 4, 2025, from 09.30 to 11.30 AM, in the multipurpose room on the ground floor of SMATAG Surabaya. The event was attended by 86 out of 95 registered 11th-grade social science students. The majority of participants were male, with 45 students (52 percent), while the remaining 41 students (48 percent) were female. Three economics teachers also took part in the activity. The session began with registration, followed by a pre-test that lasted approximately 10 minutes. The students then attended a lecture for about 50 minutes. During the presentation, many students ask questions related to digital banking service, indicating a strong interest in the topic. The material presented successfully captured the students' attention. Documentation of the activity is presented in Figure 6.



Figure 6. Banking education session

The activity continued with a snakes and ladders game, in which students were divided into three large groups based on their classes: 11-IPS3, 11-IPS4, and 11-IPS5. The student team then explained the rules of the QR Code-based snakes and ladders game, while the lecture team, assisted by a librarian, acted as referees to monitor the validity of the game. Each group decided which team would roll the dice first. Two students took turns rolling the dice, and one student acted as the game piece, moving forward based on the total value rolled. The student acting as the game piece was also responsible for scanning the QR Code, reading the question, and providing an answer. If they had difficulty answering, they were allowed to discuss it with their team. During the game, the QR Codes functioned properly, just as they

had during previous pilot tests with early-semester students for Hayam Wuruk Perbanas University. All three teams were able to understand and follow the game rules, allowing the activity to proceed in an orderly manner. On average, the students were able to answer the questions on each square correctly. They were not only playing, but also actively engaged in learning without feeling bored (Ardi & Dessty, 2023). Documentation of the QR Code snakes and ladders game is shown in Figure 7.



Figure 7. Snakes and Ladders Game

The snakes and ladders game lasted for approximately one hour. The group that first reached square 100 was group three (11-IPS5), earning them first place. Second and third place were awarded to group two (11-IPS4) and group one (11-IPS3), respectively. All three teams received prizes from the community service team for their participation in the QR Code-based snakes and ladders game. Direct observation was carried out by the community service team throughout the duration of the game (Yutanto et al., 2023). All three groups demonstrated a solid understanding of the game rules and showed strong teamwork. After the game, participants were given a post-test consisting of the same questions in the pre-test. The allotted time was also approximately 10 minutes. The average score of the 86 students in the pre-test, which assessed their knowledge of banking products and services, was 42.61 with a standard deviation of 12.17. The lowest score recorded was 22, and the highest was 63. However, after receiving the educational session, the average score increased to 86.14 (post-test), with the standard deviation decreasing to 6.48. The lowest post-test score was 73, and the highest was 98. The test results are presented in Table 1.

Table 1. Pre-test and post-test results

Measurement	Pre-Test	Post-Test
Average score	42.61	86.14
Standard deviation	12.17	6.48
Lowest score	22.00	73.00
Highest score	63.00	98.00

Table 2. Results of the community service evaluation

Assessment Elements	Average Score
Implementation of Community Service Activities	4.38
Facilities and Snacks	3.54
Materials	4.26
Speakers	4.11
Total Average Score	4.07

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The overall evaluation of the community service program yielded an average score of 4.07. Based on this score, the program is considered to be of good quality, as it falls within the 4.00-4.50 interval. The elements of facilities and refreshments received the lowest average score of 3.54, while the organization of the community service activities obtained the highest average score of 4.38. The complete evaluation results of the educational activity at SMATAG are presented in Table 2.

Discussion

The learning outcomes of 11th-grade Social Science students at SMATAG in the Economic subject, specifically on banking material, have become a primary concern. This subject is a core component of the social sciences track and is often perceived as heavily reliant on memorization (Sari et al., 2021). The low scores on formative assessments also reflect the students' limited banking literacy, despite being part of Gen Z. This generation is highly familiar with technology and digital information (Satriana et al., 2025), which calls for educational approaches that align with their characteristics. To address this, collaboration between school counselors and economic teachers is essential. These teachers also play a key role in developing learning materials using specific educational media (Inawati & Puspasari, 2021), making their involvement crucial in the implementation of the educational activities. In addition to the teachers' role, an interactive team-based learning medium is also needed—one such option is the board game Snakes and Ladders. This game is flexible and can be adapted using information technology such as QR Codes, requiring the use of smartphones for scanning via the camera.

Banking education delivered through a combination of lectures and gameplay has proven to be an effective approach. Students first acquire conceptual understanding through lectures, which is then reinforced through repetitive question-and-answer interactions within the game. This method enables students to learn by internalizing the concepts, rather than merely memorizing them. Without realizing it, the students are actively engaged in a learning process—evidenced by the significant increase in their test scores. The average score improved from 42.61 in the pre-test to 86.41 in the post-test, effectively doubling. This improvement indicates that banking education delivered through the interactive Snakes and Ladders game had a significant impact on student comprehension (Inawati & Puspasari, 2021; Niswandia et al., 2024; Rohmatan, 2016). The distribution of scores also became more consistent, as reflected in the decrease of the standard deviation by 5.69 points. This suggests that knowledge gained was relatively uniform across students, not just an increase in the average. Interactive, game-based education is thus capable of accommodating a range of initial understanding levels (Ali et al., 2024). Furthermore, the score range narrowed and tended to increase, with no students scoring below 65. Students were able to correctly answer questions of varying difficulty levels. The combination of lectures and interactive gameplay has been shown to significantly enhance students' banking knowledge. These findings are in line with previous studies (Prihatiningtias et al., 2024; Ratnasari et al., 2024). However, this differs from the findings of Ali et al., (2024), who implemented banking education through gameplay alone. Their results showed only a 35.25 percent increase in student knowledge—considerably lower than the improvement seen with the combined method used in this community service activity. Nevertheless, interactive, team-based gameplay has successfully fostered a healthy competitive atmosphere and motivated students to engage more actively in learning (Ardi & Desstya, 2023; Prihatiningtias et al., 2024; Ratnasari et al., 2024). Going forward, the Snakes and Ladders game can be implemented in small groups within a classroom setting using an A4-sized QR Code-based game board. Economic teachers

have also been provided with a pocket guidebook for using the game, enabling its reuse in future teaching sessions.

The educational activity was followed by the students from beginning to end, as it was enjoyable and engaging (Novita & Sundari, 2020). However, the students criticized the layout of the tightly arranged seating in the SMATAG multipurpose room. In their written feedback, they suggested that future educational activities be held in a larger space, such as the SMATAG hall. This suggestion serves as valuable input for the community service team to consider students' comfort and freedom of movement by evaluating room size in relation to the supporting infrastructure. Overall, the educational activity received a positive response from the students. Their active participation and the evaluation results, supported by the involvement of teachers, reflect SMATAG Surabaya's commitment to improving students' banking literacy.

4. CONCLUSION AND RECOMMENDATIONS

The improvement in banking literacy among Social Sciences students at SMATAG cannot be separated from the role of teachers who recognized the suboptimal evaluation scores of their students. These teachers have demonstrated a strong commitment to delivering interactive learning by collaborating with Hayam Wuruk Perbanas University. One of the games that has proven effective in enhancing students' understanding of specific material is Snakes and Ladders, which has undergone innovation to reduce boredom during the learning process. Through this approach, students not only improved their knowledge but also developed non-technical skills such as communication, teamwork, emotional intelligence, and response speed. The QR Code-based Snakes and Ladders game serves as an effective interactive learning medium, as it assesses not only cognitive abilities but also psychomotor and affective domains.

The QR Code-based Snakes and Ladders game has the potential to enhance students' understanding of banking-related subjects. However, there are still limitations in the evaluation process. The data has not yet been disaggregated by gender, and the study was limited to a single private high school in Surabaya, which does not represent the diversity of Gen Z characteristics. In addition, students' behavioral aspects related to the use of banking products and services have not been assessed. Based on these limitations, the scope of evaluation needs to be expanded—for example, by exploring the relationship between gender and banking knowledge, involving multiple top-tier private high school in Surabaya. The educational activities should also be complemented by savings simulations, and the Snakes and Ladders could be further developed into a web-based application. Technological innovation remains essential to engage Gen Z in active learning. Most importantly, teachers must continue to innovate learning media through collaboration with higher education institutions, particularly those with expertise in banking and finance.

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Empowering high school students' banking literacy through QR Code-based Snakes and Ladders Game

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