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The Implementation of Gamification Methods in the Edusting Application as an Educational Medium to Enhance Mothers Knowledge of Stunting

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Abstract: Interventions for stunting are an urgent public health priority. Because mothers' limited knowledge about stunting has a direct impact on stunting prevention and management. One of the extraordinary outreach programs is the stunting socialization program for mothers of toddlers carried out at the integrated health post. However, the socialization action is considered too limited. Gamification is one potential approach to increase the effectiveness of these efforts by introducing game design and game elements into educational content in three areas: childcare practices, nutritional intake, and stunting prevention. This is expected to explore mothers' involvement and motivation to prevent stunting. Mothers certainly prefer a more attractive interactive interface and gamification applications will stimulate cognitive and emotional involvement so that mothers feel more comfortable in the learning process about stunting management. In this study, we present the design of an education that aims to help mothers understand and overcome stunting. This application is expected to make mothers better understand parenting patterns, nutrition, and stunting management so that it can help mothers' learning to increase the speed of mothers' understanding of stunting prevention.

Keywords: Education; Gamification; Stunting.

1. Introduction

Toddlerhood is an important period in the process of human growth and development. Given the importance of this phase in achieving optimal growth and development, development that occurs during toddlerhood can determine the success of a child's development in the future. To support healthy child growth and development, adequate nutritional intake is needed and in accordance with the needs of the body. Based on data from the State of the World's Children 2019: Children, Food, and Nutrition, more than 50% of toddlers in Indonesia experience growth disorders caused by nutritional problems. One of the nutritional problems that is currently a major issue in Indonesia is stunting in toddlers. Stunting is defined as a chronic nutritional problem caused by a lack of nutritional intake over a long period of time, which has an impact on inhibiting physical growth and cognitive development of children, such as low height and limited brain capacity [1]. In Indonesia, the problem of stunting is still relatively complex, as seen from the high prevalence of stunting in toddlers. Based on the results of the Basic Health Research (Riskesdas, 2018) and the Indonesian Toddler Nutrition Status Survey (SSGBI, 2019), the prevalence of stunting from 2018 to 2019 showed a decrease from 30.8% to 27.67% [2][3]. However, according to the World Health Organization (WHO), this figure is still relatively high because it exceeds the standard threshold for stunting prevalence, which is 20%. In addition, in 2017, Indonesia was recorded as the country with the third highest stunting prevalence rate in the world, which was 36.4% [4].

In East Flores Regency, based on the Nutritional Status Monitoring Data (PSG) in August 2019, the number of toddlers experiencing stunting with very short and short status was 4,999 toddlers or 31.07% of the total 16,092 toddlers in the region. The stunting rate is spread across several sub-districts, one of which is Titehena Sub-district, which has 856 toddlers, with 304 toddlers or more than 35% experiencing stunting (Source: East Flores Regency Health Office, 2020). Stunting has long-term impacts on sufferers, such as decreased school achievement, low income in adulthood, and an increased risk of developing various chronic diseases, such as diabetes, stroke, and cancer [6][7]. Good quality human resources can be formed since children are toddlers. Therefore, the role of parents, especially mothers, is very important in supporting children's growth and development. If mothers ignore their role in meeting children's nutritional needs, this can increase the risk of stunting [8][9]. Good knowledge about stunting can encourage mothers to implement appropriate parenting practices, which in turn can help children avoid stunting.

However, based on field data, many mothers still feel less educated about stunting. Although the health center and health office have conducted socialization related to stunting, many mothers of toddlers consider the information provided to be less effective [10][11]. This has an impact on the lack of knowledge of mothers about stunting and its prevention. In Titehena District, the stunting rate continues to increase from year to year. In 2019, the prevalence of stunting in Titehena District was recorded at 35.99%, and in 2020 it increased to 38.4% [6]. To overcome this problem, one step that can be taken is to provide educational media in the form of gamification for mothers, in order to increase their knowledge and understanding of stunting. Gamification is a learning approach that uses game elements to motivate individuals in the learning process. Based on the description above, the solution to this problem is to design a game as a learning medium to increase mothers' knowledge about stunting, which includes topics such as nutritional intake, nutritional improvement, monitoring child growth and development, and healthy lifestyles. With this gamification-based educational application, it is hoped that it can reduce the risk of stunting in toddlers in Titehena District, East Flores Regency.

2. Research Method

The method employed in this study is gamification. Gamification refers to the integration of game elements into non-game contexts, with the aim of making activities more engaging, enjoyable, and effective for learning or task completion. This approach leverages various game design principles, such as goals, challenges, feedback mechanisms, and rewards, to enhance motivation and increase participant engagement. By incorporating these elements, gamification seeks to encourage specific behaviors and improve the overall learning experience. The key elements of gamification typically include points, badges, and levels, which serve to monitor progress and provide tangible incentives for users to stay engaged. Several studies have explored the diverse motivational aspects of gamification, demonstrating its potential to facilitate both intrinsic and extrinsic motivation. According to Zichermann and Cunningham, among the most commonly used elements in gamification development are points, badges, and levels [12].

1) Points
Points are one of the most fundamental components of gamification. They are awarded to users as a result of achieving specific milestones or completing tasks within the game. Points may be given when participants successfully answer questions, complete challenges, or reach certain objectives. The accumulation of points acts as a measure of progress and serves as a motivational tool, encouraging participants to continue engaging with the activity. Points also provide immediate feedback to the player about their performance, helping them gauge their improvement over time.
2) Badges
Badges are symbols of achievement, given to participants as a form of recognition for completing specific tasks or challenges. In the context of gamification, badges serve as a form of feedback, acknowledging users' efforts and accomplishments. They can be seen as a way to reward progress and encourage further participation by offering a visual representation of success. Badges are typically awarded after players meet certain criteria or complete a series of tasks, and they function as motivators for users to continue progressing through the game. As such, they are often used to reinforce desired behaviors and outcomes, fostering a sense of accomplishment and increasing overall engagement with the activity. According to Prambayun, Suyanto, and Sunyoto (2016), badges act as a tangible indicator of achievement and can enhance players' intrinsic motivation to participate [13].
3) Levels/Progression
Levels are used to represent different stages of skill acquisition or knowledge mastery. The progression from one level to the next indicates a player's increasing competence and ability to handle more complex tasks. Each level typically involves a series of challenges or objectives that become progressively more difficult as the player advances. The use of levels serves to maintain interest and challenge participants, as they are encouraged to move through stages of increasing complexity. In educational gamification, this concept of progression helps users measure their improvement and gives them a sense of accomplishment as they reach higher levels. Levels are essential for creating a sense of structure and direction in the game, providing users with a clear path toward achieving their goals.

3. Result and Discussion

3.1 Results

The user interface (UI) is an essential component in the design of an application as it serves as the communication mechanism between the user and the system. A well-designed UI should be not only visually appealing but also intuitive, user-friendly, and effective in delivering the intended user experience. In this study, the Edusting application was developed with a UI that caters specifically to the needs and capabilities of mothers with infants and toddlers. The application features various screens and menus, each designed to ensure smooth navigation and interaction. Below is a detailed description of some of the key components of the UI of the Edusting application. The opening screen is the first page that appears when the Edusting application is launched. This page serves as an introduction to the application, welcoming the user before proceeding to the main menu. It displays the application's logo, name, and a brief description of the app's purpose, helping users understand the primary goal of Edusting—providing educational content about stunting and child development in a fun and engaging way.

Figure 1. User Interface Opening Screen

After successfully passing through the opening screen, the user is directed to the main menu page. The main menu acts as the central hub for navigating the application. It contains four main menu options: Game Mode, Level Selection, Score, and Settings. Each option leads to different functionalities of the application, allowing users to choose according to their preferences. The layout of this screen is designed to be simple and easy to navigate, ensuring that the user experience is smooth and without confusion.

Figure 2. User Interface Main Menu

On the Game Mode Selection page, the user is presented with two primary options: Quiz Mode and Image Shooting Mode. These two game modes offer a variety of ways to engage with the educational content. Quiz Mode involves answering questions about child nutrition, parenting practices, and stunting prevention, while Image Shooting Mode presents a challenge where users need to select the correct images based on the instructions provided.

Figure 3. User Interface Game Mode Selection

The Easy Quiz Mode presents 10 questions related to nutritional intake for infants and toddlers. These questions are designed to be simple and easy to understand for the target audience. The UI is structured to ensure clarity, with large, easy-to-read text and user-friendly navigation, making it accessible for mothers to interact with the application without difficulty.

Figure 4. User Interface Easy Quiz Mode

The Medium Quiz Mode offers 15 questions, focusing on parenting practices. The difficulty level is higher than the Easy Mode, but still designed to be understandable and educational. The UI layout remains simple and consistent with the previous modes, ensuring that users can easily follow the questions and provide answers.

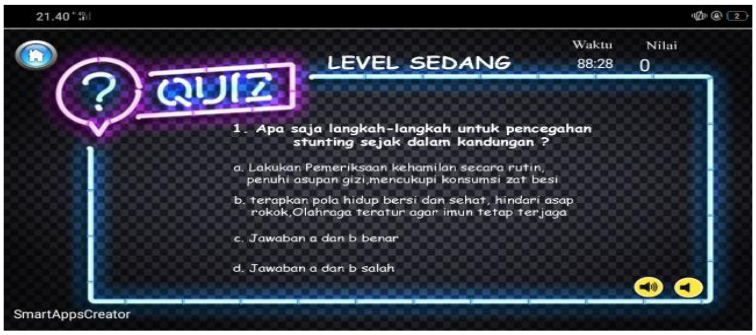

Figure 5. User Interface Medium Quiz Mode

The Difficult Quiz Mode contains 20 questions on stunting, a more complex topic that requires deeper knowledge. The user interface remains consistent, but with more advanced content, reflecting the higher difficulty level. Feedback is provided after each question to help users learn from their mistakes and improve their understanding of stunting.

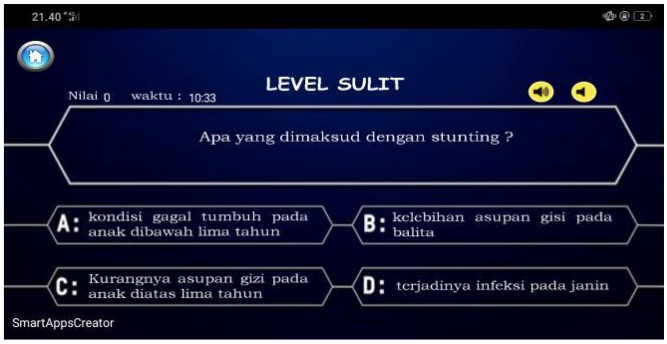

Figure 6. User Interface Difficult Quiz Mode

The Level Selection menu provides three buttons for choosing the level of difficulty: Easy, Medium, and Difficult. The user can choose the difficulty level that best suits their current knowledge or preferences. The UI is designed to be visually clear, with distinct icons that represent each difficulty level, making it easy for users to identify their choice.

Figure 7. User Interface Level Selection

The Score Menu presents users with their performance results. There are three buttons for selecting the scores from different levels: Easy, Medium, and Difficult. Each button displays the user's score for the corresponding level of difficulty, helping them track their progress.

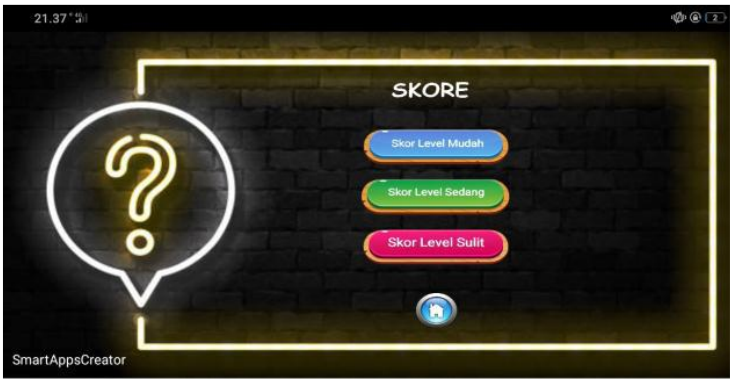

Figure 8. User Interface Score Menu

In this section, users can view the points they have earned from completing the Easy Quiz Mode. The score is presented clearly, allowing users to see how well they did in answering questions related to nutritional intake. This feedback motivates users to improve their performance.

Figure 9. User Interface Easy Level Score

Similar to the Easy Level Score, this section displays the points accumulated from the Medium Quiz Mode. Users can view their performance in the parenting questions and gauge how well they understood the material.

Figure 10. User Interface Medium Level Score

The Difficult Level Score section shows the points earned from completing the stunting-related quiz. This section provides feedback on how well users grasped the more complex issues surrounding stunting prevention.

Figure 11. User Interface Difficult Level Score.

3.2 Discussion

3.2.1 Effectiveness Testing

Effectiveness testing measures the success of the Edusting application in enhancing the knowledge of mothers regarding stunting. This is assessed based on the completion of tasks given to users within the app. Each task successfully completed is awarded a score of 1, while incorrect answers receive a score of 0. To calculate the effectiveness percentage, we use the following formula:

Table 1. Effectiveness Data

Respondent Code	Number of Tasks Completed	Total Tasks	Success Percentage
R 01	10	10	100%
R 02	10	10	100%
R 03	10	10	100%
R 04	10	10	100%
R 05	10	10	100%
R 06	10	10	100%
R 07	10	10	100%
R 08	10	10	100%
R 09	10	10	100%
R 10	10	10	100%
R 11	10	10	100%
R 12	10	10	100%
R 13	10	10	100%
R 14	10	10	100%
R 15	10	10	100%

The table indicates that all respondents successfully completed 100% of the tasks, signifying that the Edusting application is highly effective in improving the knowledge of mothers about stunting. This success rate can be categorized as "very good" with a 100% success rate. Following the percentage data, the next step is to determine the grading system. According to Suharsimi Arikunto (2005), the grading system for success rates is as follows:

$$Success\ Percentage = \frac{Number\ of\ Successful\ Tasks}{Total\ Task\ Count}\ x100\%$$

$$Success\ Percentage = \frac{15}{15}\ x\ 100\%$$

Table 2. Success Presentation

Success Percentage	Category
81-100%	Very Good
61-80%	Good
41-60%	Satisfactory
21-40%	Poor
0-20%	Very Poor

Based on the data, the success percentage of 100% places the results in the "Very Good" category, confirming that the application is very easy to use and helps mothers improve their understanding of stunting.

3.2.2 Efficiency

Efficiency measures the resources used, particularly time, and how accurately the tasks are completed. The table below shows the time each respondent took to complete the tasks.

Table 3. Data for Completed Tasks and Time Duration

Respondent Code	Number of Tasks Completed	Time Duration (seconds)
R 01	20	275
R 02	20	273
R 03	20	260
R 04	20	231
R 05	20	270
R 06	20	238
R 07	20	278
R 08	20	290
R 09	20	292
R 10	20	305
R 11	20	275
R 12	20	309
R 13	20	273
R 14	20	276
R 15	20	309
Total		4154

$$Time\ Based\ Efficiency = \frac{\sum_{j=1}^{r} \quad \sum_{i=1}^{n} \frac{n_{ij}}{t_{ij}}}{NR}$$

From the data, we can see that the average time taken by each respondent to complete the tasks is relatively efficient. The overall time efficiency value, calculated as 0.072698269 seconds per task, suggests that the Edusting application is efficient in terms of task completion speed.

3.2.3 Satisfaction

Satisfaction was measured using a 5-point Likert scale to assess the users' overall experience with the application.

Table 4. Likert Scale Rating

Rating	Description
1	Strongly Disagree
2	Disagree
3	Neutral
4	Agree
5	Strongly Agree

The calculation used to measure the usability of the application is the System Usability Scale (SUS), which provides a subjective assessment of three key aspects: effectiveness, efficiency, and user satisfaction. SUS measures users' perceptions of how easy and effective the application is to use. In the SUS calculation, each question is assigned a specific weight. For odd-numbered questions, the score is reduced by 1, while for even-numbered questions, the highest score (5) is subtracted by the user's response. This process is applied to all the questions to obtain a final score that reflects the acceptance level of the application by the users.

Table 5. User Satisfaction Responses

Kode Responden	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
R01	5	5	5	3	5	3	5	3	5	3
R02	5	5	5	3	5	3	5	3	5	3
R03	5	5	5	3	5	3	5	3	5	3
R04	5	5	5	3	5	3	5	3	5	3
R05	5	5	5	3	5	3	5	3	5	3
R06	5	5	5	3	5	3	5	3	5	3
R07	5	3	5	3	5	3	5	3	5	3
R08	5	3	5	3	5	3	5	3	5	3
R09	5	3	5	3	5	3	5	3	5	3

R10	5	3	5	3	5	3	5	3	5	3
R11	5	3	5	3	5	3	5	3	5	3
R12	5	3	5	3	5	3	5	3	5	3
R13	5	3	5	3	5	3	5	3	5	3
R14	5	3	5	3	5	3	5	3	5	3
R15	5	3	5	3	5	3	5	3	5	3

The SUS score is calculated by summing up the results of all questions and then converting it into a more representative value. Mathematically, the SUS calculation formula is as follows:

$$SUS = \sum(Odd\ Question\ Score - 1) + \sum(5 - Event\ Question\ Score)$$

After performing the calculation, the SUS score is found to be 74.67, which is rounded up to 75. This score indicates a good level of user acceptance of the Edusting application. According to the established guidelines, a SUS score above 70 is categorized as "Acceptable," and with a score of 75, Edusting falls into the Grade C (Good) category. This suggests that the application is well-received by users. The Paired Sample T-Test is used to compare the means of two related samples (pre-test and post-test) to determine if there is a significant difference in users' knowledge before and after using the Edusting application. This test helps assess whether the use of the application leads to an improvement in the users' understanding of stunting prevention.
Hypotheses:

1) H0: There is no relationship between the application of gamification and the improvement in mothers' knowledge of stunting.
2) H1: There is a relationship between the application of gamification and the improvement in mothers' knowledge of stunting in the Edusting application.

The significance level used for this test is 95%, and the paired t-test is chosen as the statistical test. The rule for testing is as follows:

1) If the t-value > t-table, H0 is rejected and H1 is accepted.
2) If the t-value < t-table, H0 is accepted.

To calculate the t-value and t-table, we first compute the mean and standard deviation of both pre-test and post-test scores.

Table 6. Pre-Test and Post-Test Scores

Respondent	Pre-Test	Post-Test	D (Difference)	D^2 (Squared Difference)
R1	4	15	-11	121
R2	6	15	-9	81
R3	5	15	-10	100
R4	5	15	-10	100
R5	5	15	-10	100
R6	7	15	-8	64
R7	6	15	-9	81
R8	4	15	-11	121
R9	3	15	-12	144
R10	4	15	-11	121
R11	7	15	-8	64
R12	2	15	-13	169
R13	6	15	-9	81
R14	5	15	-10	100
R15	6	15	-9	81
Total			-153	23409

The mean (average) value is calculated by summing all the pre-test and post-test scores and dividing the result by the number of respondents. From the data collected, the average score for the pre-test was found to be 4.80, while the average score for the post-test was 15.00, based on 15 respondents. Standard deviation is a measure of how spread out the values in a dataset are, and it provides insight into the variability of the responses. The formula for calculating standard deviation is:

$$\sigma = \sqrt{\frac{\sum(x-\mu)^2}{n-1}}$$

where μ represents the mean, x is an individual data point, and n is the number of respondents. For the pre-test, the calculated standard deviation was 1.612, while for the post-test, the standard deviation was 0.000, as all respondents scored perfectly in the post-test. The Standard Error of the Mean (SE) is used to determine how closely the sample mean approximates the population mean. The formula for calculating SE is:

$$SE = \frac{\sigma}{\sqrt{n}}$$

where σ is the standard deviation and nnn is the number of respondents. For the pre-test, the standard error was calculated as 0.416, while for the post-test, the SE was 0.000, due to the uniformity in the post-test scores. Based on the calculated results, there is a significant difference between the pre-test and post-test scores, indicating that the Edusting application has had a positive effect on improving the knowledge of mothers about stunting. The average score increased from 4.80 in the pre-test to 15.00 in the post-test, showing that the application effectively enhanced the knowledge of the users. The results of the paired sample correlation showed the strength of the relationship between pre-test and post-test scores. The strong correlation indicated that the increase in knowledge was directly influenced by the use of the Education application. The results of the paired sample t-test further confirmed that the application had significantly improved mothers' knowledge regarding stunting prevention, as evidenced by the significant increase in post-test scores.

4. Related Work

In the realm of health education, especially concerning child nutrition and stunting prevention, mobile applications combined with gamification have emerged as increasingly popular methods for improving user engagement and knowledge retention. Gamification, which refers to the integration of game design elements into non-game settings, has proven to be a highly effective tool for engaging users, increasing motivation, and enhancing learning outcomes. Numerous studies and practical applications have explored the use of mobile apps, as well as gamified learning platforms, to improve awareness and behavior regarding health issues such as stunting. These applications are particularly valuable in resource-limited settings, where access to conventional educational resources may be scarce. This section delves into relevant trends in the use of mobile applications and gamification in health education, with a particular focus on their application to stunting prevention.

The application of gamification within health education is becoming an increasingly significant strategy to foster user engagement and enhance learning outcomes. Gamification involves the incorporation of game-like elements—such as points, badges, levels, and challenges—into non-game contexts, and it has been shown to increase user motivation, participation, and overall enjoyment of the learning process. This method is particularly effective in education on topics that are often perceived as complex or intimidating, such as stunting prevention. Several studies have demonstrated that gamification can improve learning outcomes in health education by creating more interactive and rewarding experiences for users. For instance, providing instant feedback through rewards such as points or badges motivates users to continue engaging with educational content, thereby reinforcing the learning process [14][15]. These game elements help keep users motivated and engaged, which is essential in health education, as continuous participation is required for knowledge retention and behavior change. In the case of Edusting, the use of interactive quizzes, feedback systems, and game-like elements such as levels and achievements plays a critical role in keeping mothers engaged while they learn about proper nutrition, child growth, and stunting prevention. Gamification in health education has been particularly valuable in reaching audiences who may be unfamiliar with complex health topics. By transforming the learning process into something more enjoyable and accessible, gamified applications can overcome the perceived difficulty of subjects like stunting. For mothers, a subject as vital as child nutrition can often seem overwhelming, but by presenting the information through engaging and fun interactions, gamified platforms make it easier to grasp and retain key concepts. Moreover, research consistently supports the idea that gamification can lead to positive educational outcomes. Studies have found

that learners who engage with gamified learning environments report higher levels of motivation, enjoyment, and learning retention [16][17]. This is crucial in health education, where understanding and applying information over the long term can have significant effects on health outcomes. In Edusting, mothers gain a sense of accomplishment as they progress through different levels, with rewards reinforcing their learning and encouraging continued engagement. This type of engagement ensures that users not only complete the learning tasks but retain and apply the information to real-life situations, such as improving their children's nutritional habits and recognizing signs of stunting early on.

Mobile health applications have proven to be valuable tools in addressing public health issues like stunting, especially in areas where access to traditional health education may be limited. These applications are designed to provide accessible, real-time health information to users, allowing them to track their child's growth and nutrition and receive personalized guidance on stunting prevention. By harnessing mobile technology, these applications provide a practical and cost-effective means to educate mothers and caregivers, particularly in rural or low-income areas. Several mobile health applications focus on educating mothers about the importance of proper nutrition, monitoring child growth, and preventing stunting. These apps typically offer a variety of content, including articles, videos, and quizzes, along with interactive features to engage users and assess their knowledge [18][19]. Many of these applications allow users to monitor their child's growth over time, often incorporating growth charts or other tracking tools. Such features are vital for helping mothers identify early signs of stunting, enabling them to take prompt action [20][21][22]. Tracking growth patterns can highlight whether a child is at risk for stunting, and early interventions can be implemented based on this information. In addition to monitoring growth, these applications often include educational content that teaches mothers about proper nutrition and stunting prevention. Personalized notifications and reminders are also a common feature, helping mothers remember to follow recommended health practices and keep up with their child's developmental milestones [23][24]. These notifications encourage proactive health management, which is essential in the fight against stunting. Applications that integrate gamification elements, like interactive quizzes and rewards, can significantly increase engagement and knowledge retention. Gamification makes the learning process more enjoyable, allowing mothers to progress through levels and receive rewards for their efforts. This approach has been shown to improve user engagement and retention, both of which are important for long-term behavior change [25][21][25][26]. These gamified mobile applications not only educate users but also empower them to make informed decisions about their child's health and nutrition [27]. The Edusting application builds upon the success of these existing tools by integrating gamification into its design. While many health education apps provide essential information, Edusting goes a step further by incorporating game elements to make learning more enjoyable and motivating. Through quizzes, challenges, and progress tracking, Edusting creates an interactive experience that encourages mothers to stay engaged with the content. This gamified approach ensures that users return to the app regularly and continue learning about the prevention of stunting, which ultimately supports better outcomes for child health.

Gamification has proven to be an effective strategy for promoting behavior change in various health contexts. By introducing game-like elements such as rewards, challenges, and levels, educational apps can motivate users to engage more actively with the material and adopt healthier behaviors. This is particularly crucial when addressing issues like stunting, where long-term changes in behavior related to nutrition and child care are essential for improving health outcomes. Research has consistently shown that gamification increases user motivation and engagement, making it easier for users to adopt new behaviors and retain important information [28]. A mother who successfully completes a quiz about proper infant nutrition might receive a reward, such as points or a badge. This immediate feedback not only reinforces the learning process but also encourages users to keep participating in the app, further solidifying their understanding of the material. In the case of Edusting, gamification elements such as points, badges, and progress levels help keep users motivated by providing a sense of accomplishment [29][30]. Each time a mother progresses through a quiz or challenge, she receives feedback that boosts her confidence and encourages continued learning. This type of feedback is particularly important in health education, as it reinforces the key messages that can lead to positive behavioral change. Moreover, gamification can be particularly effective in addressing long-term health issues like stunting, where sustained behavior change is needed [31]. By rewarding mothers for adopting proper nutrition practices or monitoring their child's growth, gamified apps like Edusting help users build lasting habits that can improve their child's health and development over time.

A significant benefit of using gamification in education is its ability to improve knowledge retention. Studies show that users retain information more effectively when they actively engage with the material rather than passively consuming it [32][33]. This is especially important in health education, where the information learned must be applied in real-world situations to improve health outcomes. Gamification, by creating an interactive learning experience, helps ensure that users retain critical information. In Edusting, the

incorporation of interactive quizzes, feedback, and rewards supports active learning. When users engage with quizzes and challenges, they are prompted to recall and apply the information they've learned about stunting prevention. This real-time application of knowledge helps solidify the learning experience and improves retention. Furthermore, the instant feedback provided after each quiz question helps users understand the rationale behind their answers, reinforcing the correct information and promoting deeper learning. The effectiveness of gamification in promoting knowledge retention has been supported by various studies, which show that users who engage with gamified learning environments tend to retain information for longer periods and are better equipped to apply that knowledge in practical situations [34][35]. By fostering active participation and reinforcing learning through feedback and rewards, Edusting helps mothers not only retain information about stunting prevention but also apply it to improve their child's nutrition and health [36].

Despite the promising potential of mobile applications and gamification for health education, several challenges need to be addressed [37][38]. One of the main issues is accessibility, particularly in rural and low-income areas where access to smartphones or reliable internet connections may be limited. This is a significant barrier to the widespread use of mobile health apps, particularly those that rely on the internet for downloading content or receiving updates [39][40]. Another challenge is ensuring that the design of the application is user-friendly and suitable for the target audience. In the case of Edusting, the target users are mothers with varying levels of education and technological familiarity. The app must be simple to navigate and free from unnecessary complexities that could frustrate users. Additionally, the design should account for cultural and educational differences to ensure that the content is both relevant and accessible. Edusting addresses these challenges by focusing on simplicity and accessibility. The app is lightweight and optimized for devices commonly used by mothers in Indonesia, and it features clear instructions and visuals to guide users through the application process. These considerations ensure that mothers can easily engage with the app and make the most of its educational content.

5. Conclusion

The Edusting application is an educational tool that can be used as a medium in efforts to prevent stunting. In general, educational media can be interpreted as tools, methods, and techniques used to increase the knowledge of mothers of toddlers in preventing stunting. Based on the results of the study and discussion, it can be concluded that the knowledge of mothers of toddlers in Titehena District can be increased through the use of the Edusting application. In the effectiveness test, which was carried out to measure the success of using the Edusting application through the tasks given, the results were 100%, which showed a very good category. This shows that the Edusting application is easy to use by mothers of toddlers. Based on data from the efficiency test, which was used to measure the accuracy and speed of users in completing tasks, the results were 0.072698269 based on time-based efficiency measurements. The ability of mothers of toddlers to use the Edusting application is very helpful in handling stunting and increasing understanding of stunting for mothers of toddlers.

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