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THE EFFECT OF EPIDEMIOLOGIST EXPLORATIONS GAMIFICATION TO INCREASE CHILDREN'S HEALTH KNOWLEDGE

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ABSTRACT
Generational change can be interpreted as educational development, including changes in educational strategies so that education is carried out more effectively and efficiently. One approach that suits the character of learning in the 21st century is through gamification, namely game-based learning. Objective: Exploring Epidemiologists was a game approach based on introducing the Epidemiology profession which aimed to increase children's health knowledge. Method: This research used a quasi-experimental pre-post one study design. Samples consisted of 17 respondents, children aged 8-10 years who took part in the Epidemiologist Exploration activity. Data were analyzed using the Wilcoxon Test to see the results of pre and post intervention knowledge. Results: The results of the research showed that there was no effect of Epidemiologist Exploring gamification on increasing children's health knowledge (p=0.755). Conclusions: The gamification process in children's health education should pay attention to environmental confounding factors found by respondents.

Keywords: child health; gamification education; health education; health promotion; ibu profesional

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INTRODUCTION

Education must adjust to the development of the times and the characteristics of the target to be given knowledge. Generational change can be interpreted as the development of education, including changes in educational strategies so that the education carried out is more effective and efficient. According to the Indonesian Central Statistics Agency (BPS), there are several generation classifications, namely the baby boomer generation born in 1946-1964, generation X born in 1965 to 1980, generation Y or millennials born in 1981 to 1996, generation Z born in 1997 to 2012, and the Post Gen Z or alpha generation born in 2013. Gen-Z is digital-native, which is always triggered to try something new, fun, likes to learn creatively, interactively, and thinks outside of the box1, and up to date with technological developments, especially the use of media (Charles Igel & Vicki Urquhart, 2012)(Bourgonjon et al., 2009). Therefore, learning now needs to focus more on improving certain technical skills, new ways of thinking, different learning management and requires an educational approach (McGrath & Bayerlein, 2013).

One of the approaches that is in accordance with the character of learning in the 21st century is through gamification, namely game-based learning (Deterding et al., 2011). Gamification is the process taken to add an element of play to an activity, to increase participation (Hamari et al., 2016) and satisfaction, to create a relaxed atmosphere (Kabita Bose, 2016) which is very important to determine the effectiveness and success of the learning process (Martin & Bolliger, 2018). Gamification can also be done to change a person's habits so that the highest

public health can be achieved. The concept of applying gamification to education has existed for a long time. The balance between the element of fun being an attraction for learning is a key part of the concept of gamification (All et al., 2016). In the last five years, according to Google, gamification systems are in great demand (Figure 1) in Malaysia and Indonesia (Figure 2).

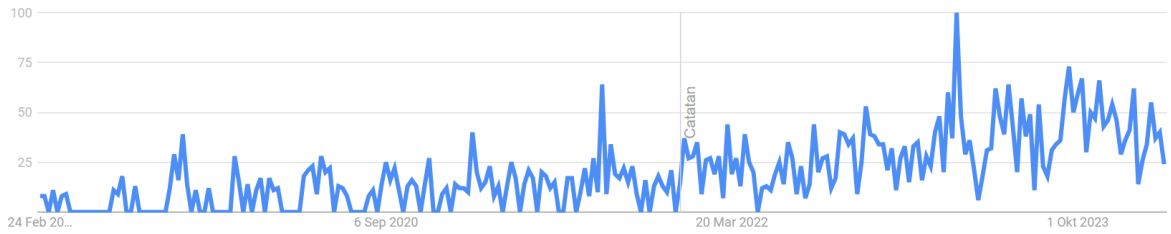

Figure 1. Overview of Interest Searches in Gamification

Figure 2. Regional Specialization in Gamification Systems 2020-2024

Health education in children has an important role in shaping mindsets, healthy living habits, and health status in the future. Knowledge about diseases, their causes, and how to prevent them is an important first step in reducing the spread of diseases. Children who have a good understanding of the importance of washing hands, maintaining environmental cleanliness, and eating healthy foods tend to be better able to prevent infectious diseases. Instilling awareness of proper health practices from an early age can form sustainable healthy habits. Through health education that is integrated into the formal and informal education curriculum, children can understand the importance of maintaining health and implementing these health practices in their daily lives (Birch LL, 2009). This Epidemiologist gamification is a game approach based on the introduction of the Epidemiologist profession. Health education is packaged through the presentation of the role of Epidemiology in daily life using original props and simple experimental experiences. Strengthening the gamification system in collaboration with the Komunitas Ibu Profesional Bandung in an agenda of Jelajah Cita-Cita activities. The experience of each child consisting of 10 professions, one of which is an Epidemiologist, presents knowledge about health, namely how the mosquito life flow using original props, how to wash hands properly and correctly with simple experiments, a balanced nutritional diet with food models, and various experiments that make it easier for children to understand the importance of maintaining health from an early age. The concept of Health Education in gamification is expected to increase children's knowledge and awareness of health.

METHOD

Population and Sample Research

The research population was 20 respondents aged 8-10 years old. The research sample was respondents aged 8-10 years old who have been briefed on the research totaling 17 people. Participants who were not involved in the pre-test and post-test because they were late so they did not fill out the pre-test and the child's condition was not conducive when given a pre-test and post-test briefing so that it could reduce the validity of the data provided.

Research Design and Variables

The research design used a quasi-experimental study (Figure 3). Quasi-experiment is a research method to measure certain effects on the intervention carried out. The dependent variable is the increase in knowledge with gamification interventions.

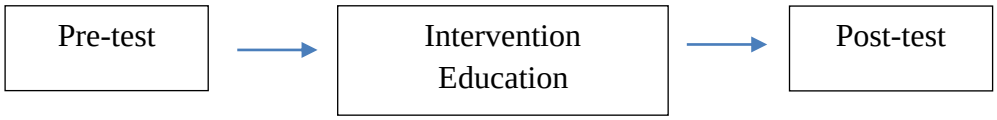

Figure 3. Research Flow Chart

In the first stage, respondents were given 12 pre-test questions that had been tested for validity and reliability. Respondents entered the Epidemiologist stand to be given intervention in the form of providing health education through original props. Respondents visited 3 other professional stands for 20 minutes, then knowledge measurement was carried out through a post-test.

Instrument and Data Collection

Instruments pretest and posttest used a knowledge comprehension questionnaire in the form of 7 picture questions and a behavior questionnaire of 5 questions. The research was carried out in stages starting from briefings on filling out pretest and gamification activities. Then the pretest was filled out directly. The group of respondents toured the professional stands that had been provided. At the Epidemiologist professional stand, researchers educate about children's health such as the flow of mosquito life, the dangers of mosquitoes and prevention from mosquito bites, how to wash hands properly and correctly, and the message of balanced nutrition. Next, the respondents went around back to the professional stand until it was finished. At the end of the session, respondents were given a post-test.

Data Processing

After the data was collected, the following processing was carried out: Editing, which is to re-check the questionnaire that has been filled out by ensuring the completeness of the answers. Coding and scoring, which is processing data by numbering each answer. The correct answer to the knowledge question was given the number 1 while the wrong answer was given the number 0. Knowledge categorization is in the form of good (3), sufficient (2), and lack (1). Processing and Cleaning, which is processing data in a software-generated format and checking and evaluating questionnaires whether there were filling errors or not. Knowledge variables were categorized into good knowledge (76%-100%), sufficient knowledge (56%-75%), and lack (<56%) (Notoatmodjo, 2014). Behavioral variables are categorized into supportive behaviors (more than the median value) and unsupportive behaviors (values below the median).

Data Analysis

The results of the questionnaire were processed using SPSS version 22 software and analyzed with frequency distribution to see a picture of knowledge and behavior results. The Wilcoxon test was used to see the effect of gamification on improving children's knowledge. The knowledge variable with $p<0.05$ in the bivariate analysis or potential variable based on the literature, was interpreted as the effect of gamification intervention on the improvement of children's knowledge with a confidence interval of 95%.

RESULT

The number of research samples was 17 respondents of children aged 8-10 years. All respondents were given a health education session by approaching the Epidemiologist stand who had previously been given clues. The number of male (47.1%) and female (52.9%) respondents was almost the same and more than half of them were 8 years old (52.9%) (Table 1).

Table 1.
Distribution of Respondent Characteristics and Variables

Respondent characteristics	f	%
Age		
8 years old	9	52.9
9 years old	5	29.4
10 years old	3	17.6
Gender		
Male	8	47.1
Female	9	52.9

Inside the stand, respondents were given education by demonstrating the life flow of mosquitoes through original props such as mosquito eggs, larvae/pupa, mosquito larvae, and adult mosquitoes. Children are given knowledge about the identification of mosquito eggs and larvae so that they can prevent mosquito breeding, especially in the home environment, children are also equipped with how to catch live mosquitoes and distinguish between male and female mosquitoes. Furthermore, respondents were given an explanation of proper and correct hand washing techniques, at least to prevent diarrhea and COVID-19 transmission. The explanation of washing hands began with a simple experiment using soapy water and sprinkling pepper on water filled with a basin. The result was a sprinkling of pepper away when the water is given drippings by soapy water. Then, a simple experiment was done by dipping a paper prop with a picture of a virus and bacteria and dipping it in water so that the image of the virus and bacteria was lost. These two experiments could increase children's curiosity about why they should wash their hands. Finally, children are invited to recognize a balanced nutritional diet with food model props. The children were very enthusiastic about participating in the whole series of Epidemiologist gamification, even some children did not want to leave the stand after the education session was over for 10-15 minutes. The results of the research data were tested for normality and homogeneity of the data. The test used in the normality of the data was Kolmogorov Smirnov. The median value of health knowledge before and after gamification was obtained as unchanged (median=6). The results of the frequency distribution test showed that most of the respondents were well informed (58.8%) and most of the respondents had supportive behavior (58.8) towards health efforts (Table 3).

Table 2.
Pre and Post-test Knowledge Distribution

Knowledge	Pre-test		Post-test		Sig.
	f	%	f	%	
Good	3	17.6	5	29.4	
Sufficient	7	41.2	5	29.4	0,755
Lack	7	41.2	7	41.2	

Table 3.
Distribution of Respondent Behavior

Variable		f	%
Behavior	Supportive	10	58,8
	Unsupportive	7	41,2

Table 4.
Wilcoxon Test

	Result	N	Sig.
Pretest-posttest	Negative rank	4	0,755
	Positive rank	5	
	Ties	8	

After providing education and experience, respondents went around other professional stands to get other materials. At the end of the session, respondents were given a post-test to measure the increase in knowledge. The results of the data analysis found that there was a reduction in post-test scores compared to pre-test (4 respondents), an increase in post-test scores (5 respondents) and no change in the level of knowledge (8 respondents) after being given education (Table 4). The results of the bivariate analysis showed that there was no effect of epidemiologist gamification on the improvement of respondents' knowledge (Table 2). This could happened because the gamification process of epidemiologist exploration has a confounding factor, namely a post-to-post system with various professions that allows respondents' understanding to be distracted or reduced.

DISCUSSION

The selection of elementary school age children as the target of the study is based on the consideration that between the ages of 6-12 years can think logically about concrete events and can classify objects into different forms. In addition, they have the characteristics of playing and moving. The research activity was carried out by demonstrating the life flow of mosquitoes through original props such as mosquito eggs, larvae/pupa, mosquito larvae, and adult mosquitoes. Respondents were given knowledge about the identification of mosquito eggs and larvae so that they could prevent mosquito breeding, especially in the home environment, respondents were also equipped with how to catch live mosquitoes and distinguish between male and female mosquitoes. Furthermore, respondents were given knowledge about proper and correct handwashing techniques, at least to prevent diarrhea and COVID-19 transmission. The explanation of washing hands began with a simple experiment using soapy water and sprinkling pepper on water filled with a basin. Then, a simple experiment was done by dipping a paper prop with a picture of a virus and bacteria and dipping it in water so that the image of the virus and bacteria was lost. Finally, respondents were invited to recognize a balanced nutritional diet with food model demonstrators.

Learning while playing is something that children will not forget. When playing, children also have the opportunity to make mistakes in a safe context because they are accompanied by an instructor or observer, this will help them gain a deeper understanding of a concept being learned. Jelajah Epidemiologist's gamification approached through play and experiment with props sparks children's curiosity so that it will help children in critical and systematic thinking. This condition was supported by the results of the study which stated that there was a change in children's knowledge from enough to good by 8.2% (Table 2). High health awareness had a significant positive impact on children's behavior. They tend to pay more attention to aspects of their health in their daily lives, including choosing healthy foods, exercising actively, and avoiding behaviors that are at risk of causing disease (Hingle et al., 2013). Gamification of Jelajah Epidemiologist could increased knowledge, make the learning process fun, and more interesting through original teaching aids. Respondents felt challenged

to conduct experiments and were more motivated to listen to health education sessions (Ryan & Deci, 2000).

The success rate of an information can be influenced by the right method and learning media such as educational aids in the form of attractively packaged teaching aids (Novitasari, n.d.) and the reception of messages through the sense of sight is 90% while through the sense of hearing is 5% and the remaining 5% is for pronunciation, smell and touch (Arsyad, n.d.) (Notoatmodjo, 2017). Original props can reduce misinterpretation in children, provide a clearer and more detailed picture, are easier to understand, attract attention, and encourage to do what is recommended during health education. Original teaching aids have the highest intensity to perceive health educational materials (FG, 2010). It can be concluded that educational media with original teaching aids can increase knowledge because it uses many sensory tools, especially the sense of sight. It is allowed to repeat interesting experiments, making respondents visually mindful and gesture. This could processed information more effectively and last for a long period of time (Mayer, 2009). Active participation in gamification helps children better remember information and understand each experiment (Kapp, 2012) (Suista et al., 2023). At the end of the gamification session, respondents were active in asking questions and the researcher gave feedback to explain the reason for the scattering of pepper when given soap droplets, light refraction, and the discovery of mosquito larvae at home. Feedback was an important element in gamification. Feedback connects what is learned to everyday life.

Behavior is an individual's response/reaction to stimuli that come from outside or from within (FG, 2010). According to (Wawan A, 2011), behavior is an action that can be observed and has a specific frequency, duration and purpose whether consciously or unconsciously. So behavior is a process that can be realized or not that is individual depending on the person. Behavior According to the theory of Lawrance Green et al. (Wandini RR, 2018), human behavior is influenced by three main factors, namely predisposing factors, enabling factors, and reinforcing factors. Behavior change requires a constant stimulus so that it produces the correct response or reaction by the individual.As many as 58.8% of respondents have behaved positively in protecting the environment from dangerous disease agents. In studies stated that the lecture method using original props involved 20% of the memory that can be remembered by humans (Jatmika & Safrilia, 2019). The media could improve respondents' behavior. When knowledge increases, it was hoped that it can increase the awareness of respondents' attitudes in healthy behavior, especially balanced nutrition practices. The results showed that behavior changes that took a short time were only 1-2 weeks after the first intervention so that the behavior was good, furthermore, meaningful behavior changes were obtained after the 1st intervention with a 2-week interval from the pretest and the second intervention which had a 3-week interval from before the intervention was given (Irbah et al., 2020). The limitation of this study lies in the absence of attitude measurement before and after gamification because it took more time to follow up. This study was only conducted in one day, so it was not possible to measure attitudes within a period of 4 hours after gamification.

In this study, the gamification of Jelajah Epidemiologist was not affect the improvement of children's knowledge ($p=0.755$) because the educational process diverted the essence from the health material. The results showed the same thing that there was no significant difference in respondents' knowledge after one week of gamification (Sobrino-Duque et al., 2022). No change in respondents' behavior when giving ankle gamification for reproductive health (Irbah et al., 2020).During the study, respondents were too engrossed in conducting experiments and were divided in concentration when given explanations and feedback. The Epidemiologist Tour contains 4 other activities that end with a posttest. This can affect the

physical condition of the child, fatigue so that it is not optimal in the absorption of information (Domínguez et al., 2013). Another condition that affects is the presence of strong predictors such as exposure to pre-existing health knowledge because the condition of the respondents is very diverse in their health backgrounds even though they have different age variations. The use of gamification in learning requires strategies in using it such as game procedures, individual or group involvement, display, and special goals (Sobrino-Duque et al., 2022). At the very least, gamification design can pay attention to aspects of badges, leaderboards, system points and scores, social connection, and levels (Destriani & Heroza, 2023).

CONCLUSION

Play and experimentation in the introduction of professions is one of the best methods in a child's developmental age. Children stay focused and always want to come back to continue learning and spend their curiosity. In the end, the debriefing of health knowledge will be easier for children to accept and remember. However, in designing gamification, the condition of children and the environment must be considered so as to reduce confounding factors in the research results.

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