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3D Unity Labyrinth Game Model Based on Android as an Educational Media in Improving Knowledge and Teeth Brushing Skills in Deaf Children

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Abstract: Deaf children tend to have a higher frequency of caries than non-deaf children. Deaf children have limitations in their sense of hearing when capturing information. Dental health education in a promotional way is one strategy that can be used to provide behavior change for deaf children. Promotives using visual methods are very suitable because they have high visual capture power. One of the visual methods is endgame. The technique used is Research and Development with a quick experiment Pretest-Posttest group design research design. The subjects in this research were deaf students at SLBN Gorontalo City. Intervention: 10 people were given the Android-based 3D Unity Labyrinth Game, and control of 10 people was given conventional methods. Data collection techniques include: questionnaires and observation of tooth brushing and DI examination. Data was tested using the Paired Sample T Test and Independent Sample T Test. The results obtained are that the Android-based 3D Unity Labyrinth Game Model can increase knowledge of brushing teeth and brushing skills in deaf children and reduce the debris index in deaf children. The Android-based Unity 3D Labyrinth Game Model is effective as a learning medium for improving knowledge of brushing teeth and brushing skills in deaf children.

Keywords:- *Knowledge, Teeth Brushing Skills, Debris Index, Edugame.*

I. INTRODUCTION

The Indonesian population experiences dental and oral health problems as much as 57.6% according to the 2018 Basic Health Research (RISKESDAS) [1]. One of the health problems that still occurs in Indonesian society is cavities (caries) [2]. Dental caries or cavities is a major public health problem and globally is the most widespread non-communicable disease.

According to the 2019 Global Burden of Disease Study, as many as 520 million children have cavities. This can happen because children are a group that has a high risk of contracting caries[5]. Based on Basic Health Research (RISKESDAS) in 2018, the prevalence of tooth decay based on the age group, namely 5-9 years, was 54% and in the 10-14 year age group, it was 41.4% [1].

High caries rates are not only found in normal children but also occur in children with special needs. This can happen due to low knowledge about how to maintain healthy teeth [3]. One group of children with special needs who have difficulty capturing information is the group of deaf children.

Deaf children experience a deficiency or loss of their ability to perceive sound properly in part or in whole due to dysfunction in part or all of their hearing apparatus [4]. Therefore, deaf children will have limitations in capturing information, including information about dental and oral health. The group of deaf children is considered to be a group that has a higher risk of developing caries compared to the non-deaf group [5].

The causal factors for the occurrence of dental caries consist of clinical factors and non-clinical factors. One of the clinical factors is OHI-S, while the most dominant non-clinical factor is behavior. The behavior of brushing teeth is a significant thing because brushing teeth is a routine activity carried out every day to maintain healthy teeth and mouth from caries and this activity is one of the activities that functions to remove plaque mechanically. [16],[17]

Based on Basic Health Research (RISKESDAS) in 2018, only 1.4% of teeth brushing behavior was carried out correctly in the 5-9 year age group and 2.1% in the 10-14 year age group [1]. This happens because there is still a lack of knowledge about how to brush your teeth properly. So it is necessary to take promotive and preventive measures to overcome this problem. [8], [9]

Promotive activities are through health education. Dental health education can be done by providing dental health education. The materials and methods presented in health education must be adapted to the health needs of the target and the language used must be easy to understand and understand. [10]

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Health education is one strategy that can be used to provide behavior change for deaf children. Deaf children have difficulty communicating, this is because they are unable to grasp and convey problems, so they need adequate health services to maintain the condition of their teeth and mouth to remain healthy. [10]

Health education can be done using many methods. One of them is the visual method. Visual methods can be used to support success in learning activities and understanding for deaf children because these children have quite high visual comprehension skills. The visual method is a method that can be seen so it can be useful to help stimulate the senses of the eye (vision). Visual methods can also be combined with simulation methods in a learning process because they can make it easier and clearer to understand the message conveyed. The target is expected to be able to quickly understand and understand so that they don't just imagine. [9],[11],[12]

One of the visual methods combined with simulation is endgame, which is a learning medium in the form of games that can help stimulate a person's thinking power which can increase concentration and solve problems. Education is done so that the learning process can be fun. [13],[14]

This type of puzzle game is widely used because it can hone a person's thinking skills in solving a problem. One puzzle game that can attract attention is the problem of the maze game. In this era, games can be displayed on gadgets. Someone can play a game on an Android-based device to make it more concise by using a game engine. One of the game engines used on the Android system is Unity 3D. [15],[16],17]

II. RESEARCH METHODS AND SAMPLE

The method in this research uses the Research and Development (R&D) development method. This research and development method is used to produce a product and test the effectiveness of the product. There are 10 (ten) main steps in the research and development procedure, namely: 1) research and data collection, 2) planning, 3) product design, 4) design validation, 5) design revision, 6) product testing, 7) product revision, 8) use trials, 9) product revisions, and 10) product results. This research aims to develop a model for learning dental and oral health for deaf children through gamification.

This research uses a Quasy Experiment research design with a Pretest and a Posttest with a Control Group Design. This design uses two groups of subjects, measurements taken before and after treatment. The difference between the two measurement results is considered a treatment effect. The sample in this study was 20 deaf child respondents.

III. RESULTS AND DISCUSSION

A. *Validity test*

The validity test was carried out using the *Intraclass Correlation Coefficient (ICC)*to test the feasibility of the model so that model trials can be carried out. There are 3 expert validators in testing eligibility.

Table 1 Validity test

Expert Validation				
Name	**N**	**F (%)**	**Average**	***p-value****
Media Expert	10	97.5%	98.3%	0.006
Health Promotion Expert	10	97.5%		
Expert on Children with Special Needs	10	100%		

****Intraclass Correlation Coefficient (ICC)***

Validation test results from the three validator experts were obtained 0.006WhichThis means that the Android-based 3D Unity Labyrinth Game Model is relevant and suitable for use as an educational model for maintaining oral and dental health and hygiene for deaf children.

B. *Product/Model Trial*

- *Data Normality Test*

Table 2 Data Normality Test

Variable	***p-value***
	Intervention
Deaf Children	
Pre-test knowledge	0.191
Post-test knowledge	**0.004**
Pre-test skills	0.245
Post-test skills	**0.001**
Debris index pre-test	0.088
Debris index post-test	0.062
SLB teacher	
Pre-test knowledge	0.272
Post-test knowledge	0.683

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Pre-test attitude	0.683
Post-test attitude	0.224
Action	0.683
Post-test measures	0.272

**Shapiro-Wilk*

The table above shows that the normality test results for knowledge, skills, and debris index (DI) in deaf children, then the knowledge, attitudes, and actions of special school teachers are mostly normally distributed because the p-value is >0.05, so it can be continued with parametric tests.

➢ *Homogeneity Test*

Homogeneity test is a statistical method used to test groups of data in research. The purpose of the homogeneity test is to see whether the data group being tested has a similar level of data distribution or not.

Table 3 Homogeneity Test

Variable	Homogeneity Test	
	Levenes Statistics	***p-value***
Deaf Children		
Knowledge	0.080	0.781
Skills	0.034	0.855
Debris Index	3,609	0.074
SLB teacher		
Knowledge	0.158	0.705
Attitude	4,500	0.078
Action	0.150	0.267

**Levene's Test*

Statistically, it is known that the intervention group and the control group have homogeneous data where the test results show that the knowledge, skills, and debris index variables for deaf children and the knowledge, attitudes, and actions of special school teachers have the same mean because they have a significant p-value.>0.05.

C. Effectiveness Test

➢ *Effectiveness Test for Deaf Children*

Table 4 Effectiveness Test for Deaf Children

Variable		N	Mean±SD	Δ	*p-value*
Knowledge	Pre	10	6.2±1,032	3.0	<0.001
	Post	10	9.2±0.918		
Teeth Brushing Skills	Pre	10	4.4±0.966	5.0	<0.001
	Post	10	9.4±0.843		
Debris Index	Pre	10	2.19±0.340	1.7	0,000
	Post	10	0.49±0.171		

**Paired Samples T-test*

The test results for the variable knowledge of brushing teeth in deaf children showed a change with the p-value being <0.001 (<0.05), which means that the Android-based Unity 3D Labyrinth Game Model is effective in increasing knowledge of brushing teeth in deaf children. The variable for brushing teeth skills in deaf children shows that there is a change with a p-value <0.001 (<0.05), which means that the Android-based Unity 3D Labyrinth Game Model is effective in improving teeth brushing skills in deaf children. The debris index variable in deaf children shows that there is a change with a p-value of 0.000 (<0.05), which means that the Android-based Unity 3D Labyrinth Game Model is effective in reducing the debris index in deaf children.

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➢ *SLB Teacher Effectiveness Test*

Table 5 Teacher Effectiveness Test

Variable		N	Mean±SD	Δ	*p-value*
Knowledge	Pre	4	4.25±0.957	4.75	0.002
	Post	4	9.00±0.816		
Teeth Brushing Skills	Pre	4	34.00±0.816	14.75	<0.001
	Post	4	48.75±1,500		
Debris Index	Pre	4	15.00±0.816	4.50	0.003
	Post	4	19.50±0.577		

**Paired Samples T-test*

The test results for the variable knowledge of brushing teeth in special school teachers changed with a p-value of 0.002 (p<0.05), which means that the Android-based Unity 3D Labyrinth Game Model is effective in increasing knowledge of brushing teeth in special school teachers. There was a change in the dental and oral health attitude variable among SLB teachers with a p-value <0.001 (p<0.05), which means that the Android-based Unity 3D Labyrinth Game Model is effective in improving dental and oral health attitudes among SLB teachers. There was a change in the dental and oral health action variable for SLB teachers with a p-value of 0.003 (p<0.05), which means that the Android-based Unity 3D Labyrinth Game Model is effective in improving dental and oral health actions for SLB teachers.

IV. DISCUSSION

A. Model EffectivenessAndroid Based 3D Unity Labyrinth Game on Knowledge in Deaf Children

The choice of media or method in a learning or counseling process is very important, this is because the information provided must be easy for the target to understand. The use of the selected media must be adapted to behavioral patterns, attitudes, culture and geographical location of the area to be targeted. [18]

The Android-based Unity 3D Labyrinth Game Model provides learning about dental and oral health and hygiene by displaying attractive visual images packaged in educational games using language and sentences that are easy for the target to understand.

Judging from the p-value, it can be interpreted that treatment using the Android-based Unity 3D Labyrinth Game Model is effective in increasing knowledge of brushing teeth in deaf children. In line with research conducted by Haka, et al in 2021 media packaged digitally or in the form of applications will make it easier for targets to respond directly during the learning process. The use of digital media makes the learning process more effective and more practical so that it will be easier for targets to understand the content of the material presented.[19]

The increase in knowledge of brushing teeth in deaf children is due to a stimulus in the information conveyed to deaf children through education which has an influence on the level of knowledge and cognition of deaf children through the Android-based 3D Unity Labyrinth Game Model which attracts children's attention and is easy to understand so that it is a stimulus to children are stimulated and accepted so that there is an increase in knowledge of brushing teeth in deaf children. Android-based games can increase children's motivation to learn something because Android-based games have audio, graphic, visual, and animation displays that attract children's attention so they are interested in playing the game and completing it. [20]

B. Model EffectivenessAndroid Based Unity 3D Labyrinth Game on Teeth Brushing Skills in Deaf Children

Judging from the p-value, it can be interpreted that treatment using the Android-based Unity 3D Labyrinth Game Model is effective in improving teeth-brushing skills in deaf children. In the game application, there is a maze game area in which there are post points containing material about dental and oral health and videos on how to brush your teeth properly and correctly, making it easier for children to grasp the dental and oral health material provided. Apart from that, deaf children also implement the habit of brushing their teeth and mouth at home every day by filling in the attendance list in the game which is connected to Google Forms.

Compared with Tikha Fatikha Maulidiah's research in 2023, this research got a higher delta score, namely 5.0, whereas Tikha's research only got a delta score of 2.91. This is because the research conducted by Tikha Fatikha Maulidiah used digital-based pop-up book media which made the target feel uninterested when they heard about book they were going to read even digitally, whereas this research used games that made children feel interested in playing them.

Formation or change in behavior in children cannot be done instantly but must be done gradually and repeatedly. According to Rogers, behavioral changes can be carried out in 5 stages and each stage is carried out every 2 days, this will change the child's behavior and habits in brushing their teeth. [21],[22]

C. Model EffectivenessAndroid Based Unity 3D Labyrinth Game Against Debris Index in Deaf Children

Based on the resulting p-value, it can be interpreted that treatment using the Android-based Unity 3D Labyrinth Game Model is effective in the debris index in deaf children. The factors in reducing the debris index score in deaf children in this study were not only promotive but also the respondent's compliance with their habit of brushing their teeth properly and correctly, which was done regularly. Apart from that, the method used in delivering learning will also influence the results of what will be achieved.

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Compared with research conducted by Kurnia Aprianti in 2023, the debris index for deaf children decreased more with a delta of 1.70, whereas in Kurnia's research, it was only 1.07. This is because the method used in the research conducted by Kurnia Aprianti was a drill method which only focused on learning carried out repeatedly which made it possible for the target to feel bored, while the research carried out this time used a gamification method in the form of an interactive game.

The use of interactive games that aim to provide education in brushing teeth can help in reducing the debris index score because interactive games will provide a new atmosphere that children get through the games provided and they will feel challenged to complete the games provided regarding dental hygiene education and mouth[84]. So that providing DHE (Dental Health Education) plays an important and active role in shaping children's behavior in maintaining the health and cleanliness of their teeth and mouth and making healthy and clean living habits a daily habit that is applied in their lives so that it will influence their debris index scores. [23]

D. Model EffectivenessAndroid Based 3D Unity Labyrinth Game on SLB Teacher Behavior

Teachers are the ones who have a role in the process of growth and development of knowledge, skills, intelligence, attitudes, and outlook on life in their students. Therefore, the figure of a teacher is needed to help the growth and development of students, therefore teachers need to be given health training so they can provide health learning to students so that they experience changes in health behavior and their health status will increase. [24]

Giving training will influence knowledge about health and oral hygiene in SLB teachers. Providing training or learning is a process of gaining knowledge and experience in the form of changes in behavior that are relatively permanent or permanent. [25]

The improvement in the behavior of SLB teachers can be influenced because SLB teachers have a Bachelor's educational background and some have Master's degrees in their field of expertise in educating, teaching, guiding, directing, training, assessing, and evaluating so that teachers have expertise in implementing structured educational learning. And coherent.

The training given to teachers will increase the teacher's knowledge so that there will be sufficient confidence in mastering the material to provide dental and oral health education. Apart from that, the training given to teachers will improve their skills in mastering the use of media/visual aids to provide oral health education. [25]

Improving a person's positive attitude toward health requires sufficient knowledge in the field of health and a person's inner will and ability to be able to carry out health efforts independently. [26]

The increase in actions that occurred among teachers occurred because there was material on how to brush teeth properly and correctly during training using simulations and demonstrations. The role of teachers in dental and oral health education is that the good knowledge and attitudes possessed by teachers regarding health promotion programs will influence the implementation of health promotion in schools. [27]

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