The Smart Spin Wheel Educational Game Tool (ROPTAR) is an Alternative Screening Media Child Development

Rita Yulifah[1], Tri Johan Agus Yuswanto[2] (Corresponding Author)

[1]Midwifery Department, Poltekkes Kemenkes Malang, Indonesia; ritayulifah.d2@gmail.com
[2]Nursing Department, Poltekkes Kemenkes Malang, Indonesia; denbagusjohan@yahoo.co.id

ABSTRACT

Children are human resource assets. To become a quality asset, it needs to be prepared from an early age for both growth and development. Stimulation, Detection, Early Growth and Development Intervention (SDIDTK) is one of the efforts to improve the quality of children by monitoring to optimize children's development regularly and periodically from an early age. Development monitoring is carried out using the standard Pre-Screening Development Questionnaire (KPSP). The use of KPSP during and as a result of the development of KPSP in the form of an Android application is one-way, so that children, parents and the user community are passive. This research is development research (research and development) which aims to develop a standardized child development assessment instrument, namely KPSP and determine the feasibility of development results. This research uses a prototype development model. Data collection used a questionnaire sheet, expert testing was carried out by two people, namely a growth and development specialist and a media expert, data analysis was descriptive. The development of a standardized instrument is based on the form, number of questions and algorithm. The results of development research are educational game products whose suitability has been tested by experts and by product users. Evaluation of development trial results: 1) the form of the 8 components has an overall average of 91% in the good category, 2) the content of the addition of 9-10 questions to 12 questions, 3) the algorithm of the 6 evaluation components with a minimum score of 87 and a maximum score of 92 is considered positive. The average development quality results according to users in terms of functionality, efficiency and usability were 93.33% in the good category. The effectiveness test results obtained were p=0.001 (p < 0.005). So it can be concluded that the development of the Pre-Developmental Screening Questionnaire (KPSP) in the form of an educational game tool is suitable for use as a tool to help monitor children's growth and development.

Keywords: development; pre-screening questionnaire; smart spin wheel educational game tool (ROPTAR)

INTRODUCTION

Health development is part of efforts to develop the whole person. To be able to develop a complete human being, it is necessary to start with health development efforts from an early age, namely from childhood. Child health development from an early age is intended as an effort to improve the quality of life of children so that they can grow and develop optimally both physically, mentally, emotionally, socially and with multiple intelligences according to the child's genetic potential.[1]

Children under five years old are in the golden period, during this period brain growth and development of thinking power are at their highest point. This period is also a time critical period or critical time. Children's brains have great opportunities to accept the learning process, enrichment and be sensitive to the environment. So that during this period nutritional needs must be met and stimulation must be adequate, so that children can grow and develop optimally.[1]

Children are an asset in the human resources of a nation. As a nation's asset, children must be guaranteed their right to health. This is in accordance with the mandate of the 1945 Constitution, article 28 paragraph (1), which states that every person has the right to live in physical and spiritual prosperity, to have a place to live, and to have a good and healthy living environment and has the right to obtain mandatory health and state services. to provide it. Paragraph (2) Every child has the right to survival, growth and development and the right to protection from violence and discrimination.[1] One effort to fulfill children's right to be healthy is by providing Early Growth and Development Detection and Intervention Stimulation (SDIDTK).

The results of Early Growth and Development Stimulation Detection and Intervention services for 500 children, it was reported that 57 children (11.9%) experienced growth and development abnormalities. The most common growth and development abnormalities were delayed development (delayed growth) in 22 children, then 14 children experienced *global delayed development*, 10 malnourished children, 7 children with Microcephaly, and 7 children who have not gained weight in the last few months. The achievement of growth and development

monitoring frequency was 75.82%, not yet reaching the set target of 85%.[2] 11.9% of toddlers who attended SDIDTK experienced growth and development disorders.

SDIDTK is an effort to improve the quality of children by carrying out regular and periodic monitoring from an early age (early detection), optimizing early stimulation according to the child's stage of development (early stimulation) and carrying out early intervention measures if there are deviations.[3] One of the early detections of growth and development currently carried out is the screening method at Integrated Service Posts (POSYANDU), Community Health Centers (PUSKESMAS), and in hospitals, using the Pre-Screening Development Questionnaire (KPSP).

KPSP is a standard questionnaire centered on health workers in conducting child development screening, so that in its use parents and children are more passive. Several studies were carried out to develop KPSP, including in the form of an Android application or mobile-app as a result of previous research[4], only one-way, namely the health worker/assessor reads the questionnaire first, then asks the child to act according to the statement items on the questionnaire. So it is not uncommon that during the assessment, children are busy with the games around them, lazy to be given orders and do not want to do what the assessor tells them to do.

The aim of this research is to develop a Pre-Screening Development Questionnaire (KPSP) into an educational game tool in the form of a Smart Spin Wheel (ROPTAR).

METHODS

This research was development research (*research and development*) with reference to Borg & Gall opinion cit. Sugiyono.[5] Population of children aged 4-6 years, samples taken randomly simple number of 100 children.[6]

This research used Kindergartens, PAUDs and play groups under the auspices of the Eka Mandiri Foundation and Kindergartens Aisyiyah Bustanul Athfal (ABA) Batu City. The Eka Mandiri Foundation is located at Jalan Panglima Sudirman Number 18 Ngaglik, Batu District, Batu City, East Java (65311), located at Among Tani City Hall (Building A, Floor 1), which was established on 06 May 2016, Foundation Establishment Number 5 and SK Number Legal Entity Ratification: AHU-0026899-AH-01.04 of 2016, June 8 2016, and to date has 20 kindergartens with private school status. Meanwhile, Aisyiyah Bustanul Athfal (ABA) Kindergarten is Private schools under the Batu City Muhammadiyah foundation consist of ABA 1, ABA 2 and ABA 3 all of them have been registered with the Indonesian Ministry of Education and Culture, and have school identification numbers national and education permit decree as well as operational permits, and accredited A and B.

Table 1. Number of early childhood education institutions in Batu City 2018

No	Sub district	Number of villages	Villages that provide PAUD services	
			Frequency	Percentage
1	Batu	8	87	100
2	Junrejo	7	41	100
3	Bumiaji	9	50	100
		24	178	100

Source: 2018 Batu City KLA implementation evaluation form report BPS. Batu City in figures 2018

Data collection was carried out using KPSP, ROPTAR, and questionnaires. The data was analyzed descriptively, then testing for effectiveness was carried out using the non-parametric Mann-Whitney U statistical test using a significance level of 0.005.

RESULTS

Table 2. Characteristics of FGD participants in stage 1 of KPSP development research in Batu in 2022

No	Characteristics of FGD participants	Parameter	Frequency	Percentage
1	Age	26 – 30 years	15	57.69
		31 – 35 years	5	19.23
		36 – 40 years	5	19.23
		> 40 years	1	3.85
2	Length of work	5 – 10 years	22	84.62
		11 – 15 years	3	11.54
		> 15 years	1	3.85
3	Last education	Junior high school	3	11.54
		Senior high school	19	73.08
		D3	1	3.85
		S1	3	11.54

Table 3. Characteristics of FGD II participants in second year KPSP development

No	Respondent characteristics	Parameter	Frequency	Percentage
1	Age	26 – 30 years	1	20
		31 – 35 years	2	40
		36 – 40 years	2	40
		Total	5	100
2	Gender	Man	3	60
		Woman	2	40
		Total	5	100
3	Last education	D3	1	20
		S1 IT	1	20
		Master of Educatione	1	20
		SpA doctor	1	20
		S2 KIA	1	20
		Total	5	100

Table 4. Evaluation results of the pre-screening development questionnaire (KPSP) instrument in Batu City PAUD in 2022

KPSP Instrument Standards	Information	Category
Use standard format	There are no questionnaires that present more pictures, because standard ones contain more questions and commands	Just up to standard
Systematic	The questionnaire consists of 10 question items	
Fill in according to the available question items	The questionnaire is filled out according to 10 question items	
Fill in sequentially, one by one	The questionnaire is filled out by referring to a systematic pattern from questions number one to number 10	
It is. Algorithm	Ask the child's parent/caregiver or examiner according to the instructions on the instrument.	
Questionnaire components	Consists of gross movement, fine movement, speech and language, socialization and independence	
Actual and new	The questionnaire has not been updated	

Table 5. FGD results regarding KPSP evaluation by participants

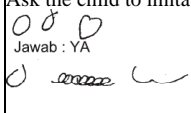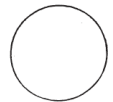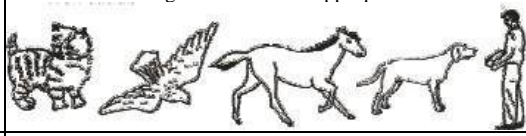| Strategic issues	Reason	FGD results	Researcher's Study
Instrument format	The format is still standard	There is a need for new instruments that involve children	Instruments that are fun for children so that children can assess their development using the principles/concepts of social play.
Fill in KPSP	More questions and orders so less interesting,	Each questionnaire is developed based on age groups	Instruments need to be adapted to new concepts by using pictures and questions/commands that are easy and can be carried out by children themselves
Systematics	KPSP is quite systematic	It needs to be developed, questions do not have to be sequential, adapted to the child's condition at the time of assessment	Instruments need to be designed according to the child's condition in the form of a game, and can be used by involving the child.
Algorithm	Not yet fully involving children	Children need to be involved, in groups it would be better.	Instruments need to be developed involving children.
KPSP components	According to standards	The fixed component contains 4 elements, namely fine movement, gross movement, speech and language, socialization and independence	Fixed instrument components.

Table 6. Research findings on KPSP instrument development

No	KPSP based on age (months)	Republic of Indonesia Ministry of Health standards	Developed KPSP instrument
1	Instrument format	The format is still standard	Using a spinning wheel-shaped game that is named Smart Play Wheel Game with a conceptual approach Cooperative play
2	Fill in KPSP	a. Contains 9 -10 questions about the developmental abilities that the child has achieved. b. There are 2 types of questions c. Questions answered by mothers/caregivers d. Order to the mother/baby sitter or officer to execute	a. The content was developed into 12 pictures adapted to 12 short questions that are easy for children to understand according to their developmental age. b. The game is two-sided c. The front side contains pictures that the child will ask questions about according to where the arrow stops when the child rotates it d. The back side contains question sentences asked by the officer or read together with the child
3	Systematics	Asked sequentially based on the order of questions in the KPSP.	Children are fully involved and given the freedom to play Smart Play Wheel Game, The child will do/answer according to the picture and command/question indicated by the arrow at the time Smart Play Wheel Game stop
4	Algorithm	a. Ask the parent/caregiver or examine the child according to the instructions on the KPSP instrument b. Count "Yes" answers c. Interpretation d. Action	a. Prepare games according to the child's age b. Ask the child to spin the game wheel, wait until the wheel stops c. Ask the child to say which picture the wheel stops on d. Ask the child or together with the parent and child to read the question behind the picture right at the stop arrow. e. Ask the child the question, ask the child to do what is in the game if there is a question that requires the child to do it f. Continue playing with your child until it's finished g. Together with parents, summarize the results of the developmental assessment h. Action
5	KPSP components	a. Rough Motion b. Smooth Motion c. Speech and Language d. Socialization and independence	a. Rough Motion b. Smooth Motion c. Speech and Language a. Socialization and independence

Table 7. KPSP development results

No	Component	Standard	Development
1	Form	Questionnaire form aged 48 – 72 months	APE of the spinning wheel:
2	Question items	9-10 questions: 3-5 fine motor assessment questions 1-2 gross motor questions 1-2 social and independence questions 1-2 language questions	12 questions 3 fine motor assessments 2 gross motor assessments 2 social assessment and independence 4 language assessment
3	Fill out the form	1-2 officers ask the mother 2-3 officer orders to the child 5-6 questions from the officer to the mother Images: lines, squares, animals and people are not colored Color 4 to differentiate 4 aspects of assessment: gross motoric (green), fine motoric (blue), social and independence (yellow), language (pink)	The child together with his friends and mother independently carry out the assessment The front of the circle which is divided into 12 slices contains pictures that correspond to the questions on the back The back contains assessment questions Consisting of 12 colors according to the image and assessment question items Color is not differentiated in the assessment aspect
4	Monitoring book	It is not written clearly in the KIA book	Made a monitoring book
5	Algorithm	Ask your parents Calculate the answer Interpretation of answer results by officers Action	Regret the use of tools, filling in development and assessment books for mothers and children Evaluation by children and mothers while playing Observation officer Interpretation of the answers by the mother and observer (officer) Action

Figure 1 is example of Pre-Developmental Screening Questionnaire Form (KPSP) According to Guidelines P implementation of SDIDTK Age 48 months

QUESTION		ANSWER	
		YES	NO
1. Give an example of making a bridge from 3 cubes, namely by placing 2 cubes a little apart (approximately one finger), then placing the third block on top of the two blocks so that it forms like a bridge. Ask the child to do it. Get a child do it?	Smooth motion		
2. Give me a pencil and paper. Do not help the child and do not call the circle. Make a circle on the paper. Ask the child to imitate it. Can child draw a circle? Jawab : YA Jawab : TIDAK	Smooth motion		
3. Show the child the picture below and ask: "Which one can fly?" "Which one can meow?" "Which one can talk?" "Which one can bark?" "Which one can neigh?" Can children? designate 2 activities appropriate?	Bicara dan bahasa		
4. Can child say his full name without help? Answer 'No' if he says part of his name or his words are difficult to understand.	Bicara dan bahasa		
5. Get to know the concept of the number one Place 5 cubes on the table and a piece of paper next to the cubes. Tell the child" Take 1 cube and place it on the paper". After the child has finished laying out, ask "How many cubes are there on the paper?" Can the child do with just take one cube and can say "One"?	Bicara dan bahasa		
6. Ask the child the questions below one by one: "What is the use of a chair?" Answer: to sit "What is the use of a cup?" Answer: to drink "What is the use of a pencil?" Answer: to cross out, write, draw Can child answer the three questions related to the use of objects is that correct?	Speech and language		
7. Ask parents or caregivers whether the child can follow the rules of the game when playing with friends (e g : snakes and ladders, hide and seek, etc.)?	Socialization & independence		
8. Ask parents or caregivers whether the child can wearing a t-shirt (T-shirt) without assistance?	Socialization & independence		
9. Place this book-sized sheet of paper on the floor. Can children? jump across the width of the paper by lifting both legs at the same time without being preceded by a run?	Rough movement		
10. Ask the child tost and on 1 leg without holding on. If necessary, show how and give the child 3 chances. Can he maintain balance in time2 seconds or more?	Rough movement		

See the algorithm for interpretation and action

Details for aspects of development with the answer "No"

Figure 1. Pre-Developmental Screening Questionnaire (KPSP) for Children Aged 48 Months Source Ministry of Health 2022; 136[5]

Figure 2. Results of shape development front look

Figure 3. Results of shape development back view

The results of the development of the questionnaire were developed in the form of a smart rotating wheel educational game tool (ROPTAR) made of acrylic material equipped with a pointer which consists of two sides,

the first side is the front side with pictures adapted to the questions on the back side. How to use it: the parent or caregiver or teacher orders the child to spin the smart rotating wheel. When the rotating wheel stops the child is asked which picture the needle is pointing at, the parent or caregiver or school teacher reads the command sentence on the back of the ROPTAR and instructs the child to do as instructed. If the child can do it, write YES in the Controlled Toddler Development Monitoring Disc (CERDIK) book. The examination is stopped if 10 to 12 drawings can be made by the child.

Figure 4 is algorithm according to SDIDTK implementation guidelines.

	Examination result	Interpretation	Intervention
1. Calculate the child's age according to the provisions 2. If the child is over 16 days old, round it up to 1 month 3. Choose a KPSP that is appropriate to the child's age. If the child's age is not appropriate, use KPAS for the younger age group 4. Ask parents or caregivers or examine the child according to the instructions on the KPSP. Count the answers "Yes"	Answer "Yes" 9 or 12	Age appropriate	• Give praise to parents or caregivers and children • Continue stimulation according to age stages • Schedule your next visit
	Answer "Yes" 7 or 8	Doubtful	• Advise the mother or caregiver to stimulate more often with lots of affection • Teach mothers how to carry out early intervention in aspects of development that are lagging behind • Schedule a return visit in 2 weeks. If the results of the subsequent examination are also doubtful or there is a possibility of deviation, refer to a level 1 growth and development referral hospital
	Answer'(Yes)' 6 or less	There is a possibility of deviation	Refer to a level 1 growth and development referral hospital

Figure 4. Algorithm for checking child development using the Pre-Developmental Screening Questionnaire (KPSP) Source Ministry of Health 2022; 121

	Examination result	Interpretation	Intervention
1. Calculate the child's age according to the provisions 2. If the child is over 16 days old, round up to 1 month 3. Select roptar appropriate to the child's age. If the child's age is not appropriate, use Roptar for the younger age group 4. Parents, caregivers or teachers check on children while playing 5. According to the instructions in the DISC book. Count the answers "Yes"	Answer "Yes" 9 or 12	Age appropriate	• Give praise to parents or caregivers or teachers and children • Provide education to continue stimulation according to age stages • Schedule your next visit • Note it down in the progress book
	Answer "Yes" 7 or 8	Doubtful	1. Advise parents or caregivers to stimulate more often with lots of affection 2. Teach parents, caregivers or teachers how to carry out early intervention in aspects of development that are lagging behind 3. Schedule a return visit in 2 weeks. If the results of subsequent examinations are also doubtful or there is a possibility of deviation, refer to a growing referral hospital 4. flower level 1
	Answer' (Yes)' 6 or less	There is a possibility of deviation	Refer to a level 1 growth and development referral hospital

Figure 5. Results of developing an algorithm for examining child development using ROPTAR

The algorithm was developed using the Smart Spin Wheel (ROPTAR), which asked not health workers but parents or caregivers or children's school teachers with a play concept approach using the ROPTAR educational game tool.

Table 8. Evaluation of algorithm development trial results by parents, caregivers and school teachers

No	Evaluation	Amount	Median (min-max)	Rates + SD
1	Explanation of use	100	13 (10-87)	33.3+46.93
2	Games by parents and/or teachers with children	100	7 (20-91)	33.3+50
3	Time Allocation	100	12 (10-88)	33.3+57.74
4	Interpretation by parents/teachers	100	7 (10-87)	33.3+47.72
5	Parental actions on outcomes	100	8 (40-88)	33.3+50
6	APE use response	100	8 (10-92)	33.3+47.38

Table 9. Results of validity tests for development of image aspects and ROPTAR questions according to design experts and child development doctors

Instrument	R count Correlation Test Pearson's Product Moment	R tables (n = 10)	Conclusion
Form figure	r : 0.885	0.749	Valid
Figure 1	r : 0.767	0.749	Valid
Figure 2	r : 0.871	0.749	Valid
Figure 3	r : 0.871	0.749	Valid
Figure 4	r : 0.849	0.749	Valid
Figure 5	r : 0.767	0.749	Valid
Figure 6	r : 0.849	0.749	Valid
Figure 7	r : 0.767	0.749	Valid
Figure 8	r : 0.862	0.749	Valid
Figure 9	r : 0.767	0.749	Valid
Figure 10	r : 0.910	0.749	Valid
Figure 11	r : 0.910	0.749	Valid
Question			
Question 1	r : 0.767	0.749	Valid
Question 2	r : 0.936	0.749	Valid
Question 3	r : 0.885	0.749	Valid
Question 4	r : 0.871	0.749	Valid
Question 5	r : 0.871	0.749	Valid
Question 6	r : 0.849	0.749	Valid
Question 7	r : 0.936	0.749	Valid
Question 8	r : 0.885	0.749	Valid
Question 9	r : 0.871	0.749	Valid
Question 10	r : 0.871	0.749	Valid
Question 11	r : 0.849	0.749	Valid
Question 12	r : 0.936	0.749	Valid

Table 10. Results of development quality evaluation according to user views in Batu City

No	Quality components	Category		
		Good: f (%)	Enough: f (%)	Less: f (%)
1	Functionality	45 (90)	5 (10)	0 (0)
2	Efficiency	50 (100)	0 (0)	0 (0)
3	Usability	45 (90)	3 (6)	2 (4)
	Rates	46.67 (93.33)	2.67 (5.33)	0.67 (1,33)

Table 1. Average development trial score

Rata-Rata Score	Control group		Intervention group	
	Frequency	Percentage	Frequency	Percentage
9-12	4	76.67	9	96.67
7-8	4	23.33	1	3.33
≤ 6	2	3.33	0	0

The results of the ROPTAR development effectiveness test using Mann-Whitney U obtained a non-parametric Z value of -4.059 with a significance of $p=0.001$ ($p < 0.005$), which means Ho was rejected and H1 was accepted, so it can be concluded that the development of the pre-development screening questionnaire (KPSP) in the form of a smart rotating wheel educational game tool (ROPTAR) is an alternative media that can be used to screen children's development.

DISCUSSION

The Pre-Developmental Screening Questionnaire (KPSP) is a measuring tool used as a pre-screening tool for child development from the age of 3 months to the age of 72 months, aimed at determining whether a child's

development is normal according to age or whether there are deviations. Developmental screening using KPSP is carried out by health workers (doctors, midwives, nurses, nutritionists and health educators.[3,7-10] In carrying out screening, health workers ask parents and order children according to the contents of the questionnaire, health workers are active while parents and children are passive. Several studies on the development of KPSP were carried out mostly using Android or applications that were still oriented towards officers and parents, children were less directly involved so that during screening children did not pay attention and were busy with themselves and the games around them.

Age 0 to 5 years is the golden age, at this age children are in the process of very optimal growth and development, children have potential that needs to be developed. Optimizing growth and development must be adjusted to the development stage according to the child's age. Developmental stimulation that is appropriate for children at this age is carried out with a play approach. Using a play concept approach, this research was carried out by developing a standard pre-screening questionnaire measuring development in terms of form, questions and algorithm. The resulting product is packaged in the form of an educational game tool called a smart rotating wheel (ROPTAR).

Roptar is a game tool in the form of a rotating wheel made of acrylic material, consisting of two sides. The front side is equipped with pictures adapted to the questions on the back side of the wheel. The front of the wheel is equipped with a needle as an image indicator. The function of the needle is to point to one of the images when the wheel stops spinning. Pictures and questions are made colorful to attract children's interest. Educational game tools are needed to increase children's motivation, educational games can increase children's knowledge.[11] Judging from the perspective of use, efficiency and function, ROPTAR is of good quality.

The effectiveness test results show that ROPTAR is an alternative media that can be used to screen children's development. ROPTAR is a game tool that is introduced to young children as a symbol to stimulate children's development, attract children's attention to explore and try to play directly and make children happy. Play activities are fun for children, done voluntarily. Play activities are very popular with children.[7] Through play children will learn[4], improving cognitive development in children[8], and supporting children's creativity.[9] ROPTAR is very practical and suitable for use for early childhood development screening, an educational game tool that is very practical and suitable for use to stimulate children's learning.[12-24] With ROPTAR, children will socialize, not only interacting with themselves, but children will also interact directly with other people as their playmates. This is in line with the results of Reni's research which states that educational game tools are an alternative learning medium for students so they can interact directly.[25]

CONCLUSION

Based on the results of the research and development that has been carried out, it can be concluded that the development of the Pre-Developmental Screening Questionnaire (KPSP) in the form of an educational game tool is suitable for use as a tool to help monitor children's development.

REFERENCES

1. RI. Undang-Undang Dasar Negara Republik Indonesia Tahun 1945, BAB X Hak Asasi Manusia, Pasal 28 ayat (1) dan ayat (2). Jakarta: RI; 1945.
2. Kemenkes RI. Laporan riset kesehatan dasar 2018. Jakarta: Kemenkes RI; 2018.
3. Kemenkes RI. Pedoman pelaksanaan stimulasi, deteksi dan intervensi dini tumbuh kembang anak di tingkat pelayanan kesehatan dasar. Jakarta: Kemenkes RI; 2020.
4. Kurniati E. Game di aplikasi Android untuk mendukung pelajaran, belajar. Prosiding ISELT FBS Universitas Negeri Padang. 2018;6:84-90.
5. Sugiyono. Metode penelitian kuantitatif kualitatif dan R & D. Bandung: Alfabeta; 2019.
6. Rosner. Fundamental of biostatistics. USA: Duxbury; 2006.
7. Pratiwi W. Konsep bermain pada anak usia dini. Jurnal Manajemen Pendidikan Islam. 2017;5(2):106-117.
8. Istri RDA, Semara Putra DKN, Wirya IN. Penerapan metode bermain melalui permainan ular tangga untuk meningkatkan perkembangan kognitif pada anak kelompok A. Jurnal Pendidikan Anak Usia Dini Undiksha. 2016;4(2).
9. Hijriati. Peranan dan manfaat ape untuk mendukung kreativitas AUD. Bunayya: Jurnal Pendidikan Anak. 2017;3(2):59–69.
10. Imroatun I. Permainan tradisional sebagai pembelajaran kecakapan sosial bagi anak usia dini. Jurnal Sains Psikologi. 2014;3(1):1–11.

11. Birru Muqdamien, Umayah, et al. Tahap definisi dalam Four-D Model pada penelitian Research & Development (R&D) alat peraga edukasi ular tangga untuk meningkatkan pengetahuan sains dan matematika anak usia 5-6 tahun. Jurnal Intersections. 2021;6(1):23-33.
12. Oktariyanti D, Aren, et al. Pengembangan media pembelajaran online berbasis game edukasi wordwall tema indahnya kebersamaan pada siswa sekolah dasar. Jurnal Basidu. 2021;5(5):4093-4100.
13. Gudadappanavar AM, Benni JM, Javali SB. Effectiveness of the game-based learning over traditional teaching-learning strategy to instruct pharmacology for Phase II medical students. J Educ Health Promot. 2021 Mar 31;10:91. doi: 10.4103/jehp.jehp_624_20.
14. Welbers K, Konijn EA, Burgers C, de Vaate AB, Eden A, Brugman BC. Gamification as a tool for engaging student learning: A field experiment with a gamified app. E-Learning and Digital Media. 2019;16(2):92-109.
15. Dahalan F, Alias N, Shaharom MSN. Gamification and game based learning for vocational education and training: a systematic literature review. Educ Inf Technol (Dordr). 2023 Jan 12:1-39.
16. Pan L, Tlili A, Li J, Jiang F, Shi G, Yu H and Yang J. How to implement game-based learning in a smart classroom? A model based on a systematic literature review and Delphi method. Front. Psychol. 12:749837.
17. Marinšek M, Lukman N. Teaching strategies for promoting motor creativity and motor skill proficiency in early childhood. Economic Research-Ekonomska Istraživanja. 2022;35:1:2645-2653.
18. Shortt M, Tilak S, Kuznetcova I, Martens B, Akinkuolie B. Gamification in mobile-assisted language learning: a systematic review of Duolingo literature from public release of 2012 to early 2020. Computer Assisted Language Learning. 2023;36:3:517-554.
19. Ishak SA, Din R, Hasran UA. Defining digital game-based learning for science, technology, engineering, and mathematics: a new perspective on design and developmental research. J Med Internet Res. 2021 Feb 19;23(2):e20537.
20. Abdulrahaman MD, Faruk N, Oloyede AA, Surajudeen-Bakinde NT, Olawoyin LA, Mejabi OV, Imam-Fulani YO, Fahm AO, Azeez AL. Multimedia tools in the teaching and learning processes: A systematic review. Heliyon. 2020 Nov 2;6(11):e05312.
21. Hammady R, Arnab S. Serious gaming for behaviour change: a systematic review. Information. 2022; 13(3):142.
22. Tahir R, Wang AI. Evaluating the effectiveness of game-based learning for teaching refugee children Arabic using the integrated LEAGUÊ-GQM approach. Behaviour & Information Technology. 2024;43:1:110-138.
23. Pan L, Tlili A, Li J, Jiang F, Shi G, Yu H, Yang J. How to implement game-based learning in a smart classroom? a model based on a systematic literature review and delphi method. Front Psychol. 2021 Dec 2;12:749837. doi: 10.3389/fpsyg.2021.749837.
24. Kaldarova B, Omarov B, Zhaidakbayeva L, Tursynbayev A, Beissenova G, Kurmanbayev B and Anarbayev A. Applying game-based learning to a primary school class in computer science terminology learning. Front. Educ. 2023.
25. Widyastuti R, Puspita LS. Pengembangan media pembelajaran berbasis game edukasi pada mata pelajaran IPA tematik kebersihan lingkungan. Jurnal Informatika dan Komputer. 2019;22(1):95-100.