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MINI MODULE "BOARD GAME" TO IMPROVE SCIENCE LITERACY SKILLS IN EDUCATORS AT KB YASMIN JEMBER

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Abstract

Efforts to deal with food issues will basically greatly support food security locally, nationally and globally. Based on surveys and data, the fact is that most of the behavior in handling food waste by both individuals and communities is thrown away, thus polluting the environment. One of the characters that is important to be instilled in the problems above is the need to inculcate the character of caring for the environment. KB is considered as the right institution in order to instill and foster the character of caring for the environment from an early age, supported by the competence of teachers who are able to prepare fun teaching materials related to scientific literacy. This research problem is focused on developing mini modules to improve Science Literacy skills in educators at KB Yasmin. The specific objectives of this research are to develop scientific literacy cognitive stimulation games for children, to make it easier for educators to package fun teaching materials, to educate students regarding scientific literacy. This study aims to develop a mini module " Board Game " to improve the Science Literacy Skills of educators at KB Yasmin Jember. The research method used is research and development. Research and development methods are research methods used to produce products while testing the effectiveness of these products. The results of the study illustrate that the board game module can improve scientific literacy skills in educators at KB Yasmin in the moderate category.

Keywords: Board Game, Science Literacy, Skills, Educator

Abstrak

Upaya penanganan isu pangan pada dasarnya akan sangat mendukung ketahanan pangan secara lokal, nasional maupun global. Berdasarkan survei dan data, faktanya perilaku dalam penanganan sisa makanan yang dilakukan baik individu maupun komunitas sebagian besar dibuang sehingga mencemari lingkungan. Salah satu karakter yang penting untuk ditanamkan dalam permasalahan di atas yaitu perlunya penanaman karakter peduli lingkungan. PAUD dinilai sebagai lembaga tepat dalam rangka menanamkan dan menumbuhkan karakter peduli terhadap lingkungan sejak dini, didukung dengan kompetensi guru yang mampu menyiapkan bahan ajar yang menyenangkan terkait literasi sains. Masalah penelitian ini difokuskan pada pengembangan mini modul untuk meningkatkan keterampilan Literasi Sains pada pendidik di KB Yasmin. Adapun tujuan khusus penelitian ini ialah mengembangkan game stimulasi kognitif litrasi sains bagi anak, memudahkan pendidik dalam mengemas materi ajar yang menyenangkan, mengedukasi siswa terkait literasi sains. Penelitian ini bertujuan mengembangkan mini modul "Board Game" untuk meningkatkan Keterampilan Literasi Sains pendidik di KB Yasmin Jember. Metode penelitian yang digunakan adalah research and development. Metode penelitian dan pengembangan adalah metode penelitian yang digunakan untuk menghasilkan produk sekaligus menguji keefektifan produk tersebut. Hasil penelitian memberikan gambaran bahwa modul board game dapat meningkatkan kemampuan literasi sains pada pendidik di KB Yasmin dengan kategori sedang.

Kata kunci: Board Game, Literasi Sains, Keterampilan, Pendidik

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INTRODUCTION

In some developed countries , waste food is serious issue because impact to damage environment live. At stage consumption, wastage food push enhancement harmful gas emissions environment and health man (Sugeng et al., 2021) . FAO (*Food and Agriculture Organization*) noted that Indonesia is a country with *Food loss* and *Food waste* biggest second in the world. Based on source Food Security Agency Ministry of Agriculture , waste and loss Indonesian food if collected in One year the amount reached 1.3 million tonnes. So that on average, one person earns trash and loss food 300 kg per year . Wasted material food and food happen start from production agriculture , system management supply and logistics to the kitchen and table Eat House households , restaurants and hotels as well as retail (Gunawan et al., 2019) .

Reported several of the Good Stats that Rara (2022) wrote type the most food left at home ladder is carbohydrate as much as 41.55%, ie in the form of rice, potatoes , corn , and others. Then , followed with side dish form meat , fish, eggs , tofu , tempeh , and so on as much as 34.40%. Furthermore vegetables with 20.77%, fruits 2.52%, finally milk with 0.76%.

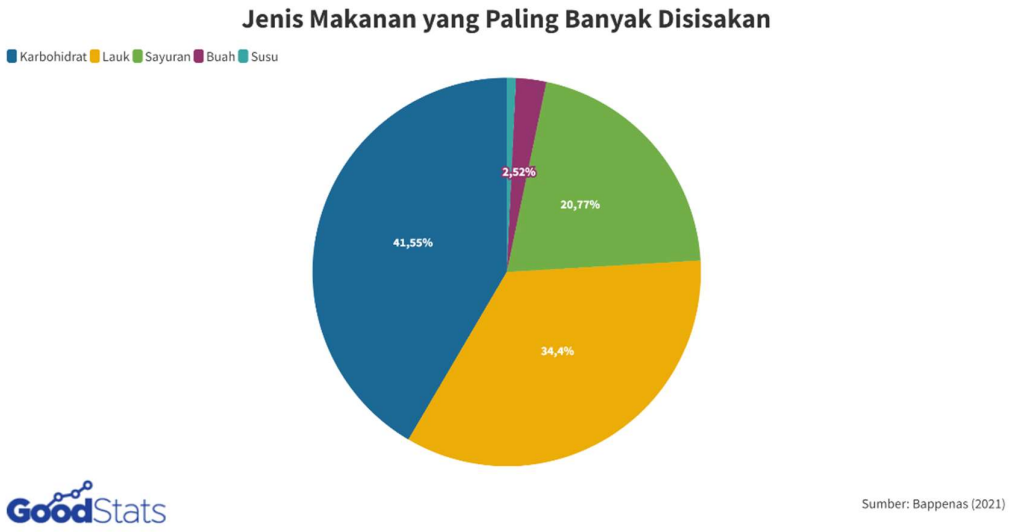

Figure 1. Graph type the most food left

Based on surveys and data released by ***Bappenas*** , in fact behavior in handling remainder food done _ Good individual nor community part big thrown away . Based on portion data plates per person as much as 44% thrown away , 36% given away to animal pet , 12% be compost , and 5% is given to other people.

Figure 2. Behavior handling remainder food

Based on data that has been exposed importance something renewal in support development that focuses on sustainability environment become the main agenda *Sustainable Development Goal's* (Subangkit et al., 2020) . Ca n't denied that factor main reason disaster ecological is character humans who don't responsible so that behavior handling remainder food pollute environment . One important character For implanted in the problem above that is necessity planting character care environment. PAUD is assessed as institution appropriate in framework implant and grow character care to environment since early (Jayawardana, 2016) . Teachers understand that stimulation child age early must done For grow all over aspect development child , no only cognitive only , but also social and physical child age early in a manner simultaneously in accordance with age development child (Yaswinda et al., 2018) . Success education child age early lies with the educator or teacher. Educator or the teacher must capable guide , help and direct child his education . One required skills stimulated by educators in Early Childhood Education, namely Skills Literacy science, then important give understanding preservation environment through activity literacy in schools specifically literacy science. Literacy ability science still child less than optimal because educator Not yet capable develop related teaching materials literacy science.

Education carried out in room informal scope is known with term Training . Training is activity purposeful learning add knowledge and skills a characteristic individual non-formal education. Understanding Simamora (Kamil, 2010) also stated that training is " a series designed activity in framework increase skills , knowledge , experience , etc change attitude a individual ". As for goals the training put forward by Dale S. Beach (1975) in (Kamil, 2010) " *the purpose of training is to achieve changes in the behavior of individuals who are trained"* can concluded from the statement above ie objective from training is For change behavior a individual who has trained . kindly official government emit Constitution about non-formal education , ie stated in Constitution National Education System (Sisdiknas) Number 20 of 2003: "Nonformal Education is **track education outside education _ formal education is possible held in a manner structured and tiered ".** Training can said as something business possible repairs solve individual or group problems , more specifically about effort enhancement performance, productivity organization , institution nor company . Through activity training of employees at a company or institution expected capable increase knowledge and skills so that capable give

contribution to improvement company or institution. Source Power humans who have quality knowledge and skills, collectively No direct will Ready face every changes and developments that have occurred organization.

Activity training become something obligation for company For increase quality employee, accordingly with Constitution Number 20 of 2003 concerning National Education and Laws Number 13 of 2003 Concerning Employment . Mentioned in Constitution the enhancement quality source Power man based competency. it tightly relation with enhancement HR quality through activity training. Training No will regardless from supporting components walk training and each other relate through development system, system the built Because from One system can influence to system others. System is possible network arrange something things to order with neat on time its implementation. Then system the Actually designed for maintenance training from beginning No get error, so on stage end can confirmed objective from implementation training This it worked.

KB Yasmin Jember is one of them institution education required application interactive teaching materials as form education public about literacy science, so researcher capable realize character and empowerment education competitive through development curriculum with character and empowerment competitive. According to Widodo and Jasmadi in the book (Lestari, 2013) states that teaching material is set means or tool learning that contains material learning, methods, limitations, and methods evaluate what is designed in a manner systematic and interesting in framework reach expected goal, research competencies and subcompetencies with all its complexity. Here state that in making There are a lot of teaching materials need books as references that are looked at and expanded upon Again with style more aloneinteresting but still see expected goal (Magdalena et al., 2020) . Based on the expression Dick, Carey, and Carey is known that teaching materials contain necessary content studied by students Good shaped print or facilitated by the teacher For reach objective certain (Pentury, 2017) .

Teaching materials are systematic It means arranged in a manner massage so that make it easy student learn . On the side That Teaching materials are also of a nature unique and specific . I mean unique teaching materials only used For target particular and in the learning process particular , and specific It means content teaching materials are designed such shape only For reach competence certain from target certain (Magdalena et al., 2020) . Development material can implemented through product in the form technology print , audiovisual technology, technology based computer or technology integrated . Technology print is method For produce or convey material. Like books and static visual materials , especially through printing mechanical and photographic Seels and Richey (1994) in (Cahyadi, 2019) . In developing necessary teaching materials consider the development model To use ensure quality teaching materials in support effectiveness learning , because development basic teaching materials is a process that is linear with the learning process . Availability teaching materials during This still minimal. Necessary teaching materials arranged based on need objective learning. Deep business increase quality basically learning is unity in the learning process, no only in selection and implementation the right strategy , however There is necessary things _ noticed among others , namely election teaching materials in present the learning process so that the results obtained are optimal and achieve learning targets in accordance with objective learning that has set . In regards of this , teaching materials is one component important in learning, especially teaching materials are means supporter in the learning process (FE Kurniawati, 2015) .

Board games is part of interactive multimedia that can be help implementation of the learning process . Rob Philips in (Mustika et al., 2017) explain meaning interactive as an empowerment process student For control environment learn . (ID Kurniawati & Nita, 2018) explain Multimedia does not only own meaning between text and graphics simple only , but also equipped with sound , animation , video, and interaction . While listening explanation can see pictures , animations nor read explanation in form text (Sutopo, 2008). According to Sigit (2008), divided multimedia into two categories , namely : linear multimedia and interactive multimedia . Interactive Multimedia is something equipped tool _ with tool control that can be operated by its users in choose something desired . _ Interactive multimedia in question in study This is learning multimedia interactive (learning interactive multimedia- based), game applications and others. According to Scorviano (2010) in (Streit & Hadi, 2016) , *board games* is type games where tools or parts game placed , moved , or moved on a surface that has been be marked or divided according to set rules . According to Wisana (2011) *board game* own a number of benefit namely : Rules, Interaction Social, Education, Risk and Simulation, Level Social.

Literacy is use practices situation social , and historical , as well cultural in create and interpret meaning through text . Literacy need at least A no sensitivity said about relationships between conventions textual and context its use as well as ideally the ability to reflect in a manner critical about relationships it . Because it's sensitive with aims/ objectives , literacy That characteristic dynamic – not static – and can be varies between and within _ community and discourse / discourse culture . Literacy need a series of cognitive abilities, knowledge Language written and oral knowledge _ about genre, and knowledge cultural (Kern: 2000) in (Pentury, 2017) . All this time potency or wisdom locally owned by various ethnic group nation in Indonesia yet optimally integrated in learning at school as source learning (Sriyati, 2021). Pornpimon, et al ., 2014) stated that wisdom local can applied in learning science and relate to it in life around _ student. One _ results must learn _ teacher built through learning and having role important is literacy environment students (Erdogan, et al ., 2009). Kostova & Validimirora (2010) added that the learning strategy applied by the teacher in class influence development literacy environment. Scholz & Claudia (2011) also stated that literacy environment is individual ability For behave Good in his daily life to condition environment surrounding . Karatekin (2012) added literacy environment as outlook about How environment natural function as well as man role in preserve and look after environment . Increasing environmental problems _ worsened at various areas in Indonesia are demanding exists literacy good environment for students. _ Erdoğan, et al . (2009) stated literacy environment divided become six component ie knowledge ecology, knowledge issues environment, knowledge social politics, skills cognitive, affective , and behavioral responsible answer to environment. The experience and enthusiasm of the teachers for teach education environment to students can too increase literacy environment in effort maintenance environment. Therefore _ that teacher can make an effort various method For train literacy environment to student among them through making based teaching materials literacy environment (Sriyati et al., 2022) . As for the map road problem study This as following :

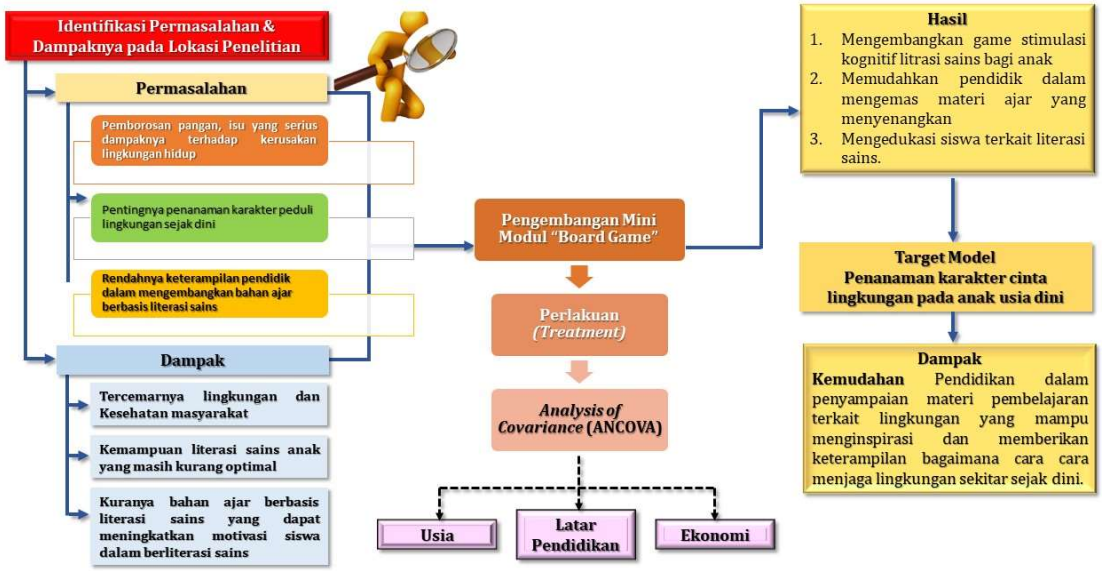

Figure 3. *Design Study* Mini Module "*Board Game* "

Problem study This focused on development Fun , educational teaching material student related literacy science that will implemented by the teacher. As for goals special study This know How effectiveness based teaching materials literacy science through the " *Board Game* " mini module for increase Skills Educator *Science Literacy* at KB Yasmin.

METHODS

1. Research Design

Study This aim For developed a mini module " *Board Game* " as solution on minimal understanding public related pollution environment . One important character For implanted in problem above that is necessity planting character care environment in children age early , so educator must capable develop related teaching materials literacy science in learning . If classified based on desired goal achieved through something model development , then study This including into the type study development or *research and development*. (Gay et al., 2009) . Can explained that study development is research used _ For produce product certain , and for perfect something suitable product with references and criteria from product made _so that produce new product through various stages and validation or testing . Regarding with study This ,model is developed is a Mini " *Board Game* " Module for increase Skills literacy science educator in the Group play .

2. Design Research , Research Locations and Data Analysis

Mini Module " *Board Game* " which will be later will implemented in study this is basically it is something activity development real from something draft early . Development the formulated through activity thought and at the same time development against similar models that have There is before . On scope education society , the model represents answer on needs and problems that occur in society , especially in relation with implementation of learning programs education society. As for the design study This is as follows :

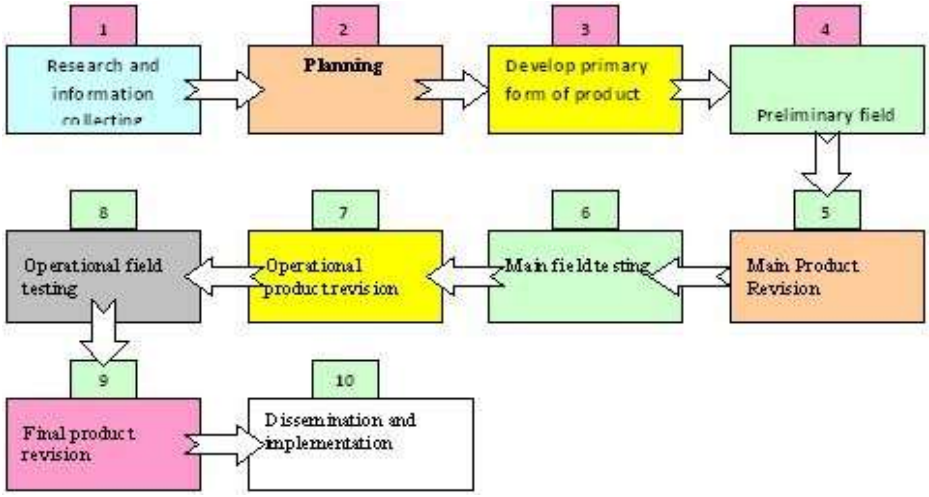

Figure 4. *Design Study* development Mini Module "*Board Game* "

Study This located at PAUD Yasmin Jember, which is located at Jl. Karimata No. 49 Jember, Sumbersari, Kecamatan Sumbersari, Jember Regency, as unit non-formal education that will become partner in maintenance development of the mini- module " *Board Game* " for educators Group play. Data collection tools in research This form questionnaire, observation, study documentation, and tests. Through observation, will qualitative data was obtained around implementation action. Through an evaluation format, it will data obtained in the form numbers and descriptions related with results treatment that has given. Whereas through questionnaire, data obtained in the form of quantitative data in form numbers. For obtain valid data, then researcher use a number of step as following : questionnaire data analysis, instrument trials (instrument validity, reliability Instruments), data analysis test (homogeneity test, normality test, T-Test test) and inspection techniques trust.

RESULTS AND DISCUSSION

Results

1. Aspects *Board Game* Module Mini Assessment

Effectiveness inner boardgame module increase literacy science educator seen from a number of aspect that is appearance module , presentation materials , benefits , and literacy skills science . Following is average value of every aspect .

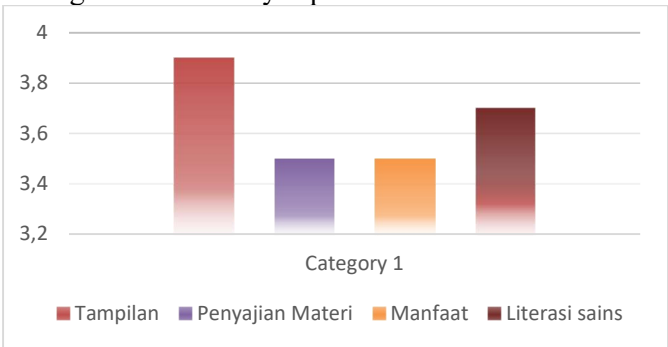

Figure 5. Aspects *Board Game* Module Assessment

Research results showing that average value on aspects appearance have mark highest namely 3.9, while literacy ability science own average value 3.7, aspect presentation material and

aspects benefit own average value 3.5. See results mark the mark from every aspect classified high , so can concluded understanding educator to *board games* in increase literacy science rated good . Following is average value of aspect display , clarity text own average rating 3.4, clarity picture own average value 4, attractiveness picture own average value 4, and suitability picture with material own average value 4.

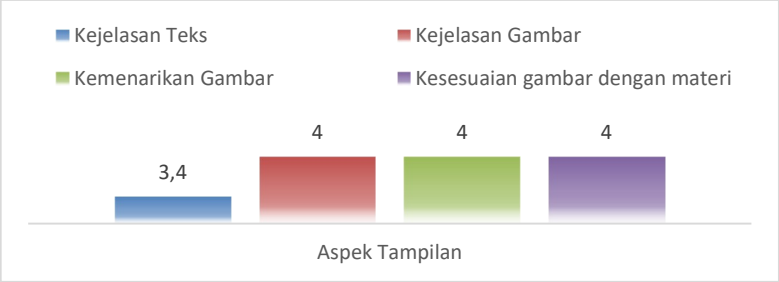

Figure 6. Aspect Mini View *of the Board Game Module*

Following is aspect mean value presentation material . Presentation material own average rating 3.1, ease understand material own mean value 4, accuracy systematic own average rating 3.4, clarity sentence own average value 3.9, symbol clarity has mean score 4, clarity term own mean value 4, suitability example with material own average value 3.

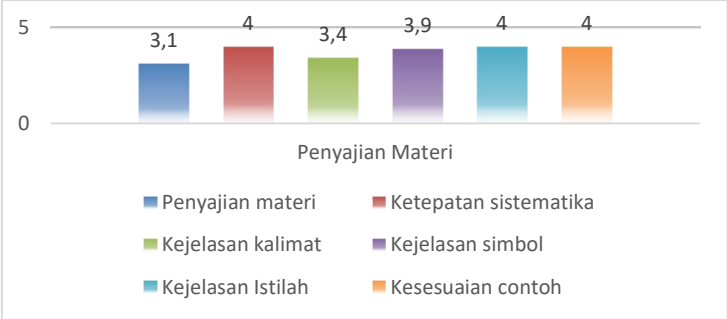

Figure 7. Aspect Presentation of Material

Following is average value for aspect benefits , convenience Study own average score 3.4, ability to use module own average value 4, and improvement motivation Study own the average value is 3.3.

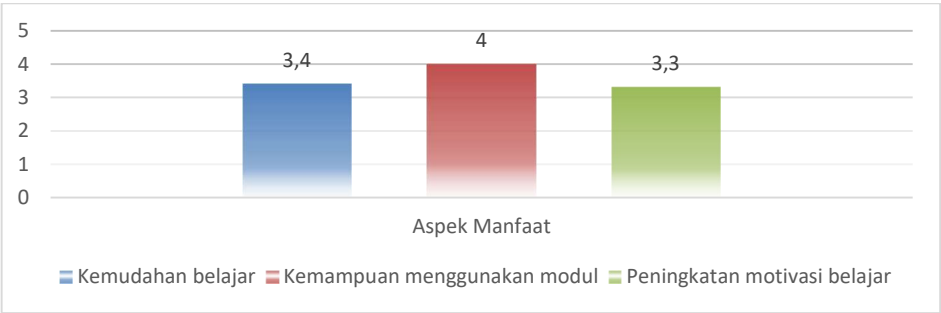

Figure 8. Benefit Aspects

Following is average value for aspects of literacy skills science , skill use knowledge science own average value of 3.6, ability to test object science own average rating of 3.7 and interest to science own average value 4.

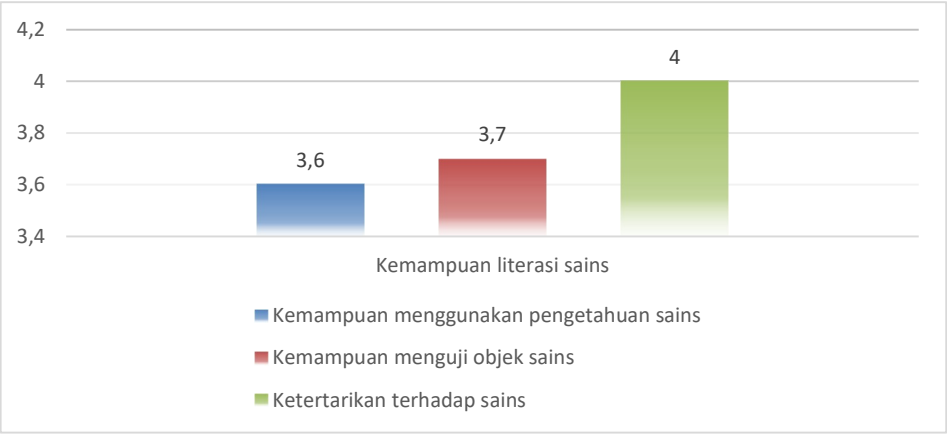

Figure 9. Scientific Literacy Ability

2. Posttest Results Implementation of the Mini *Board Game Module*

Description percentage pretest and posttest summarized in table 1. Determination amount class use formula *Sturges* (Sugiyono , 2013) namely K = 1 + 3.3 log n. With K is amount class and (n) is many respondent . Through formula the obtained K= 1 + 3.3 log 20 = 5.29. Or rounded to 5. Class intervals on scores pretestt obtained from results range (Maximum pretest score – Minimum pretest score) is divided amount class . $\frac{16-10}{5} = 1.20$rounded to 1. The class interval of the posttest score is obtained from results range (score maximum posttest minimum posttest score) divided amount class that is $\frac{26-21}{5} = 1$, rounded to 1. Following results pretest and posttest in stage 1 test with n-10.

Table 1. Pretest and Posttest Results of Trial with N20

No	Interval Class	Pretest Score		Interval Class	Posttest score	
		Frequency	Percentage		Frequency	Percentage
1	10-11	4	20%	21-22	4	20%
2	12-13	9	45%	23-24	8	40%
3	14-15	6	30%	25-26	5	25%
4	>16	1	5%	27-28	3	15%
Amount		20	100%		20	100%

Table 1 shows pretest scores from 20 participants students who get it score between 10-11 there were 4 respondents with percentage 20%, score between 12-13 there were 9 respondents with percentage 45%, score 14-15 there are 6 respondents with percentage of 30%, score >16, there was 1 respondent with percentage 5%. If depicted in the diagram as following .

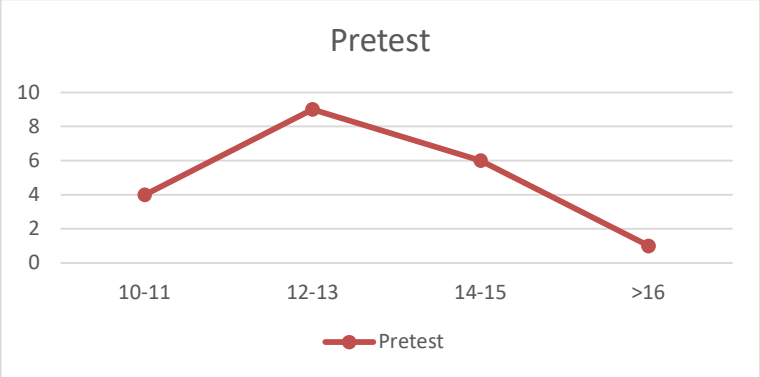

Figure 10. Pretest scores

Whereas posttest scores obtained of 20 respondents namely 4 people get score between 21-22 with percentage 20%, 8 people gain score between 23-24 with percentage 40%, 5 people gain score between 25-26 with percentage of 25% and 3 people win score between 27-28 with percentage 15%. If depicted in the diagram can seen as following :

Figure 11. Posttest score

3. N-Gain Calculation

N-Gain is normalization of the gain obtained from results pretest and posttest . Calculation n-gain average value is performed For see enhancement results Study participant educate . The application of the model is said effective If results increasing participants' abilities education >0.30. Furthermore n-gain value will also used For do data analysis which includes normality test and hypothesis test . Testing carried out on the results of the pretest and posttest with formula as following :

$$N - Gain = \frac{(Skor\ postest - skor\ pretest)}{(Skor\ Maksimum - Skor\ Pretest)}$$

$$N - Gain = \frac{(24{,}2 - 12{,}85)}{(28 - 12{,}85)}$$

$$N - Gain = 0{,}752$$

Furthermore N-Gain normalization is classified into 3 categories that is

Table 2. Normalized Gain Criteria

Index	Criteria
0.70<g<100	Tall

0.30≤g≤0.70	Currently
0.00<g<0.30	Low

(Hakes, 1999)

In conclusion is there is enhancement posttest score of pretest scores with category high .

4. T test results

For know effectiveness module *board game* in increase literacy science to educators and participants educate , then The paired sample t test was carried out . But before carry out a paired sample t test mandatory requirements _ fulfilled namely the data being tested must normally distributed so must done first test for normality . Following is normality test results in stage 1 test with n-10.

Table 3. Normality Test Results Kormogorov - Smirnov

		Pretest	Posttest
N		20	20
Normal Parameters [a,b]	Means	12.8500	24.2000
	Std. Deviation	1.49649	1.96281
Most Extreme Differences	Absolute	.140	.180
	Positive	.121	.180
	Negative	-.140	-.120
Kolmogorov-Smirnov Z		.626	.803
Asymp. Sig. (2-tailed)		.828	.540
a. Test distribution is Normal.			
b. Calculated from data.			

The data in table 3 shows normality test results on pretestt and posttest data . Pretest data own sig value . 0.828 > α 0.05 which means that the data is normally distributed . While the posttest data has sig value . 0.540 which means that the data is normally distributed .

Next, test effectiveness inner boardgame module improve literacy skills science educator done For answer hypothesis study namely : " There is increasing literacy skills science educator after use module boargame at KB Yasmin Jember ". Hypothesis study the can translated to in hypothesis statistics as following :

Ho : Not available increase in literacy skills science educator after use module *board games*

Ha : Yes increase in literacy skills science educator after use module *board games*

Table 4. Test Results Effectiveness of the Boardgame Module in increase Educator's Science Literacy

Statistics	Pretest	Posttest
Means	12.85	24.20
Std. Deviation	1,496	1,962
Correlation	0.387	
t	25,976	
Sig.	0.000	

Table 4.8 shows the results of the pairedes sample t test where the sig value . 0.000 < α 0.05, so hypothesis zero his rejected and Ha accepted , or can interpreted that there is increasing literacy skills science educator after use module *board games* . Test results the give description that module *board games* can improve literacy skills science to educators at KB Yasmin Dalam category medium .

Discussion

Model Trial Implementation

This Mini Board Game Module tested in PAUD Yasmin which has a group program Play (KB) for child 2-4 years old with accompanied by 5 teachers. Activity mini module development *Board Games* This is through process identification start , fix *learning outcome* , design design *boards games* . In design this *board game*, author use *design based research* Model Reeves (Pool and Laubscher, 2016) with with Steps as following :

1. **Identification and analysis problem**
   Researcher identify need necessary _ in planning *board game Scientific* literacy . Identification refer to How *boards games* will made Good from facet design , content , and completeness . Whereas analysis problem especially formerly writer find when reflect learning Science Literacy in Groups Play about importance For grow character Love environment child since age early through the learning process delivered by the teacher.
2. **Develop solution**
   Develop solutions based on benchmarks theory existing *design principles* and innovation technology After through identification and analysis, author submit *board game* as a learning medium For grow character Love environment child since age early. Developed solution based on studies theoretical and practical about *board game* as one of the game media at the time simultaneously can used as a learning medium .
3. **Repeat the process For test and repair solution in a manner practical**
   Stages This researcher return do reflection about solution offered after through sing. So that found it solution about form *board games* that will designed .
4. **Reflection**
   Reflection For produce *design principles* as well as increase implementation from solution in a manner practical.
5. **Decision design**
   At stage This decision about design that will made related *board game* taken . Researcher decide form design *board games,* design *game rules* , pawn design , and completeness other *board games*.

Kindly general , design from planning this *board game* is For improve literacy skills science educators at KB Yasmin about :

1. understanding environment , so capable convey to child that environment is creation of Allah SWT.
2. Understanding *Food waste* , so educator capable convey to child about awareness in reduce waste food (*food waste*).
3. Understanding images, signs, *symbols*, stories, so on educator capable introduce to a child about various information like images, signs, symbols, and stories.
4. The ability to tell stories, so educator capable convey to long process child get food until to plate / table .

5. Impact trash, so educator capable convey to child that rubbish food own impact For earth.
6. Management trash, so educator capable convey to child to child capable role active in manage rubbish food.
7. Plant plants, so educator capable convey to child How plant the food Alone in a manner simple.

Every development carried out , which consists from three component main , that is planning , implementation , and monitoring , so achieved maintenance program efficient and effective education _ (Hidayati et al., 2021) . This model given to educators in the Group Learn (KB) with characteristic (1) has age range 30-40 years , (2) Minimum educational qualification of Strata 1 (S1) educator .

Limited trial _ carried out on 5 people teacher . Model testing done start from stages planning, organizing, implementing, evaluating and acting continue. As for management program done by PAUD manager , namely Mother Ernawati . Based on results limited model testing done observations on program managers regarding application module, obtained average score on aspect appearance have mark highest i.e. 3.9, aspect presentation material and aspects benefit own the average value is 3.5. See results mark the mark from every aspect classified high, so can concluded developed module can understood and applied with well by educators. Following is the average value of aspect view , clarity text own average value 3.4, clarity picture own average value 4, attractiveness picture own average value of 4, and suitability picture with material own average value of 4. Meaning successful program manager understand steps *board* games inside module in accordance with guidelines that have arranged.

Apart from knowing how much tall model validation, also for see what are literacy skills? science participant educate experience significant improvement from before. So pre and post tests were carried out which showed happen increasing participants' abilities educate within class. the results of the pairedes sample t test where the sig value . $0.000 < \alpha\ 0.05$, so hypothesis zero his rejected and Ha accepted, or can interpreted that there is increasing literacy skills science educator after use module *board games*. this in accordance with opinion Sukmadinata & Syaodih (2012) that student Study individually in their meaning can adapt speed learn it with their respective abilities, meanwhile students in class control No It can be seen which students have more Formerly completed and what is not yet. In the learning process going on educator can evaluate which student is more fast learning, so superior student Formerly finished given question games that can be done by students outside class hours. So that capable give influence Good to his character related Love sustainable environment He get through the learning process. Besides that achievement change attitude students are also supported with suitability development designated module for student. With Thus, based on study end, it says the "Board Game" mini module has been completed worthy used in learning literacy science in early childhood education units.

CONCLUSION

Test results give description that module board games can improve literacy skills science to educators at KB Yasmin Dalam category medium . Development teaching materials do not free from curriculum because one element or part urgent main curriculum are : teaching materials . Educator as someone who delivers student For reach objective or competence , then Educator obliged prepare all something including compile teaching materials . In case compile Educator teaching materials must know principles in development teaching materials, so that existing

teaching materials can expedite in the learning process so that created teaching materials can works in a manner maximum.

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