DEVELOPMENT OF JENGA GEOGRAPHY (JEGE) AS AN EVALUATION OF GEOGRAPHY MEDIA ON THE ATMOSPHERIC LAYER MATERIAL FOR CLASS X OF SMAN 71 JAKARTA

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ARTICLE INFO	ABSTRACT
	The study aims to determine the feasibility of developing a geography jenga game as an evaluation media for atmospheric layer material that can meet the dimensions of comprehensive evaluation competency. The study was conducted using a mixed method and the Plomp & Nieveen Educational Design Research research design model consisting of 3 stages, namely preliminary research, prototype stage, and assessment stage. The results of this study are the preparation of a Jenga Geography (JeGe) evaluation media with 88% material validity, 100% media validity, 90% validity from geography teachers, and the final stage of small group trials obtained 88% feasibility and large group trials obtained 90% feasibility. Thus, the results obtained by the Jenga Geography (JeGe) evaluation media as a whole obtained a very feasible feasibility category so that it can be used as a comprehensive evaluation media for atmospheric layer material.

A. INTRODUCTION

Evaluation is one of the important components that must be carried out in the learning process. Evaluation is an assessment through data collection and analysis which will later be used to make decisions about the value of a program (Hamm in Eny Winaryati, 2021). Evaluation is important to determine the extent of students abilities, which will be used as a benchmark for steps or decisions afterwards. The dimensions of competence that must be achieved are the cognitive, affective, and psychomotor domains (Asrul et al., 2014).

In reality, many still implement conventional evaluation activities in the form of tests by giving questions directly to students. This is supported by the results of observations made by authors on class X students of SMAN 71 Jakarta. That observations stated that during the learning process, evaluation activities are carried out through tests given to students after completing certain topics. The test is usually in the form of a written test or a test using an online Google form that require students to answer them.

In conventional tests by giving questions directly, it would be appropriate

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if used to measure the cognitive domain. Conventional tests would not be appropriate if it is used to measure the affective domain, even though the scope of educational objectives includes cognitive, affective, and psychomotor (Putri, 2018) . Based on this explanation, it can be concluded that the use of tests in this evaluation is considered not yet fulfilled the requirements to assess the affective and psychomotor domains. In addition to the competency dimensions that need to be considered, student's interests also have an important role (Ananda & Hayati, 2020) . Interest is a focused attention that containing elements of feelings such as pleasure and tendencies of the heart so that a desire arises and is active in accepting something from outside (Achru, 2019) .

Therefore, author are interested in developing a specific evaluation media that can be evaluated comprehensively and make evaluations more enjoyable. Author try to develop game-based evaluation media that expected to be an alternative to make students feel more interested during the evaluation process. The game-based evaluation media that authors will develop is the Jenga game. Jenga is a type of game that focuses on arranging blocks into a towering structured building. This Jenga game can train various abilities in students, such as training strategy, thinking skills, controlling emotions, focus, and training

cooperation or improving social skills (Khoridah et al., 2022) . In its application, students also learn to consider what steps to take, also focusing on problem realization and then finding solutions in the game (Cinta et al., 2021).

In this study, the author will modify the jenga game into jenga geography (JeGe). The reason for choosing the jenga game is because jenga can be played by many people and easily applied in class. In making the jenga game as an evaluation medium, the author will develop this jenga game by making cards containing questions that will be asked and then answered directly by the players. Based on the description above, the author is interested in conducting research on "Development of Jenga Geography (Jege) as a Geography Evaluation Media for Atmospheric Layer Material for Class X SMAN 71 Jakarta".

B. METHOD

The purpose of this study was to determine the feasibility of developing a geography jenga game on the material of atmospheric layers. This study was conducted as a trial in class X of SMA Negeri 71 Jakarta.

In the development of the Jenga Geography (JeGe) product, author used a design developed by Plomp, named Educational Design Research (EDR). The use of EDR in this study is due to the appropriate suitability between the objectives of this study and the

fundamental concept of EDR itself. The purpose of this study is to develop a media product as a means of evaluation, especially on the material of the atmospheric layer and to test its feasibility to applied in real practice. This is in line with the basic concept of EDR itself. According to Plomp in Putrawangsa, the research approach with design research has the function of designing and developing an intervention in education. to solve an educational problem and to improve understanding of the characteristics of the intervention (Putrawangsa, 2018).

McKenney explains that educational research design *(EDR)* defined as research that develops solutions to practical and complex problems in education through scientific investigation, that is theoretically possible and useful for practitioners. (McKenney & Reeves, 2018)

The model used in this study is the Plomp & Nieveen model which includes three main stages, the preliminary research stage, the prototype creation stage, and the assessment stage (Nieveen & Folmer, 2013). The use of the Plomp & Nieveen model is based on the conclusions of the development of several models. The following are the stages carried out in this research:

1. **Preliminary Research Stage**

At this stage, the author conduct needs analysis or problem identification to understand what needs to be taught by teachers and students during the evaluation process. Teacher's needs analysis conducted by observing how effective the evaluation method used and how students respond to the evaluation media used. Then analyze student needs by observing evaluation methods that students like and interest during game-based evaluation innovations. Afterwards a curriculum analysis is also carried out, such as suitability to curriculum objectives in terms of content. Final analysis to be completed in this observation is a concept analysis. This analysis conducted by creating a concept that can fulfill the evaluation domain while helping students in carrying out the evaluation as desired.

2. **Prototype Creation Stage**

At this stage, after conducting a problem identification analysis, the author develop an intervention design by establishing design guidelines, then after through a cycle design and evaluation, design will be formating by experts, and revised. Formative evaluation activity is more clearly described in the following image :
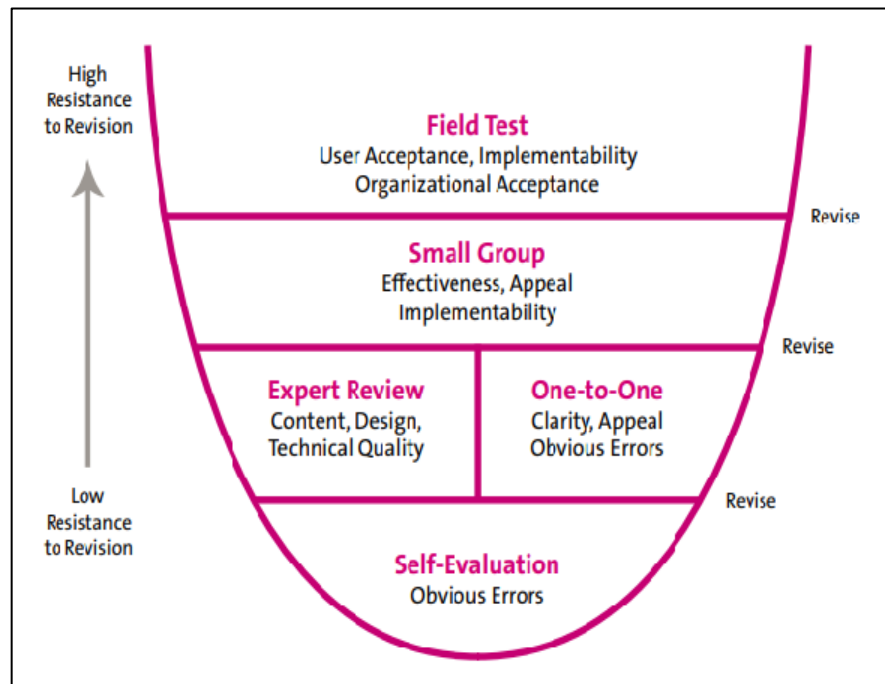
Figure 1. Stages of Formative Evaluation
(Source : Tesmer in Plomp & Nieveen, 2013)

The image showed the stages which formative evaluation is carried out, namely:

1) Evaluation or review of design or content (product specifications)
2) Expert review (considering experts in eligibility/experience standards)
3) One-on-one evaluation with a representative target audience
4) Testing or micro evaluation
5) Field testing or testing on large groups

3. Assessment Stage

At this stage, an evaluation is carried out on users whether the intervention developed has been effective Evaluation conducted through summative evaluation. It was started from the needs analysis, followed by expert assessment, field practitioners assessment namely geography teachers, and the distribution of student response questionnaires. The following points below will explain the stages of product design in this study:

a) Stage 1: carried out by author and produces a design in the form of a *analysis of the preliminary research stage*.

b) Stage 2: by the supervisor, design for Jenga geography evaluation media is assessed to determine whether the content is in accordance with the evaluation components. This assessment was conducted by the supervisor. Evaluation conducted by author under supervision of lecturers

that assessing and providing suggestions for improvement before enter the validation by the expert stage.

c) Stage 3: validation of material by lecturers of Geography Education FIS UNJ and validation of media by lecturers of Educational Technology FIP UNJ. Validation resulted from test given by validator. This validation is carried out by lecturers with a minimum education degree of Bachelor (S1)

d) Stage 4: by geography teachers, the assessment was carried out using a questionnaire to obtain the responses of geography teachers of class X of SMA Negeri 71 Jakarta.

4. Data analysis Technique

The data that will be produced in this study are validated by learning material experts and media experts, teacher assessment to questionnaires, and student respond to questionnaires. The data obtained during the study were analyzed using a Likert scale to determine a person's opinion, perception, or attitude towards a phenomenon that occurred (Sugiyono, 2019). In this study, a Likert scale with four scales was used. The use of these four scales is considered advantageous of being able to capture research data more accurately. That is because the *undeciden* (neutral) answer category which has multiple meanings is

eliminated (Hertanto, 2017). In calculating *the Likert scale,* you can use a score for the calculation and have your own criteria for each score. The scores and criteria used are 4 (strongly agree), 3 (agree), 2 (less agree), and 1 (disagree) (Rozi & Kristari, 2020). Then, from the score results obtained, the percentage of eligibility will be calculated using the formula from (Sugiyono, 2019), whereas the percentage of eligibility is calculated from the score obtained divided by the maximum score then multiplied by 100%.

The calculation results in form of percentages then be adjusted to the classification or interpretation criteria of the Likert scale, namely a percentage of 76% - 100% with very feasible criteria, 56% - 75% with fairly feasible criteria, 40% - 55% with less feasible criteria, and 0% - 39% with unfeasible criteria. (Rozi & Kristari, 2020). The scores obtained previously will be calculated to convert the numbers into qualitative criteria using a formula that refers to as follows:

Very Good = $Mi + 1.5\ SDi \leq \bar{X} \leq Mi + 3\ SDi$ ……………(1)

Good = $Mi \leq \bar{X} < Mi + 1.5\ SDi$……………(2)

Good Enough = $Mi - 1.5\ SDi \leq \bar{X} < Mi$……………(3)

Not Good = $Mi - 3\ SDi \leq \bar{X} < Mi - 1.5\ SDi$……………(4)

$\bar{X}$ is Average score, *I* is ideal average, whereas *SDi* is ideal standard deviation (Lukman & Ishartiwi, 2014).

C. RESULTS AND DISCUSSION
C.1. RESULTS

In this study, results were divided into three segments; the preliminary research stage, the prototype stage, and the assessment stage. The preliminary analysis consists of teacher needs analysis, student needs analysis, curriculum analysis, and draft analysis. Preliminary analysis in the form of teacher needs analysis, student needs analysis, curriculum analysis, and draft analysis. Teacher needs are known through interviews with grade X geography teachers. The results of the interview showed that the implementation of the evaluation is still conventional.

Next results is the analysis of student needs, which was carried out by observation and questionnaires distribution. From the questionnaire, it was found that students were interested in using media during the evaluation. 86% of the students stated that they agreed with the application of game-based media in the implementation of the evaluation. The implementation of the evaluation also does not yet use media as evidenced by 78% of students, saying that no media was used during the evaluation.

Next results is the requirements for learning evaluation analysis. In the implementation of comprehensive learning evaluation, an important thing that needs to be considered is the evaluation domain which includes the cognitive domain, affective domain, and psychomotor domain. Meanwhile, the results of interviews with geography teachers showed that the evaluation was more focused on the cognitive domain only, while the affective and psychomotor domains were quite neglected. The last of this preliminary research is the final analysis by developing comprehensive evaluation media that includes cognitive, affective, and psychomotor evaluation based on the game Jenga. The combination is carried out between the Jenga game and the evaluation of the questions that have been prepared.

After the preliminary stage, the next stage is the prototype stage. A prototype is an original model of the product developed by author and will then be an example to be validated by experts before being applied to evaluation activities. This prototype stage is carried out 3 times. The first prototype was carried out in the form of implementation of the preliminary research stage. Previous jenga blocks that already exist then modified by adding question cards, bonus cards, and blank cards. Next is the second prototype in the form of self-evaluation, where the results of the first prototype were discussed with the supervisor and there were shortcomings found so that revisions were needed. The following table of the results of the revision in prototype II was shown below.

Table 1. Product Revision Phase I.

Revision Section	Information
Image on the card cover	The Jenga image on the cover is adjusted to the color combination used, namely left (before revision) and right (after revision). The use of cover colors is adjusted to the color of the question card.
Question card qualification	Card revision: The cover and contents of the question card have been revised, the color of the question card has changed from 3 to 6 colors based on the weight of the difficulty level of the question (C1-C6). In addition, the Jenga image on the cover has also changed to match the color combination used. The following are the color details according to the weight of the difficulty level of the question: 1) Blue color: question weight C1 2) Green color: question weight C2 3) Yellow color: question weight C3 4) *pink* : question weight C4 5) Red color: question weight C5 6) Purple: weight of question C6
Game instructions	New instructions were created and adapted to the change of cards and blocks from 3 colors to 6 colors.
Jenga Blocks	Jenga blocks revised from 3 colors to 6 colors

(Source: Author, 2023)

After the revision of the second prototype stage, the next step was the third prototype, namely validation (expert review). Validation from expert review carried out by material experts and media experts and assessment by geography teachers as field practitioners or representatives of the target audience (one-on-one evaluation).

Material expert validation was to assess the validity and feasibility of the product that being developed. In this study, the material validator was Mrs. Dra. Asma Irma Setianingsih, M.Sc, a lecturer in undergraduate geography education at the State University of Jakarta. This material validation tests the feasibility of the material or questions that authors have developed in the form of question cards. There are three aspects assessed by the material validation expert. First, the material aspect (questions) gets a feasibility percentage of 81% with very good validity. Second, the linguistic aspect gets a feasibility percentage of 100% with very good validity. Third, the learning evaluation aspect gets a feasibility percentage of 88% with very good validity. Thus, the overall total gets a feasibility percentage of 88% with very good validity.

Table 2. Phase II Product Revision.

Revision Section	Information
Image on the card cover	Addition of special cards: Special cards without answer barcodes will be given to Jenga game participants, while cards with answer barcodes will only be held by the referee or judges in each group.
Questions on the card	Changes to the question: some of the wording in the question has been adjusted, including reductions, additions, and modifications of words or sentences.
Game instructions	Revised instructions/gameplay for Geography Jenga, with the addition of Jenga block images and question cards to give players a clearer picture. Also, there is a revised explanation to be more detailed by mentioning the first player and so on.

(Source: Author, 2023)

Furthermore, media expert validation was to assess the validity and feasibility of the product being developed. In this study, the media validator was Mrs. Dra. Suprayekti, M.Pd., a lecturer in educational technology at the State University of Jakarta. This media validation tested the feasibility of the media that had been developed by the author. There are three aspects assessed by the media validation expert. First, the appearance aspect getting a feasibility percentage of 100% with very good validity. Second, usage aspect getting a feasibility percentage of 100% with very good validity. Third, the assessment and interest aspects getting a feasibility percentage of 100% with very good validity. Thus, the overall total gets a feasibility percentage of 100% with very good validity.

Next is the Geography Teacher Assessment, the evaluation of the developed product by teachers as field practitioners. The geography teacher of SMA Negeri 71 Jakarta who became the assessor was Mrs. Christiana Ngajiyem, S.Pd. There are four aspects in the assessment by the geography teacher. First, the learning evaluation aspect getting a feasibility percentage of 88%. Second, the appearance aspect getting a feasibility percentage of 88%. Third, the usability aspect getting a feasibility percentage of 100% so all of them get very good validity. Fourth, the interest aspect gets a feasibility percentage of 92% with very good validity. Thus, overall total gets a feasibility percentage of 90% with very good validity.

The table above contains several parts that were revised directly by the material validator and media validator. Furthermore, after the revision was carried out by the author, the final product results were obtained in the form of Jenga blocks along with question cards. The following was a picture of the final product results after the final revision was carried out

Figure 2. Geography Jenga Products
(Source: Author, 2023)

The picture above is the final result of the product that the author developed, named geography jenga. Geography jenga itself includes jenga blocks, question cards, game instruction sheets, complete with geography jenga boxes. The final results of this product will then be tested directly on students (assessment phase), which will be discussed in the next discussion segment.

C.2. DISCUSSION

The development stages carried out using the *Educational Design Research* (EDR) research design by Plomp & Nieveen which has a number of stages in its development, namely the *preliminary research stage*, *prototype stage*, and *evaluation stage.*

After all stages have been implemented, the next step is to calculate the overall media assessment. Based on the research data obtained, the results of the validation of material experts and geography jenga media evaluation experts. From the score ranged from 1 to 4, it obtained an average score of 3.5 and 4.0 respectively. Those values classified as very good validity category with percentage of eligibility from material experts 88% (very feasible) and from media experts 100% (very feasible). Then the results of the assessment by geography teachers. From the geography teachers, geography jenga evaluation media obtained an average score of 3.62 from the

score ranged from 1 to 4. Classified in the very good validity category with a percentage of eligibility of 90% (very feasible). The results of the questionnaire distribution response to students regarding the evaluation of geography Jenga media was tested on a small trial scale with 12 respondents and on a large trial scale with 24 respondents. From a score ranged form 1 to 4, the response getting an average score of 3.53 and 3.59 respectively, classified in the very good category and getting an overall feasibility percentage of 88% (very feasible) and 90% respectively (very worthy).

There are several comparisons between the evaluation media previously used in schools with the media developed by authors, Jenga Geography (JeGe), namely from various specifications such as form, model, process. In terms of the form of the previous evaluation media in the form of *paper/form*, the media developed by the author is in the form of a game. The model used in the previous evaluation media is conventional-based evaluation while the model of the media developed is game-based evaluation. Then in terms of the implementation process, the previous evaluation media implemented by individual work while the media developed by the author implemented in class.

In addition, there are several advantages of the media developed by authors such as students actively participate in the implementation of the

evaluation, this can fulfill the psychomotor domain of students. Furthermore, during the evaluation using geography jenga, it can train cooperation between students because the implementation process is carried out in groups. Several advantages of this geography jenga media allow teachers to conduct comprehensive evaluations that include cognitive, affective, and psychomotor domains . In its application, the contents of the questions on the cards have been adjusted according to competency needs from C1 to C6. Each different color on the jenga card and jenga blocks represents the level of the question so that this geography jenga can be directly implied as an evaluation media, especially on the material on the atmosphere layer.

This is in line with previous research conducted by Rosalita who developed learning media in the form of a Jenga-assisted question- based game to increase interest in learning and mastery of physics material for grade X high school students. The results in the form of products developed that are able to increase interest in learning with an increase score of 0.33 (moderate category) and are able to increase mastery of the material with an increase score of 0.77 (high category) (Rosalita Anggi, 2020). In addition, there was also research that is in line with previous research conducted by Wahyu who developed a smart Jenga card educational game tool for the theme of human and animal organs for grade V

elementary school and obtained "good" results when used in the learning process on the theme of human and animal organs (Revelation of Aji Prayogo, 2015).

D. CONCLUSION

Based on the research that has been done in the form of the development of Geography Jenga (JeGe) as a geography evaluation media on the material of the atmospheric layer for class X, it produces a game tool as a geography evaluation media jenga in the form of jenga blocks modified with 6-color question cards that are adjusted to the color of the blocks and the level of difficulty of the questions, namely C1 to C6.

The development of geography jenga media can be directly implied in the classroom, especially as an evaluation of the atmospheric layer material because the comprehensive evaluation includes the cognitive, affective, and psychomotor domains that have been validated by feasibility tests by material experts and media experts and assessments by geography teachers, in addition, a two-stage trial has also been carried out. Thus, the Jenga Geography (JeGe) evaluation media that was developed as a whole has gone through development stages and obtained a feasibility category, namely very feasible so that it can be used practically for variations of evaluation media on the sub-material of the atmospheric layer.

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