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Development of Augmented Reality Flashcards as an Innovative Learning Media on Linear Motion

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Abstract: This research is a development research that uses the ADDIE Design Research and Development (R&D) model which consists of 5 stages, namely analysis, design, development, implementation, and evaluation. The purpose of this study is to describe the validity and practicality. Augmented reality-assisted flashcards on linear motion material to increase students' learning interest. Product validity was assessed by 3 experts consisting of aspects of material and construct assessment as well as aspects of media and design assessment with an overall average score of 3.64 with a very valid category. The practicality of the product is assessed from the readability aspect and the teacher's perception aspect by obtaining an overall average percentage of 95% in the very practical category. Based on the analysis of the results of the data, it was concluded that the product resulting from the development of augmented reality-assisted flashcards on linear motion material was valid and practical to increase students' interest in learning.

Keywords: flashcards, augmented reality, learning interest, linear motion.

Abstrak: *Penelitian ini merupakan penelitian pengembangan yang menggunakan Desain Research and Development (R&D) model ADDIE yang terdiri dari 5 tahap yaitu analysis, design, development, implementation, dan evaluation. Tujuan penelitian ini yaitu mendeskripsikan kevalidan dan kepraktisan. Flashcards berbantuan augmented reality pada materi gerak lurus untuk meningkatkan minat belajar peserta didik. Kevalidan produk dinilai oleh 3 orang ahli yang terdiri dari aspek penilaian materi dan konstruk serta aspek penilaian media dan desain dengan hasil skor rata-rata keseluruhan 3,64 dengan kategori sangat valid. Kepraktisan produk dinilai dari aspek keterbacaan dan aspek persepsi guru dengan memperoleh persentase rata-rata keseluruhan sebesar 95% dengan kategori sangat praktis. Berdasarkan analisis hasil data disimpulkan bahwa produk hasil pengembangan flashcards berbantuan augmented reality pada materi gerak lurus telah valid dan praktis untuk meningkatkan minat belajar peserta didik.*

Kata kunci: *flashcards, augmented reality, minat belajar, gerak lurus.*

▪ INTRODUCTION

The government has made many efforts to realize quality education at every level of education, namely by using a curriculum that is developed according to the needs of students. Indonesia in 2022 is currently in a period of curriculum transition, namely the transition from the revised 2013 curriculum to the independent curriculum. This curriculum change is inseparable from following the era of digitalization. This era of digitalization is a benchmark for the emergence of an independent curriculum (Manalu, et al, 2022). The use of the independent curriculum is in accordance with the Indonesian government's efforts to improve the quality of education that is relevant to the characteristics of 21st century learning (Priantini, et al., 2022). Quality education is able

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to develop all the potential of students. Quality education must be realized in all subjects, one of which is physics.

Physics is a subject that studies the universe to practice thinking and reasoning. The reasoning abilities of students who are continuously trained make their thinking develop, so students will increase their thinking ability and knowledge (Nurmaulidina & Bhakti, 2020). One of the factors that influence the success of students in learning physics is interest in learning (Achmad, et al., 2017). In fact, the results of the needs analysis used a Google form questionnaire which was distributed to students in class XI MIPA in three schools in Bandar Lampung. The results of the questionnaire which had been filled out by 31 students in class XI MIPA 7 SMA Perintis 2 Bandar Lampung showed that students had an interest in learning physics in the low category where only 41.7%. Then based on the results of the questionnaire which had been filled in by 27 students in class XI MIPA 1 SMA Muhammadiyah 2 Bandar Lampung shows that students have an interest in learning physics in a low category where only 35.6% of students have an interest in learning physics. Then, based on the results of a questionnaire that was filled out by 22 students in class XI MIPA 1 SMA Budaya Bandar Lampung, it showed that students had an interest in learning physics in the low category, where only 34.7% of students had an interest in learning physics.

Based on the problems above, of course a solution is needed to overcome the low interest in learning students, namely by innovating in learning media. Media in learning functions as a teaching tool to clarify the message conveyed by the teacher. Advances in technology require teachers to be able to utilize various learning media. This is reinforced by Law No.14/2015 concerning teachers and lecturers which states that teachers and lecturers must be able to utilize Information and Communication Technology (ICT) for the benefit of implementing development activities in educating.

However, the results of the needs analysis conducted for Physics teachers in the three schools showed that the teaching and learning process was only guided by textbooks. This is due to the lack of availability of facilities and infrastructure in schools and the lack of teacher ability to innovate in ICT-based learning media. One of the physics materials that must be mastered by students is linear motion. This material is the basis for studying more complex advanced material. This is in accordance with the learning outcomes in the independent curriculum, namely students are able to apply the concepts and principles of kinematics and dynamics of motion. There are many mathematical equations in linear motion material which make it difficult for students to understand the material. Previous research found that students did not understand linear motion material because it was based on students' lack of interest in physics lessons (Wibowo, 2018). This is supported by the results of the needs analysis of students, it was found that students experienced difficulties and did not like linear motion material. The results of the needs analysis for teachers also mentioned this, where students seemed less enthusiastic in learning linear motion material. This will affect subsequent materials.

Based on these problems, learning media is needed to increase student learning interest in valid linear motion material. Therefore, a development research was carried out entitled "Development of Augmented Reality Assisted Flashcards to Increase Students' Learning Interest in Linear Motion Material". The product developed is a new product, so that the development of Augmented Reality Assisted Flashcards products

made by researchers aims to describe the validity of Augmented Reality assisted flashcards to increase students' interest in learning linear motion material and also to describe the practicality of Augmented Reality assisted flashcards to increase interest in learning students on linear motion material.

▪ METHOD

The product in this study was validated by two physics education lecturers at the FKIP Universitas Lampung and one teacher at the Bandar Lampung Culture High School. Flashcards were tested on a small group with a population of 11th grade MIPA students at SMA Budaya Bandar Lampung with a research sample of 11th grade MIPA 1 students as many as 22 students. Teacher perception assessment was aimed at 3 physics teachers at SMA Budaya Bandar Lampung.

This study uses research and development methods using the ADDIE development model by Dick and Carry (1996) which includes five stages of development, namely analysis, design, development, implementation. , and evaluation (evaluation). The purpose of this development is to produce augmented reality-assisted flashcards on linear motion material to increase students' interest in learning that is valid and practical.

The instrument used in this study is by using the questionnaire method. In this study, the preparation of the questionnaire was carried out for several stages, such as the analysis stage and the development stage. The preparation of the questionnaire includes a needs analysis questionnaire, a validity questionnaire, a practicality questionnaire, and a usage response questionnaire which was carried out during product trials and practical trials. Validation scoring uses a Likert scale. The results of the validation scores were analyzed by percentage analysis using the formula according to Sudjana (2005). The percentage results obtained are converted with the criteria as in Table 1. The percentage results obtained are converted with the criteria as in Table 2.

Table 1. Validation scores (ratumanan & laurent, 2011)

Score Intervals	Category
3.25<skor<4.00	Very Valid
2.50<skor<3.25	Valid
1.75<skor<250	Less Valid
1.00<skor<1.75	NotValid

The practicality of the product is assessed based on the readability and teacher perception aspects. Product practicality scoring uses a Likert scale in Table 3. very valid, valid, less valid, not valid. The results of completing the practicality questionnaire were analyzed using the formula according to Sudjana (2005) as follows.

$$\%X = \frac{\Sigma\, Score\ obtained}{\Sigma\, Max\ Score}\ x\ 100\%$$

Table 2. Practicality score (riduwan, 2004)

Presentase	Category
75.01%-100%	Very Practical

50.01%-75.00%	Practical
25.01%-50.00%	Less Practical
0.00%-25.00%	Impractical

▪ RESULT AND DISSCUSSION

The product of this development is augmented reality assisted flashcards. The flashcards developed in this study are augmented reality-assisted flashcards which aim to increase students' learning interest in the linear motion material. The researcher designed augmented reality-assisted flashcards on linear motion material beginning with designing the sections on the flashcards which consisted of the initial part which consisted of the cover, table of contents, learning outcomes, learning objectives, and concept maps. The content section consists of material presentation, sample questions, and practice questions in the form of augmented reality. The closing section consists of a bibliography and author biography like in the Figure 1.

Figure 1. Product flashcards

The results of this stage, the authors packed the initial product flashcards with the help of augmented reality, which were then validated by material experts and media experts. The validation stage needs to be carried out to determine whether flashcards assisted by augmented reality are appropriate or not used as learning media. The presentation of the results of the validation of experts is presented in Table 3.

Table 3. Expert validation results

No.	Aspect	Average Score
1	Material and Construct	3.59
2	Media and Design	3.7
Average		3.64
Category		**Very Valid**

Based on the table above, it shows that the results of the validation of material experts and constructs for the products developed obtained a score of 3.59. On the results of the validation of media and design experts, a score of 3.7 was obtained. Based on the average value of the data from the validation results of material and construct experts as well as the results of the validation of media and design experts, a score of

3.64 is obtained in the very valid category, in other words, flashcards assisted by augmented reality are categorized as suitable for use with improvements.

After the flashcards are declared valid or feasible and improvements have been made based on suggestions and input from the validators, then the implementation of the use of augmented reality-assisted flashcards is carried out on a small-scale test to measure the practicality of the product being developed. Measuring the practicality of augmented reality-assisted flashcards was assessed based on the results of the students' readability test and the teacher's perception. The results of the practicality test of augmented reality-assisted flashcards can be seen in Table 4.

Table 4. Practicality results

No.	Aspect	Persentase
1	Readability	92%
2	Teacher Perception	98%
Average		**95%**
Categori		**Very Practical**

Based on the table above, it shows that the readability test results obtained a percentage value of 92%. While the results of the teacher's perception of the product developed obtained a percentage of 98%. Based on the average value of the data on the readability and perception test results, the teacher obtained a percentage of 95% in the very practical category. In this case it shows that these augmented reality assisted flashcards can be used in the learning process of linear motion material. The product developed is considered practical because these flashcards are easy to use and help increase students' interest in learning. The developed flashcards are considered practical because the material presented on the flashcards is in accordance with the CP and TP in the independent curriculum, the flashcards use communicative language, the presentation of flashcards is attractive, the flashcards are presented with pictures, illustrations, and interactive augmented reality that can help participants. students to increase interest in learning. This is in line with Fitriyana, el al., (2020) which states that a good flashcard must be able to assist students in capturing information from the content of the material presented. Augmented reality can help students improve literacy skills and support the implementation of 21st century learning (Kholiq, 2020). The evaluation stage is the last stage of this development research. Evaluation is carried out at every stage of the research, starting from the analysis, design, and development stages. It aims to see the activities carried out in each stage are running well or not.

Flashcards with the help of augmented reality certainly have advantages and disadvantages in them. The advantages of augmented reality-assisted flashcards according to the researcher's perspective are: practically, the flashcards developed contain an outline of the material, easy to carry everywhere, namely the size of flashcards which tend to be small, it's fun, namely the augmented reality in these flashcards is interactive because it is presented in the form of a barcode so that it can be directly accessed using a mobile phone, and the practice questions contained in the flashcards are interactive because they are in the form of augmented reality which contains true-false feedback from the selected answers. In addition to the advantages of augmented reality-assisted flashcards that have been described, augmented reality-

assisted flashcards also have disadvantages according to the researcher's perspective, namely: its small size tends to slip easily and requires a stable internet connection to access augmented reality.

▪ CONCLUSION

Augmented reality-assisted flashcards to increase students' learning interest in linear motion material are declared valid with an average score of 3.64 in a very valid category and augmented reality-assisted flashcards to increase students' interest in linear motion material is declared practical based on the assessment obtained from the readability and teacher perception tests with a percentage of 95% in the very practical category. Based on the results of the validity and practicality test results, flashcards with the help of augmented reality can already be used by teachers in teaching linear motion material. The weakness of this study is that it has not yet reached an effectiveness test, for this reason it is suggested to further researchers to measure the effectiveness of augmented reality-assisted flashcards on linear motion material in increasing students' learning interest.

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