

## DEVELOPMENT OF “AVATAR” LEARNING MEDIA USING SMART APPS CREATOR (SAC) TO IMPROVE STUDENT ABSTRACTION ABILITY

Kurnia Sekarsari<sup>1</sup>, Swasti Maharani<sup>2\*</sup>, Reza Kusuma Setyansah<sup>3</sup>

<sup>1,2,3</sup> Universitas PGRI Madiun, Madiun, Indonesia

\*Corresponding author. Jl. Setiabudi No. 85 Madiun, Indonesia

E-mail: [kurniasekarsari6@gmail.com](mailto:kurniasekarsari6@gmail.com)<sup>1)</sup>  
[swasti.mathedu@unipma.ac.id](mailto:swasti.mathedu@unipma.ac.id)<sup>2\*)</sup>  
[reza.mathedu@unipma.ac.id](mailto:reza.mathedu@unipma.ac.id)<sup>3)</sup>

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### Abstract

This research is motivated by the low ability of students' abstraction while abstraction ability is a very important ability possessed by students. Based on the results of observations and interviews with one of the mathematics teachers at SMPN 1 Jiwan, it was found that students were not able to apply appropriate concepts when working on mathematical problems. In addition, the learning process carried out at SMPN 1 Jiwan still uses conventional methods with the lecture method assisted by print media. This causes a lack of enthusiasm of students when participating in learning. This study aims to develop AVATAR learning media with the Auditory Intellectually Repetition learning model which includes videos, material, sample questions, and practice questions adapted to indicators of abstraction ability and presented interactively so as to improve students' abstraction abilities. This study uses the Research and Development (R&D) method using the 4D development model which consists of the defining stage, the design stage, the development stage, and the deployment stage. The results obtained from this study were that the AVATAR learning media was declared valid with a percentage of 85.00% and very practical with a percentage of 86.36% based on the student response questionnaire.

**Keywords:** Abstraction ability; auditory intellectually repetition; AVATAR; learning media.

### Abstrak

Penelitian ini dilatarbelakangi oleh rendahnya kemampuan abstraksi peserta didik sedangkan kemampuan abstraksi merupakan kemampuan yang sangat penting dimiliki oleh peserta didik. Berdasarkan hasil observasi dan wawancara dengan salah satu guru matematika di SMPN 1 Jiwan diperoleh hasil bahwa peserta didik belum mampu mengaplikasikan konsep yang sesuai pada saat mengerjakan permasalahan matematika. Selain itu, proses pembelajaran yang dilaksanakan di SMPN 1 Jiwan masih menggunakan cara konvensional dengan metode ceramah berbantuan media cetak. Hal ini menyebabkan kurangnya antusias peserta didik pada saat mengikuti pembelajaran. Penelitian ini bertujuan untuk mengembangkan media pembelajaran AVATAR dengan model pembelajaran Auditory Intellectually Repetition yang di dalamnya memuat video, materi, contoh soal, dan soal latihan yang disesuaikan dengan indikator kemampuan abstraksi serta disajikan secara interaktif sehingga dapat meningkatkan kemampuan abstraksi peserta didik. Penelitian ini menggunakan metode Research and Development (R&D) dengan penggunaan model pengembangan 4D yang terdiri atas tahap pendefinisian, tahap perancangan, tahap pengembangan, dan tahap penyebaran. Hasil yang diperoleh dari penelitian ini yaitu media pembelajaran AVATAR dinyatakan valid dengan hasil persentase 85,00% serta dinyatakan sangat praktis dengan persentase 86,36% berdasarkan angket respon peserta didik.

**Kata kunci:** Auditory intellectually repetition; AVATAR; kemampuan abstraksi; media pembelajaran.



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## INTRODUCTION

Most of the characteristics that exist in mathematics are in the form of objects or symbols that are not real, therefore mathematics is said to be an abstract science. Yilmaz & Argun (2018) suggest that abstraction ability is the ability to carry out constructive activities consciously both in real situations and imaginary situations to build mental structures from mathematical structures. In addition, abstraction can also be interpreted as a precise construction process in the mind, which involves determining the relationship between mathematical objects and converting the relationship into a certain expression regardless of the mathematical object. Armoni (2013); Cetin & Dubinsky (2017); Nurhasanah et al., (2017) briefly explained that abstraction can be interpreted as a process that is closely related to the process of emerging new mental concepts. There are two processes needed in the abstraction process, namely generalizing and synthesizing (Herlina, 2015).

Abstraction ability is a very important ability for students (Fitriani et al., 2018; Kramer, 2007; Maharani et al., 2021; Peel & Friedrichsen, 2018). Abstraction ability is important to have so that every student can visualize and manipulate objects that are not real in mathematics. However, the fact is that students' mathematical abstraction skills in Indonesia are still relatively low. This can be seen from the results of the (OECD, 2018) in Indonesia's mathematical ability is ranked 73rd out of 79 countries with an average score of 379.

In previous research, students' mathematical abstraction ability is still relatively low (Adler & Kim, 2017; Agbo, Yigzaw, et al., 2021; Allsop,

2019; Bagley & Rabin, 2016; Hakim & Nurlaelah, 2018). Research related to abstraction ability in mathematics learning has not been widely conducted. This is because the number of references related to abstraction in mathematics learning is still small (Fitriani et al., 2018).

According to Blikstein & Wilensky (2009); Dagienė & Stupurienė (2016) the learning model is one of the important components in the learning process. This is because an effective learning model can help in the learning process so that learning objectives will be easier to achieve. According to Handayani et al., (2014) Auditory Intellectually Repetition is a learning model that has 3 aspects of learning, namely auditory which means learning to prioritize speaking and listening, intellectually is the process of thinking and creating ideas using their intelligence, repetition is repetition by giving assignments or quizzes in the hope that students can improve reasoning and can draw their own conclusions from the material that has been delivered by the teacher. The auditory intellectually repetition (AIR) learning model in its implementation utilizes all senses, so that it can make it easier for students to learn about abstract mathematical objects (Handayani et al., 2014; Sarniah et al., 2019).

Learning media is one of the factors that influence the success of the mathematics learning process at school. According to Agbo, Oyelere, et al., (2021); Eisenberg (2010); Sundayana (2014) media plays a very important role in improving the quality of education which includes mathematics education. learning media tend to be defined as graphic, photographic, or electronic tools used in the teaching and

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learning process to capture, process, and reconstruct visual or verbal information (Fauzi & Rahmatih, 2021; Hussien et al., 2021; Samala et al., 2019). The use of learning media can lead students to achieve abstraction abilities, where in this learning media there are mathematical concepts ranging from concrete to making mathematical models, that is where the students' abstraction mindset will be formed (Sugandi, Linda & Bernard, 2020).

According to Faujiah et al., (2022) seen from the type, learning media is divided into three, namely audio, visual, and audiovisual media. Audio media is media that only uses sound. Visual media is media that relies on the sense of sight, for example by displaying images. While audio visual media is a combination of audio and visual media, namely media that has sound and image elements.

One of the supporting applications that can be used to create learning media is the Smart Apps Creator application. Smart Apps Creator application is software or application that can be used to create multimedia mobile apps more easily and quickly without using coding. The Smart Apps Creator application can be used to create learning media for mathematics (Mahuda et al., 2021)(Adu et al., 2022).

Based on the problems previously described, researchers are interested in developing an audio-visual media which contains videos, materials, sample problems, and practice questions that are adjusted to the indicators of abstraction ability and presented interactively. The material displayed through audio visual media is very effective in helping teachers deliver material (Arcavi, 2003; Deliyianni et al., 2009). In addition, audio-visual media also has the advantage that it can

be more precise in summarizing the meaning of teaching materials so that it can be better understood by its users (Faujiah et al., 2022). The selection of the Auditory Intellectually Repetition learning model is because it can make students' understanding abilities better (Sarniah et al., 2019; Siregar et al., 2020).

## RESEARCH METHODS

This research uses the Research and Development (R and D) method with the use of the 4D development model which consists of the defining stage, the design stage, the development stage, and the dissemination stage. (Sugiyono, 2019). The flow of research and development can be seen in Figure 1.

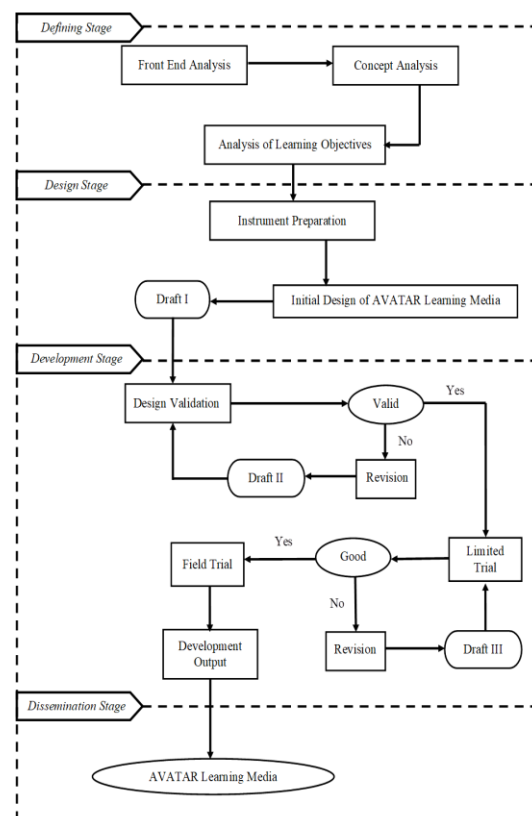


Figure 1. Research and Development Flow

The activities at each stage will be described as follows:

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**a. Defining Stage**

At this stage, researchers conducted a front-end analysis through interviews with one of the math teachers at SMPN 1 Jiwon which aims to find out the problems in the learning process. In addition, researchers also conducted concept analysis through observation of teaching modules and teaching materials used. At the end of the defining stage, researchers formulated learning objectives.

**b. Design Stage**

At this stage, researchers first compiled research instruments. Next, researchers made an initial design of the learning media to be developed.

**c. Development Stage**

At this stage the researcher validates the learning media developed to the experts who have been appointed. After the validation was completed, the

researcher revised the learning media according to the suggestions given by the validator. Furthermore, researchers analyzed the validity of the learning media. The validation data is analyzed to determine the level of validity of the product being developed. The formula used to process validation data is:

$$V = \frac{TSe}{TSh} \times 100\% \dots\dots(1)$$

Description:

- V* = Percentage validity
- TSe* = Total empirical score
- TSh* = Total expected score

Furthermore, the results obtained from the validity test are interpreted according to the validity criteria. Validity criteria according to (Akbar, 2013) are in accordance with the Table 1. 8 – 10

Table 1. Validity criteria

Validity Criteria	Validity Level
85,01% – 100,00%	Very valid, or can be used without the need for revision
70,01% – 85,00%	Valid, or can be used but needs minor revision
50,01% – 70,00 %	Invalid, it is recommended not to use it because it needs major revisions
01,00% – 50,00%	Invalid, or may not be used

If the analysis results meet the validity criteria, researchers can conduct limited trials and field trials. At the end of the development stage, researchers analyzed the practicality of the learning media developed. To process practical data results, you can use the formula, namely:

$$V_p = \frac{TSEP}{S-max} \times 100\% \dots\dots(2)$$

Description:

- V<sub>p</sub>* = Practicality validity
- TSEP* = Practicality empirical score
- S – max* = Expected maximum score

After the percentage is known, the value is grouped into practical criteria. Practicality criteria according to (Akbar, 2013) can be seen in Table 2

Table 2. Practicality criteria

Practicality Criteria	Practicality Level
75,01% – 100%	Very practical
50,01% – 75,00%	Practical, usable with minor revisions
25,01% – 50,00%	Less practical, it is recommended not to use
00,00% – 25.00%	Impractical, unusable.

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#### **d. Dissemination Stage**

The learning media developed has been declared valid and practical, then conduct limited distribution within the scope of the SMPN 1 Jiwan school environment.

Data collection techniques in this study were observation, interviews, questionnaires.

### **RESULTS AND DISCUSSION**

Based on the research and development of AVATAR learning media that has been carried out, the following results are obtained.

#### **a. Defining Stage**

Analysis of the front end obtained the results that so far students are less active when participating in the mathematics learning process. When the teacher asked several questions related to the material explained, there were only a few students who could answer the questions correctly and most of the other students were silent and passive. Some learners who are only silent during the math learning process are due to a lack of mastery of basic mathematical knowledge. Most others are due to not fully understanding the concepts of mathematics. Especially in solving flat building problems in the form of story problems. Many students are unable to apply the appropriate concepts when working on flat building problems while the material has been taught.

Most of the learning process carried out at SMPN 1 Jiwan still uses conventional methods with lecture methods assisted by printed media even though the school has provided adequate learning facilities. The use of monotonous learning media can cause students to become bored quickly and less enthusiastic during learning. Of course, this also affects students'

understanding of the material being studied. Therefore, it is necessary to develop learning media so that the learning process at school can run optimally.

Furthermore, concept analysis is useful for identifying what concepts will be used in developing learning media. When the researchers conducted observations at SMPN 1 Jiwan, the researchers analyzed the teaching modules and teaching materials for flat building materials used at SMPN 1 Jiwan as a reference for the preparation of materials in the AVATAR learning media. After conducting a front end analysis and concept analysis, analyze learning objectives. The analysis of learning objectives is adjusted to the learning objectives contained in the school.

#### **b. Design Stage**

The first step was to prepare the research instrument, which will be described as follows: the AVATAR learning media validation sheet consists of media expert and material expert validation sheets. The media expert validation sheet has 15 statement items containing the criteria for ease of navigation, cognitive content, presentation of information, media integration, artistry and aesthetics, and overall function. While the material expert validation sheet has 15 items containing aspects of material or content feasibility, presentation suitability and language suitability. The assessment used in this validation sheet uses yes or no. At the end of the sheet the validator can also provide suggestions.

The validation sheet for the learner response questionnaire has 5 statement items that contain the types of requirements for the content, construction and language domains. The

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assessment used in this validation sheet uses yes or no. At the end of the sheet the validator can also provide suggestions.

The learner response questionnaire sheet in this study contains 15 statement items, of which 8 items are positive statements and 7 items are negative statements. The learner response questionnaire that has been prepared contains indicators of interest, benefits, language, appearance and use. For the assessment students can put a tick in the column Yes or No.

The initial design of the AVATAR learning media is prepared using the help of the canva platform which contains the initial appearance,

menu, instructions for use, learning outcomes, learning videos, learning materials, practice questions, and the compiler's profile. The material contained in the AVATAR learning media consists of flat shape material.

### c. Development Stage

The first step is to conduct expert validation. AVATAR learning media was validated by two SMPN 1 Jiwan ICT teachers as media experts and two SMPN 1 Jiwan mathematics teachers as material experts. The results of the validation of AVATAR learning media by media experts and material experts are presented in the Table 3.

Table 3. Media Validation Results

Validation Results	Validators			
	I	II	III	IV
Total Empirical	12	13	14	12
Total Empirical	15	15	15	15
Validation Percentage	80,00%	86,67%	93,33%	80,00%
<b>Combined Percentage</b>	<b>85,00%</b>			

Based on table 3, the validation results of AVATAR learning media are 85.00%. (Akbar, 2013) explains that the percentage of 85.00% includes valid criteria but needs minor revisions according to suggestions from the validator.

Next, the student response questionnaire sheet. Student response questionnaire sheets were validated by one counseling teacher and one math teacher at SMPN 1 Jiwan. The results of the questionnaire validation of student responses are presented in the Table 4.

Table 4. Response questionnaire validation results.

Requirement Type	Validators	
	I	II
Contents Realm	1	1
Construction Realm	2	1
Language Realm	2	2
Total Empirical	5	4
Validation Percentage	5	5
Persentase Validasi	100,00%	80,00%
<b>Combined Percentage</b>	<b>90,00%</b>	

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Based on Table 4, the results of validating the student response questionnaire were 90.00%. The developed AVATAR learning media has gone through several stages so that

the final result is the AVATAR learning media. The final result of the AVATAR learning media design can be seen in Figure 2 until 9.



Figure 2. Initial display Figure



Figure 3. Menu display



Figure 3. Instructions page



Figure 4. Learning achievement



Figure 5. Video page



Figure 6. Material page

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Figure 7. Material page



Figure 8. Profile page

In this study a limited trial was carried out at SMPN 1 Jiwan involving 6 students from class VII E. The sample selection for the limited trial was carried out using a simple random sampling technique through a draw. The implementation of the limited trial begins with students taking part in mathematics learning using AVATAR learning media after that filling out student response questionnaires.

The results of practicality in the limited trial of AVATAR learning media were obtained from filling out student response questionnaires. The results of the practicality analysis of AVATAR learning media in limited trials are presented in the Table 5.

Table 5. Limited trial practicality analysis

Aspects of Assessment	Total Score
Interest	17
Benefit	18
Language	10
Display	21
Usage	10
Practicality total empirical score	76
Expected maximum score	90
<b>Practicality Percentage</b>	<b>84,44%</b>

Based on Table 5, the results of the practicality analysis of AVATAR learning media in limited trials were 84.44%. Akbar (2013) explains that the percentage of 84.44% includes very practical criteria or can be used without revision. In the limited trial, good results were obtained so that field trials could be carried out.

The selection of samples for field tests was carried out by simple random sampling technique through a draw. The field trial involved 22 class VII H students at SMPN 1 Jiwan. Students in the field trial were also asked to take part in mathematics learning using the AVATAR learning media and were asked to fill out a student response questionnaire.

The results of the practicality of the AVATAR learning media field trials were obtained from filling out student response questionnaires. The results of the practicality analysis of AVATAR learning media in field trials are presented in the Table 6.

Table 6. Field trial practicality analysis

Aspects of Assessment	Total Score
Interest	59
Benefit	75
Language	36
Display	77

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Aspects of Assessment	Total Score
Usage	38
Practicality total empirical score	285
Expected maximum score	330
<b>Practicality Percentage</b>	<b>86,36%</b>

Based on table 6 shows the results of the practicality analysis of AVATAR learning media in field trials of 86.36%. Akbar (2013) explained that the percentage of 86.36% included very practical criteria or could be used without revision. In the field trials, good results were obtained so that the next stage could be carried out, namely the deployment stage.

#### d. Dissemination Stage

The AVATAR learning media has gone through several stages of development and has been declared valid and practical in increasing students' abstraction abilities so that it can be distributed at SMPN 1 Jiwan, especially in class VII H.

### CONCLUSIONS

Based on the results of the research and discussion, it was concluded that AVATAR learning media was declared valid with a percentage of 85.00% based on material experts and media experts on AVATAR learning media. Instructional media is stated to be very practical with an average percentage of 86.36% based on student response questionnaires.

Future researchers can also develop learning media using learning models and other materials to improve students' abstraction abilities.

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