

PENGEMBANGAN MEDIA PEMBELAJARAN *FLASHCARD* DENGAN *AUGMENTED REALITY* (AR) PADA MATERI POTONGAN BAHAN NABATI DI SMK KULINER

Development Of Flashcard Learning Media With Augmented Reality (Ar) On Plant-Based Ingredients At Culinary Vocational School

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ABSTRACT

The use of learning media will help educators in delivering learning materials so that they can be well understood by students. However, in culinary learning, especially in the material of plant-based food cuts, the learning media used is still dominated by conventional learning methods such as lectures. The media cannot be used to visualize the shape and technique of the pieces in the material, this causes students to tend to be passive and less interested in understanding the material presented. Thus, innovative and interactive learning media is needed to improve students' understanding. Augmented Reality (AR) was chosen as a solution because it is able to display real visuals in 3D so as to help students understand the material visually and realistically. This research aims to develop flashcard learning media with Augmented Reality (AR) on plant-based food ingredient materials, to determine the feasibility of the material and the feasibility of the media for the learning media that has been developed. The type of research and research model used is ADDIE, but the research is limited to the development stage. The subjects of this study are class X students totaling 34 students, while the object of this study is flashcard learning media with augmented reality (AR). The instruments used in this study include validation sheets of material experts and media experts on the media used. The results of this study were concluded that flashcard media with AR is in the form of printed products that include material cut from plant-based foodstuffs, the results of the material validation show a feasibility value of 91% which is included in the very feasible category. Media validation obtained an average score of 97% with a very decent category.

Keywords: *Development, Flashcards, Augmented Reality, Plant-Based Ingredients*

ABSTRAK

Penggunaan media pembelajaran akan membantu pendidik dalam menyampaikan materi pembelajaran supaya dapat dipahami dengan baik oleh peserta didik. Akan tetapi, dalam pembelajaran tata boga khususnya pada materi potongan bahan makanan nabati, media pembelajaran yang digunakan masih didominasi dengan metode pembelajaran konvensional seperti ceramah. Media tersebut, tidak bisa digunakan untuk memvisualisasikan bentuk dan teknik potongan pada materi tersebut, hal ini menyebabkan peserta didik cenderung pasif dan kurang tertarik dalam memahami materi yang disajikan. Sehingga, diperlukan media pembelajaran inovatif dan interaktif untuk meningkatkan pemahaman peserta didik. *Augmented Reality* (AR) dipilih sebagai solusi dikarenakan mampu menampilkan visual nyata secara 3D sehingga membantu peserta didik dalam memahami materi secara visual dan nyata. Penelitian ini memiliki tujuan untuk mengembangkan media pembelajaran *flashcard* dengan *Augmented Reality* (AR) pada materi potongan bahan makanan nabati, mengetahui kelayakan materi dan kelayakan media terhadap media pembelajaran yang telah dikembangkan. Jenis penelitian dan model penelitian yang digunakan adalah ADDIE, namun penelitian dibatasi sampai tahapan *development*. Subjek penelitian ini adalah siswa kelas X yang berjumlah 34 peserta didik, sedangkan objek dalam penelitian ini adalah media pembelajaran *flashcard* dengan *augmented reality* (AR). Instrumen yang digunakan dalam penelitian ini meliputi lembar validasi ahli materi dan ahli media terhadap media yang digunakan. Hasil dari penelitian ini diperoleh kesimpulan bahwa media *flashcard* dengan AR berupa produk cetak yang mencakup materi potongan bahan makanan nabati, hasil validasi materi menunjukkan nilai kelayakan sebesar 91% yang termasuk kategori sangat layak. Validasi media memperoleh nilai rata-rata 97% dengan kategori sangat layak.

Kata Kunci : *Pengembangan, Flashcard, Augmented Reality, Potongan bahan makanan nabati*

How to Cite: Anistian Nur Azizah¹, Febriani Lukitasari², Luthfiyahn Nurlaela³, Diwyacitta Antya Putri⁴. 2026. Pengembangan Media Pembelajaran Flashcard Dengan Augmented Reality (AR) Pada Materi Potongan Bahan Nabati Di Smk Kuliner. Jurnal Pendidikan Tata Boga dan Teknologi, Vol 7 (2): pp. 83-89, DOI: 10.24036/jptbt.v7i1.27072



INTRODUCTION

Currently, education has become an important part of the development of a country (Hidayah, 2022). (Rahman et al., 2022) explained that education is part of an effort that is consciously used to create cultural heritage from one generation to another, education will make this generation a role model for the teaching of previous generations. Through education, it is expected that humans will grow and develop as whole individuals and have superior quality (Nuranida et al., 2022). Changes in the current curriculum are occurring as an effort to adjust the development of science and technology as well as public expectations for the development of formal education in Indonesia (Soleman, 2020). Indonesia is currently implementing an independent learning curriculum, which is the result of the transformation of the national education curriculum system. Although the independent learning curriculum has been used, it still shows that there is a passive tendency in student learning participation (Widiyanto & Afghohani, 2025)

There are still teachers who prefer to use conventional learning models with the main focus on teachers rather than using different and more innovative learning models (Nisa et al., 2023). This causes the level of learning achieved to be less than optimal and there are still many students who have unsatisfactory academic achievements, so new innovations are needed to assist educators in delivering learning materials. The use of learning media will help educators in delivering learning materials so that they can be well understood by students (Miftahul Jannah et al., 2023). Learning media that is in accordance with the material studied aims to improve student learning outcomes for the better. The selection of learning models, methods and media that are in accordance with the learning material to be taught is an important point that can be used so that the planned learning objectives can run well.

The use of interactive multimedia learning media is one of the alternatives that can be used by educators when carrying out the learning process in the classroom (Fahira Arsyaf et al., 2022). One of the learning media that can be used in learning activities is flashcard learning media. This learning medium is in the form of small cards containing pictures, text or symbols that will later remind or direct students to something related to the given image (Lisfatkandayant et al., 2022). Along with the rapid development of the times, technology has a very important role in the world of education, efforts to utilize technology in the world of education, namely by combining flashcards and Augmented Reality (AR), this aims to make flashcard learning media more interesting (Logayah et al., 2023) Through the use of Augmented Reality (AR) combined with flashcard learning media, students can understand the concepts of the material that have been learned both visually and intellectually. This is in line with research that has been conducted by (Despriaryandi & Asriningtias, 2023) which explains that the use of Augmented Reality learning media will improve the quality of learning in culinary vocational high schools in addition to improving the learning experience of students.

The culinary skills program has several learning objectives that must be completed and mastered in an independent curriculum, one of the learning objectives is to learn pieces of plant-based food (Helmi et al., 2023). This is because pieces of foodstuffs have various types and characteristics as well as certain functions. Students need to have mastery and memory in understanding the types of food, as these ingredients are very important to master because they are not only to maintain the appearance of the dish but also to make it easier for consumers to enjoy the dish. The results of interviews that have been carried out with teachers and students, as well as the results of observations, there are findings of several problems. As the materials and learning media used are still less varied and in the delivery of material, teachers often use the teacher-centered learning method which makes students tend to pay less attention and listen to the material that has been presented by the teacher because of the lack of interaction carried out by educators and students. In addition, the material of food pieces is a basic culinary material that must be mastered and can be a provision when students carry out Field Work Practice (PKL).

Based on the background that has been explained earlier, the objectives of this study are to; (1) To know the results of *flashcard* learning media with *augmented reality*, (2) to know the feasibility of the material from *flashcard* learning media with *augmented reality*, and (3) to know the feasibility of the media from *flashcard* learning media with *augmented reality*.

MATERIALS AND METHODS

This research uses the design and development of *Research & Development (R&D)* which is development research with the aim of being able to produce certain products (Okpatrioka, 2023) which will later use the ADDIE model which will go through several stages. The stage starts from the analysis stage, which is to observe problems that arise during learning activities, then the design stage by collecting references related to the learning media to be developed, at this stage the researcher makes a *storyboard*, the next stage is the development stage, the learning media that has been developed is validated to material experts and media experts to find out its feasibility before it is implemented to students. Due to the limited time in the research, this research is only limited to the development stage of learning media.

The courses in this study are students of class X of State Vocational Schools. The response test will be carried out to 35 students of class X of the culinary skills program. The object of this research is *the flashcard learning media* that has been developed. In particular, the object of this research is the final result of a *learning media flashcard* with AR on the pieces of plant-based food that have been developed, including aspects of media feasibility and material feasibility of learning media that has been developed.

This study collected data and utilized an open-ended questionnaire. The open questionnaire given will later be divided into 2 groups, namely media validation and material validation using this questionnaire is used to provide an opportunity for validators and respondents to add input and suggestions from each question that has been given. Material expert validators are vocational high school lecturers and teachers who have mastery of plant-based food cut materials, while material expert validators are vocational high school lecturers and teachers who have competence in the field of learning media. The questionnaire instrument uses a *Likert scale* with a range of 1 to 4 to assess the evaluation of the meter and the evaluation of the media that has been developed. The data will later be analyzed using a formula that is in accordance with the learning objectives. For the measurement of the validity level of a development product, the following analysis techniques are used:

$$P = \frac{\sum x_i}{\sum x_f} \times 100\%$$

Description :

P = Percentage of choice

$\sum x_i$ = Total answer scoring score by expert

$\sum x_f$ = Highest number of answers

After obtaining the percentage of assessment, then the researcher can determine the validity of the media based on the validity interpretation criteria which can be found in the following table:

Table 1. Submission Criteria

Percentage (100%)	Validity Criteria
80 – 100 %	Very valid
66 – 79 %	Valid
56 – 65 %	Quite Valid
40 – 55 %	Less Valid
30 – 39 %	Invalid

Source: (Mustaqimah *et al.*, 2023)

The learning media developed can be said to be valid if it has obtained a score of more than 60%, if it gets a score below 60%, the learning media must go through a process of revision and revalidation.

RESULTS AND DISCUSSION

Learning Media Development

1. Analysis

The analysis of learning needs was carried out through surveys and joint interviews with class X teachers. In addition, the learning media needed by students is a media that can support students' activeness in following the learning process in the classroom and eliminate the opinion that the material can only be learned by memorizing.

2. Design




The next stage is to plan the design of *the flashcard* learning media to be made. In accordance with the *Storyboard design* that has been made before, the preparation of *the flashcard* begins with the cover, learning objectives, content materials and developer profile. Next, *the flashcard* will be printed using 210g art paper with a card size of 7 x 10 cm. All the results of the development of learning media can be seen on the QR:



Gambar 1. Flashcard Results

The explanation is presented in thick 2. As follows:

Table 2. Mining results

No	Image	Remarks
1.		Flashcard media cover section with <i>augmented reality</i>
2.		<p>Front: On the front of the <i>flashcard</i> shows a lighter image in the form of a picture of a piece of plant-based foodstuffs, the size of a piece of plant-based foodstuffs, and at the bottom of the image showing a variety of vegetables that can be cut using the plant-based food cutting technique.</p> <p>The back: On the back of the top <i>flashcard</i> explaining the name of the plant-based food ingredient piece, then a brief explanation is given regarding the meaning of the type of cut, and at the bottom right is given a QR code that can be scanned which will lead to a 3D shape of the plant-based food item.</p>
3.		When the QR code is scanned, it will go directly to the application which can convert the code into a 3D image related to the pieces of plant-based food that have been previously given.

3. Development

The media developed in this study is in the form of printed products. Then the product that has been made according to the design will be validated to material experts, media experts and users. Media expert validation assesses the feasibility of content, media presentation and independent learning aspects. Media expert validation assesses the quality of program management, ease of use, and neatness of presentation. After going through these stages, a revision process will be carried out based on the suggestions and input of experts.

Material Feasibility Validation

The feasibility of the material is carried out by validation carried out by three competent material experts in their fields. Material validation is carried out by directly evaluating the *flashcard* material and pouring it out by filling out the material validation questionnaire instrument. The way for validators to fill in the validation instrument sheet is to give a *checkmark* (✓) in the column that has been provided. The results of the material validation are presented in table 3. as follows

Table 3. Material Feasibility Validation Results

Assessment Aspects	Average (%)	Criteria
Content Eligibility Aspects		
Compatibility of <i>flashcard</i> material with elements in learning	100	Highly Worth It
Suitability of <i>flashcard</i> material with learning outcomes	92	Highly Worth It
Suitability of <i>flashcard</i> material for learning objectives	100	Highly Worth It
Actuality of the material presented	100	Highly Worth It

Easy-to-understand material	92	Highly Worth It
Average Eligibility	95	Highly Worth It
Language Eligibility Aspects		
Communicative (Easy-to-understand language)	83	Highly Worth It
In accordance with the level of development of students' thinking	83	Highly Worth It
Average Eligibility	83	Highly Worth It
Presentation Aspects		
The material presented is in accordance with practice	100	Highly Worth It
Ease of use	83	Highly Worth It
Suitability of presentation support (images, texts, AR)	92	Highly Worth It
Average Eligibility	91	Highly Worth It
Aspects of Independent Learning		
Can increase students' interest in learning	100	Highly Worth It
Can help students to learn independently	92	Highly Worth It
Average Eligibility	96	Highly Worth It
Material Eligibility Average Score	91	Highly Worth It

The average score on the feasibility aspect of the content of the three validators was obtained with an average of 91% with the interpretation criterion "Very Feasible". This average value is in accordance with the interpretation criteria set by (Mustaqimah et al., 2023) and is included in the very feasible criteria with an interpretation of 81-100%. The assessment on the feasibility aspect of the content received a score of 95%. The score is obtained from the suitability of the material contained in the *flashcard* with elements in learning, learning outcomes, and learning objectives as well as materials that are easy to understand. In accordance with the opinion (Hidayat & Saepul, 2023) which states that a good learning media is a media that is in accordance with the learning objectives that have been set.

The assessment of the linguistic aspect received an average score of 83% with the interpretation criterion "Very Feasible". This criterion is very feasible because it uses language that is easy to understand (communicative) and in accordance with the level of thinking development of students. The use of straightforward and easy-to-understand language and sentences in learning media will make it easier for students to understand the learning materials provided (Rahayuningsih Puji et al., 2022). The results of the assessment on the presentation aspect showed an average score of 91% with the interpretation criterion of "Very Feasible". This criterion is obtained from the material presented that is in accordance with practice, ease of use, and suitability of AR with the material. The picture or *flashcard* will later contain a caption or a text that represents the purpose of the image that has been presented, so that through this learning media it can make it easier for educators to deliver material to students (Cahyanti et al., 2023).

Based on this description, it can be concluded that *flashcard* learning media with *augmented reality* (AR) is stated to be very feasible. The average score on the feasibility aspects of content, language, and presentation respectively obtained a score of 95%, 83% and 91% with the category of "very feasible" interpretation. Overall, *flashcards* with AR have met the eligibility standards as a learning medium.

Media Eligibility Validation

The implementation of this validation was carried out to evaluate directly on *the flashcard* and pour it out by filling out a media validation questionnaire instrument. The filling process is carried out by giving a *checkmark* (✓) to the column that has been provided. The results of the material validation are presented in table 4 as follows

Table 4. Media Feasibility Validation

Assessment Aspects	Average (%)	Criteria
Quality Aspects of Program Management		
The added AR is not slow when operated	100	Highly Worth It
AR can be operated on various <i>gadget devices</i> such as Andriot and iOS	100	Highly Worth It
Average Eligibility	100	Highly Worth It
Ease of Use Aspect		
<i>Developed flashcards</i> are easy to operate	100	Highly Worth It

The display of <i>the flashcards</i> presented is attractive	83	Highly Worth It
Display compatibility	92	Highly Worth It
Average Eligibility	92	Highly Worth It
Neatness Aspect in Presentation		
The writing is readable	100	Highly Worth It
Color options on flashcards are interesting	100	Highly Worth It
The image on <i>the flashcard</i> is clear	100	Highly Worth It
Suitability of the supporting material presentation, accuracy of the size of the writing used	100	Highly Worth It
Average Eligibility	100	Highly Worth It
Material Eligibility Average Score	97	Highly Worth It

The average value of media feasibility from the three validators was obtained at an average score of 97%. This average value is in accordance with the interpretation criteria set by (Mustaqimah et al., 2023) and is included in the very feasible criteria with an interpretation of 81-100%. The assessment on the aspect of program management received a score of 100% with a very decent grade of excellence. This value is worth getting because the AR added to the *flashcard* is not slow when used and AR can be used on various *gadget* devices such as Android and iOS. The addition of visuals offered by AR can help students remember the material for longer, because students not only listen or read information, but can see and interact directly with the material (Febriany & Bektiningsih, 2025)

The assessment on the aspect of ease of use showed an average score of 92% with the interpretation criterion of "Very Feasible". The criteria are very worthy of being obtained because of the ease of use of *the flashcard*, the attractive appearance of *the flashcard* and the compatibility between the displays. *Flashcard* learning media is a practical medium because it has a small size and lightweight, so it is easy to carry and use in various situations (Ulfa, 2024). The assessment on the aspects of neatness and presentation showed an average score of 100% with the interpretation criteria of "Very Feasible". The criteria are very worthy of being obtained from the writing on *the flashcard* that can be read well, the selection of colors on *the flashcard* that is attractive, the images on the *flashcard* can be clearly seen as well as the suitability of the supporting material presentation and the accuracy of the size of the writing on the *flashcard*. Each image displayed has been selected specifically and relevant to the material being provided, the aim is so that students can connect the visualization in the picture with the concept of the learning material (Saputri W, 2020).

Based on these urians, it can be concluded that *flashcard* learning media with *augmented reality* (AR) is stated to be very feasible. The acquisition of average scores in aspects of program management quality, ease of use and neatness in the presentation sequentially obtained scores of 100%, 92%, and 100% overall, this developed learning media has been suitable for use.

CONCLUSION

Based on the feasibility test and students' responses to *flashcards* of plant-based food pieces with AR, it can be concluded that *the flashcard* learning media with AR on plant-based food pieces was developed using the ADDIE development model. Before the creation of media, the author had analyzed problems and learning needs. After that, it is followed by making a *design* using the Canva application with a size of 7 x 10 cm. Then *the design* is printed using *art paper*. The results of this media development can be scanned on the QR that has been given. *The flashcard* learning media with AR on the pieces of plant-based food ingredients that have been developed was validated into three material validators with an average material feasibility score of 91% which is included in the "Very Feasible" category. *The flashcard learning media* with AR on plant-based food ingredients that had been developed was validated to three media validators with an average media feasibility score of 97% which was included in the "Very Feasible" category. The researcher hopes that the learning media that has been developed can be used as an alternative learning to the material cut from plant-based foodstuffs. To other research, the research stage is still limited to the development stage so it is hoped that there will be researchers who can implement this learning media so that they can find out the learning outcomes of students.

THANKS

Thank you to all parties and institutions that played a role in the completion of this article. To the writers who always provide input so that this article can be completed. To the Validators who have taken the time to be smooth in collecting data and inputs provided. As well as to institutions and publication organizations that have provided valuable references in this research. Any form of assistance, we really appreciate it wholeheartedly.

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