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AR-NGEUNA 4.0 testing: Augmented reality application for Sundanese traditional food

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ABSTRACT

The advancement of Augmented Reality (AR) technology has opened up new opportunities in the development of innovative learning tools. In this scientific paper, we conducted a testing of the "AR-Ngeuna 4.0" application specifically designed for learning West Javanese traditional cuisine. The research design used in this study was cross-sectional with the Technology Acceptance Model (TAM) approach. The research results indicate that the majority of respondents rated the perceived ease of use and perceived usefulness of the "AR-Ngeuna 4.0" application as highly appropriate for learning traditional cuisine. Users' attitudes toward using the application and their behavioral intention to continue using it also received positive responses. The assessment of user awareness in utilizing the application (Actual System Usage) was also favorable. Therefore, the "AR-Ngeuna 4.0" application is deemed suitable for use as a learning tool for traditional cuisine by students in Vocational High Schools, especially in the Culinary Arts Program.

1. Introduction

Traditional food learning plays a vital role in preserving and conserving the culture and culinary heritage of a region. Indonesia is known for its diverse ethnicities and cultures, particularly in the western part of the Java island, where various cultures coexist. By understanding Indonesian culture, local wisdom becomes an inseparable part of a region's journey and development.

However, in this digital era, traditional approaches to learning often fail to captivate students who are accustomed to advanced technology (Burbules et al., 2020; Kamińska et al., 2019; Szymkowiak et al., 2021). Therefore, innovative and engaging approaches are needed to teach traditional food to the younger generation. One promising solution is the use of Augmented Reality (AR) technology, which combines the real world with digital elements, creating a unique and interactive learning experience. The use of AR in education has proven effective in increasing students' interest, engagement, and understanding of various subjects (Chen, 2019; Gargrish et al., 2020; Pellas et al., 2019). However, research focusing on testing AR applications specifically for traditional food learning is still limited. Therefore, in this context, in-depth research on the effectiveness of using AR in traditional food learning becomes crucial. The use of AR applications in traditional food learning can provide significant benefits. With AR, students can directly interact with traditional food through virtual elements displayed in their real environment.

Furthermore, AR applications can also enhance students' engagement in traditional food learning. Through engaging interactive experiences, students will feel more involved in the learning process, which, in turn, can increase their motivation and interest in learning traditional food (Lee et al., 2020; Sudirman et al., 2020; Wang et al., 2022). By leveraging technology that is familiar to the younger generation, traditional food learning can become more appealing and relevant to them. The development of the Augmented Reality Tuangeun Sunda Era 4.0 (AR-Ngeuna 4.0) application has been previously conducted (Yulia et al., 2021). Along with the AR book, it is expected that students can enrich their learning experience and help them understand and appreciate the cultural diversity and culinary heritage of West Java's traditional food In the context of testing AR applications for traditional food learning specific to West Java, in-depth research is needed to evaluate the effectiveness and usability of the application (Davidavičienė et al., 2021; Lim et al., 2019; Papakostas et al., 2021). This testing will involve the participation of students from various educational levels and obtain valuable feedback about their experience using the "AR-Ngeuna 4.0" application. The results of this testing can provide important insights into the effectiveness of using "AR-Ngeuna 4.0" in traditional food learning, as well as its implications and benefits in preserving and introducing traditional food heritage to the younger generation.

2. Method

The research design used in this study is cross-sectional with the TAM (Technology Acceptance Model) approach (Oyman et al., 2022). The aim of this study is to examine the usability and user experience of the augmented reality application "AR-Ngeuna 4.0" in learning culinary and traditional foods from West Java. The "AR-Ngeuna 4.0" application is equipped with an AR-book, which is a learning media used by vocational high school students in the subjects of Indonesian Cake and Pastry Products (PCKI) and Indonesian Food Processing and Presentation (PPM). Through this AR application, the origin of the food, the food composition, and the nutritional value of each food are also introduced. The testing is based on 5 required aspects: Perceived Ease of Use, Perceived Usefulness, Attitude Toward Using, Behavioral Intention of Use, and Actual System Usage (Álvarez-Marín et al., 2021; Ibili et al., 2019).

The participants in this study are 10th-grade vocational high school students majoring in Culinary Arts in Bandung Regency. The population used consists of 60 students who have the ability to use smartphones for learning. The obtained sample includes 51 out of the 60 students majoring in Culinary Arts.

Data collection was conducted using purposive sampling method (Ames et al., 2019; Campbell et al., 2020). The data analysis in this study refers to the research instrument that has been developed, namely the questionnaire. The data obtained from the questionnaire will be processed and presented in percentage form according to the Likert scale provided in the questionnaire, which includes Very Good (VG), Good (G), Fair (F), and Poor (P).

3. Results and Discussion

3.1. Perception Regarding the Perceived Ease of Use Aspect of the "AR-Ngeuna 4.0" Application

In the perceived ease of use variable, it was developed through five questions. Table 1 displays the data from the questionnaire regarding the variable of technological convenience.

Table 1. Respondents' Perception of Technological Ease

No	Questions	VG		G		F		P	
		n	%	n	%	n	%	n	%
1	I find the "AR-Ngeuna 4.0" application easy to access.	18	35	32	63	1	2	0	0
2	I find the "AR-Ngeuna 4.0" application to have clear texts, writings, information, and images.	16	34	14	27	3	6	0	0

No	Questions	VG		G		F		P	
		n	%	n	%	n	%	n	%
3	I find the "AR-Ngeuna 4.0" application appealing and user-friendly.	34	67	34	67	1	2	0	0
4	I find the "AR-Ngeuna 4.0" application innovative and not complicated.	9	19	37	77	2	4	0	0
5	The "AR-Ngeuna 4.0" application does not require special expertise.	8	16	41	84	0	0	0	0

Based on respondents' answers regarding the perceived ease of use of the "AR-Ngeuna 4.0" application, an average score of 81.17% was obtained on a scale of 1 to 5. This indicates that students find it easy to operate the "AR-Ngeuna 4.0" application. The perception of technological convenience, in this case, serves as an innovative learning media that supports the learning process itself, providing users with a better understanding of the conveyed material. The perceived usefulness of the AR application is significantly determined by its ease of use. Similarly, a positive attitude towards the AR application is significantly influenced by the perceived usefulness and ease of use of AR. These findings are consistent with previous research indicating that the level of ease of use of new technology is a strong antecedent to a positive attitude towards new technology (Ibili et al., 2019; Jiang et al., 2021; Papakostas et al., 2022; Yavuz et al., 2021).

3.2. Perception Regarding the Perceived Usefulness Aspect of the "AR-Ngeuna 4.0" Application
The Perceived Usefulness variable was developed through five questions. The data from the questionnaire can be seen in Table 2.

Table 2. Respondents' Perception of the Perceived Usefulness Aspect

No	Questions	VG		G		F		P	
		n	%	n	%	n	%	n	%
1	I find using the "AR-Ngeuna 4.0" application highly practical.	29	57	21	41	1	2	0	0
2	I feel that the "AR-Ngeuna 4.0" application makes me flexible in accessing information anywhere and anytime.	30	59	18	35	3	6	0	0
3	I feel supported by the "AR-Ngeuna 4.0" application in terms of the required information.	31	63	16	33	2	4	0	0
4	I find the "AR-Ngeuna 4.0" application easy to learn.	18	36	30	60	2	4	0	0
5	I feel that the "AR-Ngeuna 4.0" application supports subject-related discussions.	12	24	39	76	0	0	0	0

Perceived Usefulness serves as a predictor of technology adoption. When users believe that a system or technology will be beneficial to them, they are more likely to adopt it. The "AR-Ngeuna 4.0" application obtained an average score of 85.09% based on the 1-5 Perceived Usefulness indicators. This indicates that students derive benefits from using this application as a learning tool.

3.3. Perceptions of the Attitude Toward Using Aspect in the "AR-Ngeuna 4.0" Application
The Attitude Toward Using variable was developed into five questions with various answer options. Table 3 presents the questionnaire results for the Attitude Toward Using variable.

Table 3. Respondents' Perceptions of the Attitude Toward Using Aspect

No	Questions	VG		G		F		P	
		n	%	n	%	n	%	n	%
1	I find the "AR-Ngeuna 4.0" application easy for me to use.	15	29	35	69	1	2	0	0
2	I find the "AR-Ngeuna 4.0" application easy to understand.	16	31	32	63	3	6	0	0

No	Questions	VG		G		F		P	
		n	%	n	%	n	%	n	%
3	I find the "AR-Ngeuna 4.0" application not confusing.	17	33	32	63	2	4	0	0
4	I find the "AR-Ngeuna 4.0" application enjoyable to use.	17	33	23	45	11	22	0	0
5	I have a positive reaction to the innovation of the "AR-Ngeuna 4.0" application.	23	45	26	51	2	4	0	0

Based on the respondents' overall answers regarding Attitude toward using the "AR-Ngeuna 4.0" application, the average score from indicators 1-5 was 81.76%. This suggests that students can easily use the application to aid the learning process.

3.4. Perceptions of the Perceived Behavioral Intention of Use Aspect in the "AR-Ngeuna 4.0" Application

The Perceived Behavioral Intention of Use variable was developed into six questions. The data obtained are shown in Table 4.

Table 4. Respondents' Perceptions of the Perceived Behavioral Intention of Use.

No	Questions	VG		G		F		P	
		n	%	n	%	n	%	n	%
1	I perceive the "AR-Ngeuna 4.0" application as a valuable long-term tool for enhancing knowledge about Sundanese cuisine.	36	71	14	27	1	2	0	0
2	I find the "AR-Ngeuna 4.0" application highly beneficial.	38	75	13	25	0	0	0	0
3	I intend to continue using the "AR-Ngeuna 4.0" application in the future.	4	8	46	90	1	2	0	0
4	I utilize the "AR-Ngeuna 4.0" application to maximize its benefits.	10	20	38	75	3	6	0	0
5	I strive to utilize the "AR-Ngeuna 4.0" application to improve my skills in preparing Sundanese cuisine.	17	33	34	67	0	0	0	0
6	I hope that the use of the "AR-Ngeuna 4.0" application will persist in the future.	27	53	24	47	0	0	0	0

From the overall respondents' answers regarding the users' intention to use the "AR-Ngeuna 4.0" application in the future, it can be concluded that the average total of indicators 1-5 receives an average of 74%. This indicates that students can easily use the application to assist in the learning process.

3.5. Perception of Actual System Usage Aspects in the "AR-Ngeuna 4.0" Application

The Actual System Usage variable was developed based on four questions with various answer options. Table 5 presents the overall data of questionnaire responses regarding users' awareness in utilizing the application.

Table 5. Respondents' perception of Actual System Usage

No	Questions	VG		G		F		P	
		n	%	n	%	n	%	n	%
1	I perceive the "AR-Ngeuna 4.0" application as a media that offers an alternative for online learning.	20	39	30	59	1	2	0	0

No	Questions	VG		G		F		P	
		n	%	n	%	n	%	n	%
2	The ease of reading the "AR-Ngeuna 4.0" application for Sundanese cuisine is more appealing compared to reading a book.	35	69	15	29	1	2	0	0
3	I can use the "AR-Ngeuna 4.0" application anywhere.	28	55	18	35	5	10	0	0
4	Overall, I am satisfied with learning using the E-book feature on the "AR-Ngeuna 4.0" application.	25	49	26	51	0	0	0	0

Based on the overall responses from the participants regarding the Actual System Usage of the "AR-Ngeuna 4.0" application in future use, it can be concluded that the average total score of indicators 1-5 obtained an average of 87.37%. This indicates that students can easily use the application to assist in the learning process.

From the total responses of the participants regarding the users' intention to use the "AR-Ngeuna 4.0" application, it can be inferred that the participants experienced positive impacts when using the application for learning purposes, particularly in subjects related to the application's content. The users' intention to use the "AR-Ngeuna 4.0" application is a topic that can stimulate students' interest in the learning process and serves as a motivating factor that influences their intention to learn using mobile technology for assessment purposes. These findings are consistent with other studies that discuss AR as a learning tool (Saidin et al., 2015; Tashko & Elena, 2015; Yavuz et al., 2021).

3.6. User Experience "AR-Ngeuna 4.0"

Data obtained from the overall usability variable, including the aspects of technological convenience, perceived benefits, user attitudes, continuous usage, and user awareness, can be seen in Table 6.

Table 6. Average User Experience of "AR-Ngeuna 4.0"

Indicator	Percentage of Test			
	VG	G	F	P
Perceived Ease of Use	36,08%	61,57%	2,35%	0%
Perceived Usefulness	45,49%	51,37%	3,14%	0%
Atitude Toward Using	33,33%	61,18%	5,49%	0%
Behavioral Intention of Use	42,81%	54,25%	2,94%	0%
Actual System Usage	42,16%	51,96%	5,88%	0%
Average	39,97%	56,06%	3,96%	0%

According to Table 6, based on the percentage of excellent ratings perceived by students, the highest score is found in the Perceived Usefulness indicator, with a percentage of 45.49%. The highest percentage rating among the five indicators is for Perceived Ease of Use, with a percentage value of 61.57%. Furthermore, the highest score for the percentage of ratings perceived by students is found in the user attitude indicator towards the "AR-Ngeuna 4.0" application, with a percentage of 5.49%. Upon reviewing each indicator's rating for User Experience in the "AR-Ngeuna 4.0" application as a learning tool for vocational high school students, the assessment was deemed good.

3.7. Average User Experience Assessment of "AR-Ngeuna 4.0"

Table 7. Average User Experience Assessment of "AR-Ngeuna 4.0"

Indicator (Average User Experience Assessment "AR-Ngeuna 4.0")	Average Percentage Rating	Category
Perceived Ease of Use	81,17	G
Perceived Usefulness	85,09	VG

Indicator (Average User Experience Assessment "AR-Ngeuna 4.0")	Average Percentage Rating	Category
Atitude Toward Using	81,76	VG
Behavioral Intention of Use	88,72	VG
Actual System Usage	69,90	G
Average	81,33	G

From Table 7, based on the highest percentage rating in the Behavioral Intention of Use aspect, it is 88.72%, while the lowest rating is in the Actual System Usage aspect, which is 69.90%.

3.8. Recapitulation of the Benefits of the "AR-Ngeuna 4.0" Application According to Gender and Age of Vocational High School Students

In data collection, there is certainly an assessment conducted by students based on age and gender. The age range of vocational high school students who served as respondents is from 16 to 18 years old, which according to WHO falls under the category of adolescence [14]. The data results, calculated through crosstabulation, are obtained based on students' interest in using the "AR-Ngeuna 4.0" application (Table 8).

Table 8. Students' Interest in the "AR-Ngeuna 4.0" Application

Gender	Assessment	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Male	VG	166	39,1	39,1	100
	G	243	57,2	57,2	60,9
	F	16	3.8	3.8	3.8
Female	VG	344	40,5	40,5	100
	G	473	55,6	55,6	59,5
	F	33	3,9	3,9	3,9

Based on Table 8, it can be seen that female students have an interest in using the "AR-Ngeuna 4.0" application as a learning media, with a rating of excellent at 40.5%, a good rating at 55.6%, and a fair rating at 3.9%. However, male students also have an interest in the "AR-Ngeuna 4.0" application, although not as much as female students, with a rating of excellent at 39.1%, a good rating at 57.2%, and a fair rating at 3.8%. When comparing the interest of female and male students in the "AR-Ngeuna 4.0" application, there is not much difference.

4. Conclusion

This study demonstrates that the "AR-Ngeuna" Augmented Reality (AR) application, specifically developed for the learning of traditional Sundanese cuisine, received highly positive evaluations from Vocational High School students, particularly in the Culinary Arts program. The perceived ease of use, perceived usefulness, attitude toward using, behavioral intention of use, and actual system usage all received favorable ratings. This indicates that the "AR-Ngeuna 4.0" application can be effectively used as a learning media to introduce Sundanese traditional food to students. Furthermore, there were no significant differences in the evaluations between male and female students regarding the application's usage. It is expected that the use of the "AR-Ngeuna 4.0" application will provide students with a new learning experience and motivation in the process of learning traditional food in Vocational High Schools.

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