Development of Augmented Reality Practicum Modules to Grow Independent Learning in Cultural Anthropology Courses

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Abstract—The specific purpose of this development is to develop a practicum module containing augmented reality (AR) which is used for Cultural Anthropology courses which are arranged systematically, and refers to clearly measurable learning objectives. The specification of the innovation product developed is in the form of a practicum module containing augmented reality (AR) which is used for the Cultural Anthropology course in the even semester with the name Augmented Reality Based Cultural Anthropology Module or Modul Antropologi Budaya Berbasis Augmented Reality (MABAR). This development is of course also based on several other reasons, namely based on the results of interviews with several students who have taken the Cultural Anthropology course, it was revealed that: 1) students have difficulty understanding one of the materials about anthropological works (ethnography), 2) when doing practical going to the field to conduct mini-research based on ethnography, students find it difficult because there is no systematic practicum guide. The research method used is the research and development method with the Borg and Gall development cycle model. There are 10 steps in R & D developed by Borg, Gall, and Gall. The conclusion in this development research is the feasibility of MABAR. The results of the development refer to the results of the assessment of material experts, media experts, and limited trials in the form of student responses. The average score of expert validation results, namely material experts is 85% in the very feasible category, while the results of media expert validation are 88% in the very feasible category, and the average student test results are 86.5% in the very feasible category. Thus MABAR is declared feasible to be used in the learning process.

Keywords—practicum module, independent learning, cultural anthropology

1 Introduction

The development of increasingly advanced science and technology provides many offers and options for the world of education in supporting the learning process [1]. Along with these developments, the need for concepts and mechanisms for teaching and learning based on technology, information and communication has become a need that cannot be postponed anymore [2]. It is known that learning by utilizing technology or multimedia is very beneficial for educators and students [3]. In the last five years, research on the use of multimedia in learning has been carried out by many experts, especially to overcome the problem of learning independence. For example [4], [5], [6], [7],[8]. However, although many researches have been developed by experts in solving independent learning, this does not mean that this problem is solved. Therefore, this research was conducted.

In contrast to previous studies, in an effort to complete independent learning and adaptation to current needs, researchers are interested in developing teaching materials containing augmented reality (AR). AR is one of the latest trends in technological developments [9]. AR is known for its ability to combine three-dimensional virtual objects in a real environment and then display them in real time. By viewing the object through supported devices such as the web, mobile and tablet, making it accessible anywhere at any time [10].

The teaching materials developed are in the form of modules for the Cultural Anthropology course practicum. The name of the module as a learning medium in this research is MABAR. MABAR stands for Augmented Reality Based Cultural Anthropology Module or Modul Antropologi Budaya Berbasis Augmented Reality. Novelty of MABAR is an android-based application by utilizing several software such as Unity 3D, Photoshop CS6, Movavi Video Suite 17, and Blender 3D. MABAR is designed with an emphasis on student learning independence. That is, students can freely determine when and where to start learning because it is not limited by space and time. If students do not understand the material, then the material can be repeated. Then to make it easier for students to understand the material, a student activity sheet is provided. This activity sheet contains guidelines and activities that students must do for field research practice. So that in the learning process students are actively involved and have direct experience.

This development is of course also based on several other reasons, namely based on the results of interviews with several students who have taken the Cultural Anthropology course, it was revealed that: 1) students have difficulty understanding one of the materials about anthropological works (ethnography), 2) when doing practical work. going to the field to conduct mini research based on ethnography, students find it difficult because there is no systematic practicum guide. The specific purpose of developing MABAR is to provide convenience for students to practice field research using an ethnographic approach in cultural anthropology courses, as well as to increase student learning independence.

The development of an AR based practicum module in the Cultural Anthropology course is an urgent and important thing to do based on several things, namely. First, there is no practicum module based on learning independence used by students in the

Cultural Anthropology course. Even though this course is a theoretical and practical course, one of the objectives of field practice is to master the main methods of anthropological work (field research) and anthropological writing styles (ethnography), cultural differences and variations through various perspectives. Second, answer the concepts and mechanisms of teaching and learning based on information and communication technology as a current need. Third, as an effort to improve the quality of learning in Cultural Anthropology courses.

2 Literature review

2.1 Module

Teaching materials are an important part of the overall learning process. All forms of materials used to assist educators in carrying out teaching and learning activities in the classroom can be called teaching materials [11]. The form of teaching materials varies greatly, one of which is the module. The module is a learning tool that contains materials, methods, limitations, and evaluation instruments that are designed systematically and attractively to achieve the expected competencies according to the level of complexity [12]. The minimum module contains learning objectives, learning materials/substances, and evaluation [13]. While the characteristics of a good module according to [14] are that it has five characteristics: self-instruction, self-contained, stand alone, adaptive, and user friendly.

The benefits of the module for students are: 1) students have the opportunity to train themselves to learn independently, 2) learn to be more interesting because it can be studied anywhere and anytime, 3) have the opportunity to express how to learn according to their abilities and interests, 4) have the opportunity to test their own abilities by doing the exercises presented in the module, 5) being able to teach themselves, develop the ability of students to interact directly with the environment and other learning resources [15].

The module developed by this researcher is packaged in the form of an augmented reality-based android application, so it can be said to be an E-Module. This is done considering the use of information technology is an important factor that allows the speed of knowledge transformation to students. E-Modules are developed using an android application by utilizing several software such as Unity3D, Photoshop CS6, Movavi Video Suite 17, and Blender3D. E-modules are modules in electronic format that have many benefits for learning media [16]. The existence of the E-Modul application or electronic module makes it easier for students to learn without the need to spend money and students can study independently according to their speed [17]. The advantages of E-Modules compared to print modules are that they are interactive, enabling displaying images, audio, animation, AR, and video. So that the E-Module is expected to be used as an alternative learning that is effective, efficient, and interactive.

2.2 Augmented Reality

Currently Augmented Reality (AR) is a technology that is quite in demand. AR can be used in various fields such as medicine, mechanics, entertainment, and education. AR is an application that combines the real world with the virtual world in 2D or 3D which is projected in a real environment at the same time [18]. AR prioritizes reality and allows users to interact in real-time with the system [19]. The combination of real and virtual objects in a real environment that runs interactively in three dimensions is very informative and interesting [20]. Some of the software commonly used to create AR applications are Unity3D, ARToolKit, FLARToolKit, Junaio, IN2AR, D'Fusion Studio, OpenSpace3D, and Qualcomm [21]. There are commercial and non-commercial software.

Some of the advantages of using AR: 1) it allows digital content (audio, video, 2D and 3D objects) to be seen as one with the real world through a device (device); 2) allows learning content in three-dimensional (3D) form, so that it can visualize things that are difficult to see, in addition, the ability of AR to bring virtual objects to the real world in real time can activate a sense of presence, closeness, and immersion in students; provide stimulation of several senses, namely touch, sight, and hearing, so that students become actively involved in the learning process [22]. While the disadvantages of AR are that it is sensitive to changes in viewing angles and requires a lot of memory on the equipment installed [18].

2.3 Cultural anthropology

Cultural anthropology is one of the subjects contained in the curriculum of the Social Sciences Education Study Program, FIS UM. Cultural anthropology is a subject that focuses on studying physical anthropology, cultural anthropology, culture, personality, society, community dynamics and various cultures [23]. Cultural Anthropology is divided into three main sub-fields, namely archeology, linguistics, and ethnology [24]. While the problem that is the focus of attention in cultural anthropology is to explain the reciprocal relationship between humans and culture at a certain time and space [25].

The learning outcomes in this course are that students are able to 1) examine the work of anthropology (ethnography) of ethnic groups in Indonesia; 2) understand the main methods of anthropological work (fieldwork) and anthropological writing styles (ethnography), cultural differences and variations through various perspectives; and 3) communicating the results of observations to others (IPS Education Study Program Catalog, 2019).

When studied as a material, cultural anthropology studies present the cultural diversity created by humans. Culture is a way of life that develops, is shared by a group of people, and is passed down from generation to generation [26]. The form of culture consists of several things such as language, science, laws, beliefs, religion, work, music, prohibitions and so on [27]. Because of the scope of culture, there have emerged branches of science from cultural anthropology such as political anthropology, legal anthropology, economic anthropology, and educational anthropology [28]. Thus, the study of cultural anthropology does not aim to produce anthropologists, but to increase

knowledge about the diversity of cultures and traditions created by humans. In addition, cultural anthropology is a study tool for various kinds of cultures and traditions in certain societies and society in general [27].

3 Method

This study uses research and development methods, with the model used is the Borg and Gall development cycle. There are 10 steps in R & D developed by Borg, Gall, and Gall [29] that is: 1) Research and information collecting, namely preliminary studies and field exploration; 2) Planning, namely planning the prototype of the components to be developed; 3) Development preliminary from of product, namely developing an initial prototype; 4) Preliminary field tasting, namely perform external validation and limited trial; 5) Main product revision, namely revising the results of the limited trial; 6) Main field testing, namely conducting field trials to a wider target; 7) Operational product revision, namely to revise the product of the results of field trials; 8) Operational field testing, namely conducting detailed field experiment tests; 9) Final product revision, that is to make revisions to improve the final product; and 10) Dissemination and implementation, namely implement the module and disseminate. Of the 10 steps of development used in the study only up to step 7, and simplified into 4 stages of research that is: 1) preliminary study, 2) planning, 3) development, 4) validation, revision and limited trial.

The product trial in this study was conducted to collect data that was used as a basis in determining the feasibility of the product being developed. In this section, things that must be considered are: (1) trial design, (2) test subjects, (3) types of data, (4) data collection instruments, and (5) data analysis techniques.

The product trial design is divided into several stages which include: validation of media experts and material experts. This validation is carried out by media and material expert validators. Validation was carried out to determine the feasibility of the developed practicum module and to find out suggestions and opinions related to the practicum module and the material developed. The next step is group and large group trials. Small group trials were conducted to determine whether the developed practicum module was suitable for use in the learning process and to find out the opinion of respondents on a small scale about the developed practicum module. The large group trial aims to determine whether this teaching material is suitable for use and to find out the opinion of respondents on a large scale towards the developed practicum module.

The subjects in this study were lecturers as media experts and material experts. While the test subjects were students of the Social Sciences Education Study Program, FIS UM, who took the Cultural Anthropology course. The types of data obtained are qualitative and quantitative data. Quantitative data was obtained from the feasibility assessment of the practicum module by media experts and material experts in the form of a questionnaire with a score of 1 to 4 on the questionnaire, while qualitative data was obtained from the results of interviews conducted with informants and validators.

Data collection instruments in the form of interview guidelines, observation sheets, and questionnaires. Interviews and observations were conducted for the needs analysis

process. While the questionnaire was conducted for the validity of the developed practicum module. The answer to the questionnaire used a Likert scale measurement scale, namely by scoring the answers: a) A score of 4 means, very good/very decent/very happy; b) The value of 3 means, good/decent/happy; c) The value of 2 means, quite good/fair enough/quite happy; and d) Value of 1 which means, less good/less decent/less happy.

The data analysis technique used is quantitative analysis to determine the feasibility of the developed media. The calculation is obtained from the score of the assessment questionnaire by media experts and material experts using the following calculation formula:

$$V = Tsa/Ms\ x\ 100\% \quad (1)$$

Description:
V : Validity by percentage
Tsa : Total score achieved
Ms : Maximum Score

The score data obtained from the test results, the percentage is calculated using the percentage formula as above. After getting the percentage result from the calculation, then the data is converted into a predicate statement and determined based on Table 1.

Table 1. Qualification criteria assessment measuring the validity level of eligibility

No	Percentage	Category	Information
1	1-50	Not feasible	Total Revision
2	51-70	less worthy	Major Revision
3	71-85	Worthy	Minor Revision
4	86-100	Very Worthy	No Revision

4 Result and discussion

4.1 Preliminary study

At this stage, the researcher conducted a preliminary study by conducting interviews with several students who had taken the Cultural Anthropology course. Based on the interview, it was revealed that students had difficulty understanding one of the materials, namely the work of anthropology (ethnography). The learning carried out is generally limited to group discussions and presentations, so that students do not understand the concepts of cultural anthropology.

4.2 Planning

The specification of the innovation product developed is in the form of a practicum module containing augmented reality (AR) which is used for the Cultural Anthropology course in the even semester. The development of this practicum module is based on

Android with AR content so it can be said as an E-Module. This practicum e-module can be accessed anytime and anywhere independently so that it can adjust to the learning speed of each student, there are 3D images that can be seen according to the side taken so that it can cause interest for students and provide a real picture of the work of anthropology, as well as There are interactions tailored to user needs. The preparation of the storyboard consists of several steps, namely naming the application, compiling an outline of the content of the module, designing the content of the learning module, and compiling research instruments. The following are the results of the preparation of the storyboard.

The first is naming the application. The name of the application is important as the identity of this module. From this stage, the name MABAR was obtained. MABAR stands for Augmented Reality-Based Cultural Anthropology Module. MABAR is an android-based application by utilizing several software such as Unity3D, Photoshop CS6, Movavi Video Suite 17, and Blender3D.

The second is to outline the contents of the module. This stage is designing about what menus and content will be written in MABAR and how the order of menus will be presented. From this stage, the outline of the menu or content contained in the MABAR is obtained. There are 4 main menus in MABAR arranged sequentially, namely 1) E-Module of cultural anthropology, 2) student activity sheets as a guide for ethnographic research practices, 3) AR which describes cultural objects, and 4) videos as artefacts that describe the culture of the place research. While other components as a complement are the cover as the main page, instructions in the form of a guide for using the MABAR application, and an about page that contains information about application developers.

The third is compiling research instruments. The research instrument developed is the MABAR assessment instrument for media, language, and material experts. Meanwhile, to test the effectiveness of MABAR using student response questionnaires.

4.3 Development

The development stage consists of writing MABAR drafts, expert validation, and revisions according to the validator's suggestions and input until MABAR is declared eligible for testing.

Drafting of MABAR. First, the main page. The main page is the initial display in the MABAR application, so this screen appears first after passing through the splash page when the application is run.

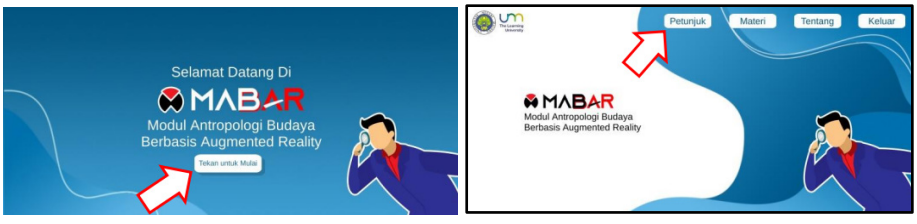

Fig. 1. App splash page and main page

If the splash page has opened, then press the 'Press to Start' button to enter the main page of the application. If you have pressed the button, you will automatically enter the main page of the MABAR application as follows.

On the main page of the application there is the title of the application and various buttons that have been mentioned in the previous section. However, to operate it is recommended to be done in a coherent manner. Besides being aimed at achieving the expected learning outcomes of the subject, it is also intended so that users get many benefits from this application. Based on this, the next step you need to do is press the 'hint button' in the menu bar. The display on the instructions page is as follows.

Second, the instructions page. The instructions page contains information on technical use of the MABAR application and instructions for its use. Third, the material page. Here is what the material page looks like. The menus in the material page are E-Modules, student activity sheets, AR, and videos.

Fig. 2. In-app material page

The various buttons available on the material page are listed in the following table.

Table 2. Button on material page

No.	Button	Information
1.		The "Electronic Module" button contains information about the meaning and methodology of cultural anthropology research. In addition, there are also examples of articles from cultural anthropology research.
2.		The "Student Activity Sheet" button contains student activity sheets after completing understanding the material in the module.
3.		"Augmented Reality" button to view augmented reality 3D objects. 3D objects can be seen by scanning the provided card (marker).
4.		The “Video” button is used to watch the Reyog Bulkiyo performance video.

The first step, you need to press the 'Electronic Module' button in the menu bar to read information about the meaning of cultural anthropology, cultural anthropological research methodologies, and articles on cultural anthropology research results. Before reading, first understand the technical guide for using the flipbook feature in the initial display on the module page. If you have finished reading the guide, then press the 'skip' button to close the guide.

Fig. 3. In-app module and page student activity sheet page in the application

The second step, zoom in and out of the module page. You can do a pinch gesture on the screen of your smart phone. If you have finished reading the module in this section, then press the 'Back' button to reopen the material page.

Next, press the 'Student Activity Sheet' button on the material page to start reading the activities that you must do after understanding the content of the material in the module. The use of the flipbook features on this page is similar to the features on the module page. If you have finished reading the student activity sheet in this section, then press the 'Back' button to reopen the material page.

The next step you have to do is press the 'Augmented Reality' button on the material page. The button is used to open the augmented reality page and to view 3D objects. Before that, you need to read the technical guide on how augmented reality works in the initial screen on this page. If you have finished reading the guide, then press the 'download' icon in the upper left corner to download the card (marker). Markers are used as a database of 3D objects that will be displayed on the screen of your smartphone.

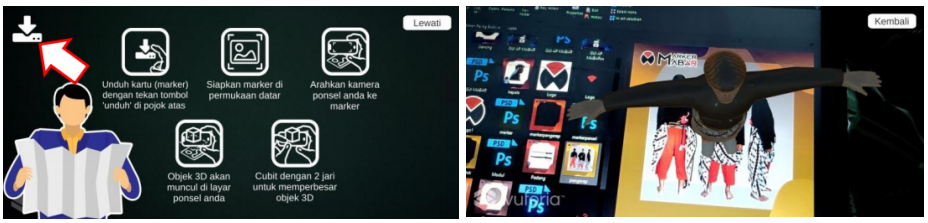

Fig. 4. Display of technical guide on AR pages and 3D objects appearing on AR pages

The next step you have to do is press the 'video' button to watch the Reyog Bulkiyo performance video. After you press the button, a video page and a technical guide for using the video player will appear. Read and understand carefully so that you have no

trouble operating the provided video. If you already understand. Press the 'skip' button to close the technical guide. Then press the 'play' icon to play the staging video.

Furthermore, if you have read all the contents of the module, you have seen all the 3D objects, and you have watched the Reyog Bulkiyo performance video, you can exit the material page to continue on the next menu. The step you can do is press the 'Back' button in the upper right corner to return to the main page. Then, press the 'about' button to read information about the MABAR application.

Next, press the 'back' button to return to the main page. When you have finished understanding the various information in the application, then this indicates that your stage is over in using this application. For that, if you want to end using this application, then you have to press the 'Exit' menu button.

Module validation, revision, and limited trial. Validation is an attempt to gain academic recognition. Validation is done through the validity test of both the material and the media. Validation is done by involving material and learning media experts.

The instrument used to obtain validation data is a questionnaire. In the questionnaire there is an assessment sheet and a comment sheet. On the assessment sheet there is a description of the aspects that need to be assessed by the validator. The description of the aspects assessed by the validator is adjusted to the type of validation. The assessment is carried out by the validator by giving a score between 1 to 4. a score of 1 for the very poor category, a score of 2 for less, a score of 3 for the good category, and a score of 4 for the very good category.

The result of the total score is then presented by dividing the score obtained by the maximum score and multiplied by one hundred percent (result score/maximum score x 100%).

MABAR validation by material experts is carried out to determine the level of validity of the material or module content regarding the nature of cultural anthropology, the nature of ethnography. The stages of ethnographic research, systematics of ethnographic research, and examples of ethnographic research results. The following are the results of critical assessments by material and media experts.

Table 3. Material and media expert assessment

Validator	Percentage	Category
Material Expert Validator	85%	Worthy
Expert Validator	88%	Very Worth it
Average	86,5%	Very Worth it

Based on the results of the validation test analysis, it can be concluded that MABAR is very feasible to use. The average rating of the two validators is 86.5%, the category is very feasible, although with a few revisions. Revisions are made in accordance with the validator's criticisms and suggestions in an effort to improve MABAR so that MABAR is really feasible to use. The following are the results of the revision in detail based on the validator's input.

Table 4. Material revision on MABAR

No.	Material Before Revision	Material After Revision
1.	There are several libraries that have not been listed in the bibliography	Have written all the libraries used in the bibliography
2.	Content about the history of cultural anthropology does not need to be written down. It is enough to write down the nature of cultural anthropology so that the material is more focused.	The material content has been adapted to the suggestion of erasing the history of cultural anthropology.
3.	Would it be better after the material was added the student activity sheet as a guide for conducting field research practice	Student activity sheet has been added in MABAR
4.	Recheck subject predicate object description and letter errors	The letter errors in the text have been fixed and the sentences are not clear. subject predicate object description has been rearranged

In general, material expert validators stated that the material was good and could be used with a few revisions according to suggestions and input. In particular, the validator emphasizes that there needs to be a student activity sheet that will serve as a guide for students in conducting practical field research activities. So that the sequence of student learning activities becomes more focused.

Table 5. MABAR media revision

No.	Media Before Revision	Media After Revision
1.	The main page which is the initial display of the MABAR application needs to be added with an institutional logo as an identity and needs animated images to make it interesting	The main page has been adjusted by adding the institution's logo as an identity and has also added animated images
2.	All buttons must be included in the instructions page and don't forget to make a manual book to make it easier for users	All buttons in the MABAR application have been included in the instructions page and the manual book has also been made
3.	Instructions on using AR camera need to be added	Detailed instructions for using the AR Kamara are added to the technical guide on the AR page when clicking the AR menu
4.	The buttons on the material page need an explanation	All buttons on the material page have been added to each start page when you click on the material
5.	It would be nice if the writing WELCOME TO MABAR was more proportional so that the word MABAR hit or appeared	The writing WELCOME TO MABAR has been adjusted so that it is proportional and the word MABAR appears more

In general, media expert validators stated that MABAR was good, interesting, and interactive. So MABAR can be used with a little revision.

A limited trial was conducted on 7 students who had taken the Cultural Anthropology course. Questionnaires are used to determine student responses to MABAR. Students' opinions or responses to MABAR can be seen in the following table.

Table 6. Student response

Student Name	Appropriateness		Student Response
	Percentage	***Information***	
A	85	Worthy	MABAR is good, makes learning enthusiasm, and the instructions and content contained in MABAR are very clear so they are easy to use
B	88	Very worth it	The abbreviation for the application name is interesting, namely MABAR. By using this MABAR I was inspired to do the same thing, which is to develop an android-based application and maybe I will add a game in it
C	86	Very worth it	This MABAR application is very interesting and interactive, especially when playing AR, so it's not boring
D	86	Very worth it	MABAR is good, the content is easy to understand, especially coupled with interesting AR
E	85	Worthy	The menu in the MABAR application is very complete, there is a student guide for conducting a research activity, so they will not be confused anymore when going to practice field research, especially regarding interview guidelines.
Average	86	Very Worthy	

Based on the results of the limited trial analysis, it can be concluded that student responses to MABAR are positive and MABAR is very feasible to use. Previous research on the use of AR as a learning medium has been widely carried out [30], [31], [32], [33], [34], [35]. Likewise, the development of AR-assisted modules as learning media [36], [37], [38]. For example, AR-assisted modules are used to increase learning motivation [39], concept understanding [40]; critical thinking skills [41]. However, although many AR-assisted modules have been developed, the problem of student learning independence has not been completed, especially in the Cultural Anthropology course. Therefore, this research was conducted. Another thing that underlies this research is the absence of guidelines for conducting research practices in the Cultural Anthropology course. The resulting product is MABAR.

MABAR will help students to learn independently because basically, the module is a teaching material that aims to make students learn independently without or with the guidance of educators [42]. In addition, MABAR which is presented in digital format makes it easier for students to access its features in it [43]. Modules in digital form are essentially the same as e-books, namely digital files containing text, images, and videos that are distributed electronically and displayed on a monitor screen [44].

MABAR which has been successfully developed is classified as an interactive learning media. Interactive electronic modules are the best alternative that can contribute to increasing reading interest and motivation [45]. Student responses to the MABAR application are that the MABAR application is easy to download and does not burden the performance of their devices; AR is easy to operate and attractive. It is interesting because the objects presented, such as art tools, look original or real [46]. The menu presented in MABAR is complete, so students can easily use it [47].

5 Conclusion

The conclusion in this development research is that the feasibility of MABAR development results refers to the results of the assessment of material experts, media experts, and limited trials in the form of student responses. The average score of expert validation results, namely material experts is 85% in the very appropriate category, while the results of media expert validation are 88% in the very feasible category, and the average student test results are 86.5% in the very feasible category. Thus MABAR is declared feasible to be used in the learning process.

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