

Mobile Cultural Heritage Apps for the Digital Literacy of the Dayak Tribe, Borneo, Indonesia

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Mobile Cultural Heritage Apps: *Concept, Design, and Implementation* for Culture and Learning Objects

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Abstract. Mobile devices and cultural heritage can be framed in traditional knowledge management systems as learning objects for achieving meaningful cultural learning experiences. This study proposes the concept, design, and implementation of mobile learning cultural heritage for object learning models. Cultural heritage content refers to the cultural domain of UNESCO, a design and development process model using the throw-away prototyping. The results of the learning object model show that the mobile learning cultural heritage media that is used as a resource of learning arouse student motivation, so the teaching-learning process is more meaningful. The use of mobile learning media accelerates the teaching process in assisting students to find their own concepts and express the phenomena they meet in real life and the events they experience are appropriate to the learning activities.

1. Introduction

The development of information and communication technology is inevitable. It has an influence on the progress of other fields such as social, economic, military, culture, education, etc. Thus, advances in information and communication technology should also have implications for education. Progress in education is one of them with a learning process that is student-centred[1]. In this case the teacher's role as a facilitator for students[2]. This explains that students must find sources of information, process the information to become knowledge, and students will be able to build their own knowledge. Apart from this, the teacher still has a role in assisting students. The change also brings a new paradigm in learning materials and learning methods. Information technology products have provided alternatives in the form of learning materials or resources that can be used and accessed by students online using a computer/smartphone[3].

The impact of the development of the technology in addition to bringing a new paradigm also raises the opposite side (threats and opportunities)[4]. One concern that arises is the tendency that leads to a decrease in the value of preservation of local wisdom due to the influence of foreign cultures. Learning and education methods for the children are increasingly developing as children are fluent in using technology-based devices. Many applications were created to help the learning process for children, but few convey local wisdom. This is also a serious concern and must be observed in efforts to preserve local cultural heritage[5].

The paper strives to create mobile learning media as a conveyor of local wisdom values through the development of cultural heritage learning in ways that adapt the habits of children accustomed to mobile technology, by rebuilding cultural values (revitalization) through the role and influence of technological development and communication by exploring local wisdom through the concept, design and application of mobile cultural heritage for object learning models.

The mutually beneficial convergence between the influence of technology on culture and theory and also practice on contemporary education [6]. Entering the digital world, it is not surprising that increased interest is related to technology and mobile learning. The early introduction of cultural heritage is very important to instil their pride in the nation's culture. Cultural learning can be applied anywhere, anytime and in any way. In schools with teacher teaching or at home with the guidance of parents or the environment, students still get the right learning.

2. Mobile Learning and Cultural Heritage

Mobile learning is a new paradigm in the world of learning[7]. This learning model appears to respond to the development of the world of information and mobile communication technology, which is very rapid lately. In addition, it cannot be denied that at present, the mobile communication device is one of the devices that is closely related to the daily lives of learning actors such as teachers and students [8]. Mobile learning according to Crompton[9], [10], has arisen from pedagogical adaptation centred on learners, which is contextualized, personalized, cooperative, a technology that enables the role of students in the learning centre, by supporting accessibility, comfort and flexibility, that provides: resources that can be accessed from anywhere, powerful search system capabilities, rich interaction, and complete support for effective learning. Alternative learning models that have characteristics do not depend on location and time. In addition, the alternative model is also expected to be able to provide knowledge sharing and visualization facilities so that knowledge becomes more interesting and easier to understand. The concept is expected to encourage the realization of a new learning atmosphere and can motivate students and teachers' learning enthusiasm.

In the era of globalization when technology has reached certain limits, especially in the world of education, there is a mutually productive convergence between the influence of technology on culture and theory and also the practice of contemporary education. When we enter the digital world, it is not surprising that growing interest is related to mobile technology and also learning.

Learning and education methods for children are increasingly developing as children are fluent in using technology-based devices. Many applications have been created to help the learning process for children, but few convey local wisdom, especially local wisdom related to cultural heritage.

The phenomenon of children at this time is very interesting to be observed. Several observations made reveal a shift in the value of cultural heritage. As happened in Bali, Indonesia. Balinese children, especially elementary school children in the Denpasar area are not accustomed to speaking Balinese, especially if the curriculum for learning Balinese is threatened to be abolished[11]. This is also a serious concern and must be observed in efforts to preserve Balinese as a valuable cultural asset for Balinese to convey the value of Balinese local wisdom by including Balinese as an alternative language of instruction.

One of the learning strategies and approaches developed is culture-based learning using object learning models. Cultural learning is the creation of a learning environment and the design of learning experiences that integrate cultural heritage as part of the learning process and the learning object model is learning that uses objects in the form of objects, images, and natural phenomena as learning resources[12], that can be packaged in a mobile learning app[13].

3. Research Design and Methodology

Methodology for developing of mobile cultural heritage: concepts, designs and applications for learning objects, taking the object of research into the cultural heritage of the Dayak tribe Borneo. The Dayak tribe is a large tribe that has 405 sub-tribes and unique cultures that are different from each other[14]. The Dayak tribe is a native of Borneo Island with a population of tribal spreads that inhabit four (4) countries on the mainland and in the Borneo archipelago. I.e. the Dayak tribe inhabiting the Indonesian mainland in Kalimantan, the Dayak tribe in the Sabah land and Sarawak Malaysia, the Dayak tribe in Brunei Darussalam, and the Dayak sub-tribe in the North Kalimantan archipelago, the Philippines[5].

3.1. Mobile cultural heritage domains

According to [15] the scope of the development of digitalization of culture includes elements of universal culture as proposed by Clyde Kluckhohn [16], that the religious system, social system or social organization, knowledge system, language, art, livelihood system or economic system, and living or technological systems. It further recommends that e-Culture related to other electronic fields, i.e. Knowledge Management System, E-Tourism, E-Business, and E-Government. The proposed study is the development of cultural heritage framework for a traditional knowledge management information system with digitalization and visual cultural contents. The building the framework refers to [14] the 5R concept architecture adaptation framework; Concepts, Systems, and Learning Scenario. This framework enriches the knowledge management information system by integrating cultural heritage context information including users, locations, devices, and information content into the adaptation process.

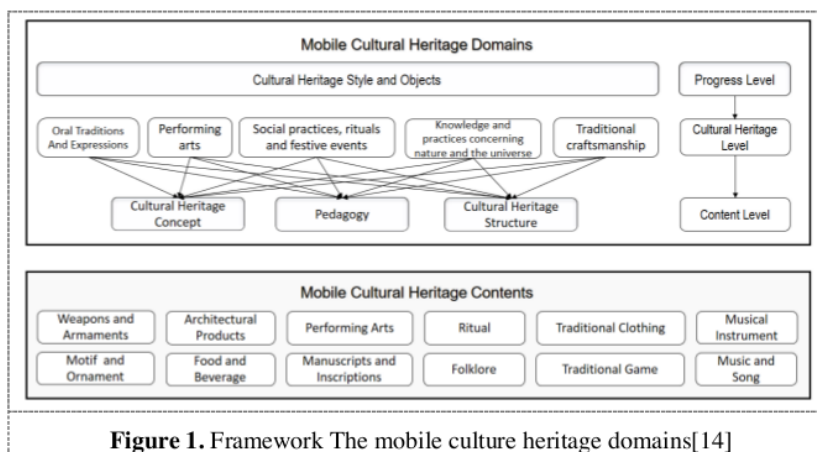


Figure 1. Framework The mobile culture heritage domains [14]

UNESCO's 2003 Convention for the Safeguarding of the Intangible Cultural Heritage proposes five broad 'domains' in which cultural heritage is manifested, (see Fig. 1) i.e. 1) Oral traditions and expressions, including language as a vehicle of the intangible cultural heritage; 2) Performing arts; 3) Social practices, rituals and festive events; 4) Knowledge and practices concerning nature and the universe, and 5) Traditional craftsmanship.

Further in [17], the term 'cultural heritage' has changed content considerably in recent decades, partially owing to the normative instruments developed by UNESCO. Cultural heritage does not end at monuments and collections of objects. It also includes traditions or living expressions inherited from our ancestors and passed on to our descendants, such as oral traditions, performing arts, social practices, rituals, festive events, knowledge and practices concerning nature and the universe of the knowledge and skills to produce traditional crafts [17]. For this reason, what is included in the mobile culture heritage domain is a cultural ecosystem. More details can be seen in Figure 1.

3.2. Cultural heritage learning and learning object models

Cultural heritage learning and learning object models can be framed in a mobile learning app, where cultural concepts are designed to enable students, social interaction, negotiation and meaning creation to the use of various learning resources. While learning objects that use media such as objects, images, and natural phenomena as learning resources can stimulate students' thoughts, feelings, interests and attention so the teaching and learning process is more meaningful. The process of creating meaning through the process of cultural heritage learning and learning objects has several components such as meaningful tasks, active interaction, contextual explanation and application of knowledge and the use of a variety of interactive learning resources that demand exploration,

investigation, building solutions and shifting learning from learning using rote learning becomes a learning that connects a concept with facts in daily life.

The learning object models is used as a general guide in learning the cultural heritage and its various manifestations can be a quality context. The characteristics of this learning (culture and objects) have in common a learning approach that emphasizes more on processes and products, more emphasis on student activity in analyzing an object and phenomenon so that it can find its own concepts to be learned. And the environment that influences learning [18].

3.3. Mobile culture heritage: concept

The concept of mobile learning in cultural heritage integrates the model of learning objects and culture in developed as an effective learning medium by using student experiences directly, connecting learning with real-life and collaborating to discover their own concepts of knowledge. The development of learning objects models is beneficial for students and teachers. The benefits for students are students can learn more effectively, where students can work together in solving problems and explore a concept of knowledge possessed by students. Benefits for teachers are able to increase the productivity of educators, and cooperation between educators in developing more innovative sources of knowledge[19].

The concept of the mobile learning model provides opportunities for students to learn to present a concept that they have discovered, so as to enhance students' critical thinking competencies [20]. The conceptual framework of learning using this model from[14],[5] is presented in **Figure 2**.

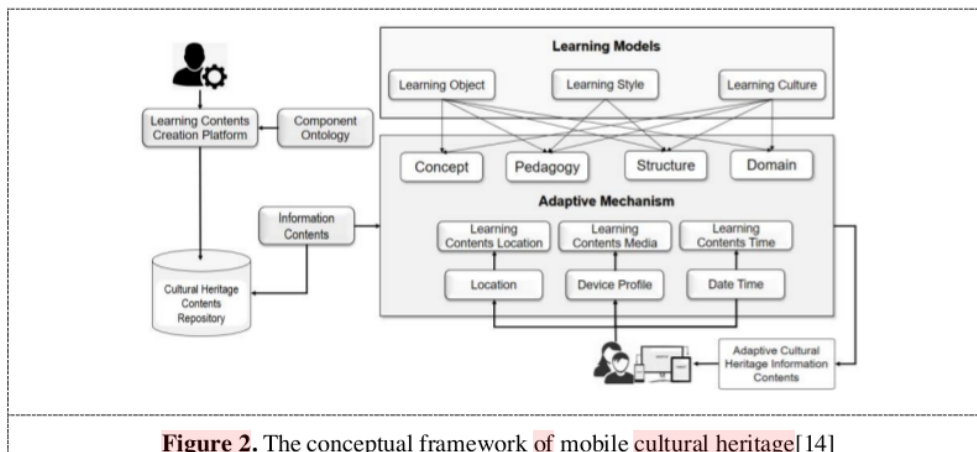


Figure 2. The conceptual framework of mobile cultural heritage[14]

- The learning content model framed in [21]the mobile learning media application integrates of the cultural learning models and objects, the real phenomena of the surrounding environment which are a cultural heritage (local wisdom) are used as learning resources for students. An object is an object while the phenomenon is the symptom observed in the object. The source of learning in mobile learning is not from the teacher, but from cultural objects and natural phenomena themselves so learning is not abstract. Cultural objects and real phenomena of experience in the environment are presented in interactive media (digital) categorized by the domain of cultural heritage, so as to motivate students to learn.
- An adaptive mechanism is an explanation of the concept, pedagogy, structure and domain of cultural heritage on locations, objects or media and time. The teacher assists students in finding explanations about objects and real phenomena by using structured questions, so

students are expected to find their own knowledge contained in real objects and phenomena in the learning content.

- Adaptive cultural heritage information contents, Students who have studied and understood a cultural object, are assigned to apply (presentation). The teacher raises questions or problems related to cultural objects so that learning is not abstract and can develop students' critical thinking skills.

These components interact with each other so that it has implications in a mobile learning culture heritage, among others:

- The teacher, the teacher is required to have the ability to explore all information related to local cultural objects in the material to be discussed. The teacher has the role of guiding and directing the potential of students to explore a variety of cultures that are already known and develop that culture.
- The students, Students in learning activities are always brought to the real context that contains cultural elements so that in the concept construction process, students are able to carry out these activities more meaningfully. Knowledge and experience about the process of discovery and problem-solving in the field of science, honing students' abilities in formulating problems and hypotheses, designing experiments and research, and producing reliable solutions. In addition, students have the skills to apply knowledge in the fields of science and various other knowledge to solve problems in a broader context.

3.4. Mobile cultural heritage: design

The development process model for mobile learning cultural heritage apps using the throw-away prototyping model, the development stages are presented in **Figure 3**, as follows:

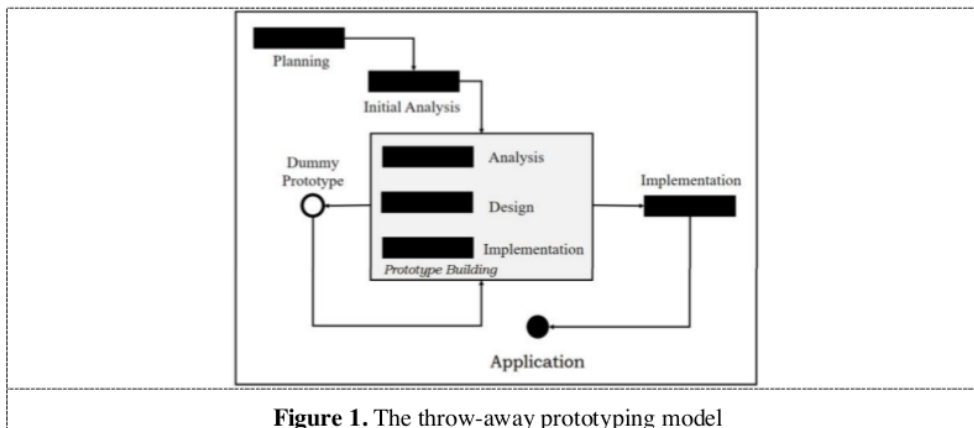
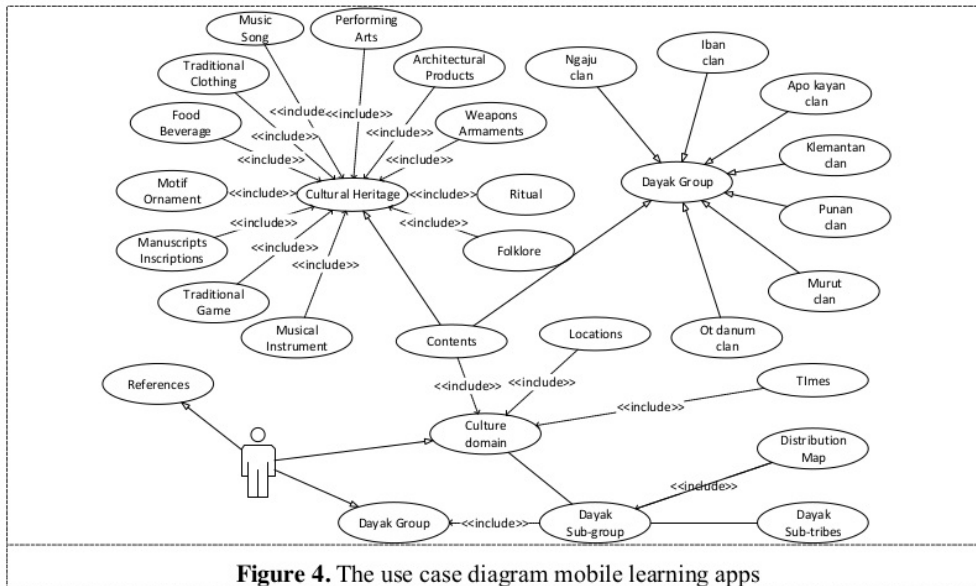


Figure 1. The throw-away prototyping model

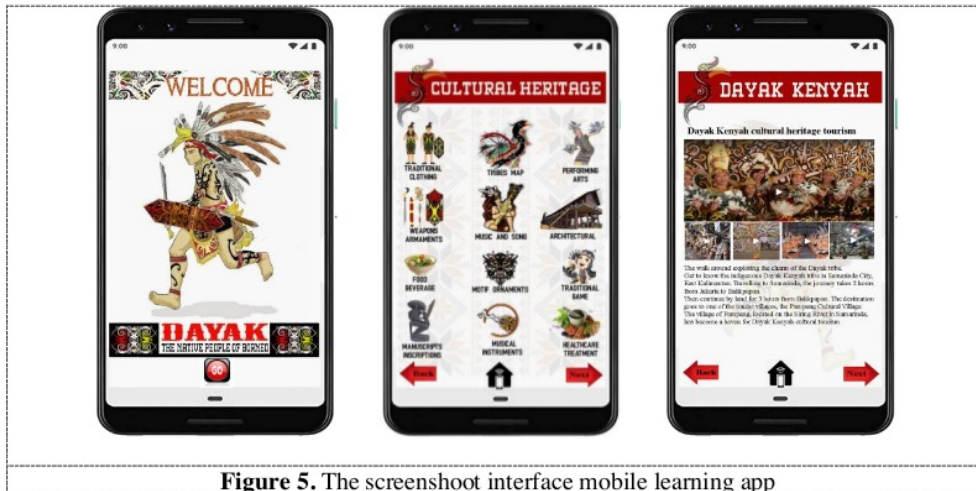
- Planning, the phase includes the activities of goal setting, preparation of a mobile learning framework, scope, resources, describing functions, performance, boundaries, interfaces and reliability. Performance considerations include processing and response time requirements. These limits identify the limits placed on mobile learning applications by external hardware, memory, or existing information systems.
- Initial analysis, the phase includes the analysis of software system requirements, hardware, and brain-ware. Software requirements analysis consists of functional and non-functional requirements of a mobile learning application.

- Prototype building, the phase consists of analysis, design and implementation activities. The modelling tools used to design software using object-oriented modelling UML diagrams (Unified Modeling Language). The modelling design is shown in **Figure 4**.



3.5. Mobile culture heritage: implementation

The results of the software product is a mobile learning application used as object learning media and cultural learning content of the Dayak Tribe Borneo. The results of the implementation are shown in **Figure 5**.



4. Result and Discussion

Some of the practical benefits of using mobile learning, specifically the cultural heritage mobile in the teaching-learning process, are the ability to develop effective learning by using student experience directly, the interaction between students and their environment, can overcome the limitations of the senses, space, and time, connecting learning with real-life and can clarify the presentation of messages and information so as to facilitate and enhance the learning process and can increase and direct the attention of children so that it can lead to learning motivation.

To assess the influence of the use of mobile cultural heritage toward student motivation, an experiment was conducted. The test uses an experimental technique, to compare student learning outcomes using mobile learning, and conventional learning. Research testing in junior high schools with a sample of 52 students taken using multistage sampling techniques. The research design uses a 2x2 factorial design, data analysis using the 2-way ANOVA technique which is first performed calculations data analysis requirements, normality and homogeneity test.

4.1. Results

Descriptive research results can be described through Table 1.

Table 1. Descriptive data

Mobile Learning Motivation	Mobile Cultural Heritage	Conventional	Sum
High	n = 13	n = 13	n = 26
	$\bar{x} = 82.8$	$\bar{x} = 68.7$	$\bar{x} = 75.8$
	s = 10.3	s = 11.8	s = 13.2
Low	n = 13	n = 13	n = 13
	$\bar{x} = 68.6$	$\bar{x} = 68.2$	$\bar{x} = 68.4$
	s = 12.2	s = 9.9	s = 10.9
Total	n = 26	n = 26	n = 52
	$\bar{x} = 75.7$	$\bar{x} = 68.5$	$\bar{x} = 72.1$
	s = 13.2	s = 10.6	s = 12.4

Based on **Table 1**, shows that if students are taught through mobile learning media and have high learning motivation, it will produce the highest learning outcomes or mobile cultural heritage learning media is effective for students who have high learning motivation. And the lowest average obtained by a group of students who are taught using conventional learning media and have low learning motivation, this shows that students are taught using conventional learning media and having low learning motivation will produce the lowest learning outcomes or ineffective learning with conventional learning media for students with low learning motivation.

Furthermore, the results of testing the data analysis requirements show that all data groups are normally distributed, and all data come from homogeneous populations so that data analysis using parametric analysis with 2-way ANOVA can be done. Hypothesis testing is shown in **Table 2**.

- Table 2 obtained the results of data analysis in the mobile learning media group between the use of mobile learning cultural heritage media with conventional (inter-line) values obtained $F_{\text{Count}} = 5,500$ and $\text{Sig.} = 0.023$. Known F table (F_{table}) at a significant level of 0.05 and free degree (df) = 1:48 is 4.043. Because of the value of $F_{\text{Count}} (5,500) > F_{\text{table}} (4,043)$ and the value of $\text{Sig.} (0.023) < 0.05$, it is concluded that there is an influence on student learning outcomes that are taught using mobile cultural heritage learning media toward conventional learning media.

Table 2. Summary of ANOVA results of learning outcomes

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1997.923 ^a	3	665.974	5.389	.003
Intercept	270432.692	1	270432.692	2188.489	.000
Media	679.692	1	679.692	5.500	.023
Motivation	708.923	1	708.923	5.737	.021
Media * Motivation	609.308	1	609.308	4.931	.031
Error	5931.385	48	123.571		
Total	278362.000	52			
Corrected Total	7929.308	51			

a. R Squared = .252 (Adjusted R Squared = .205)

- Table 2 obtained the results of data analysis on learning motivation groups between high learning motivation and low learning motivation (between lines) obtained $F_{count} = 5.737$ and $Sig. = 0.021$. Because of the value of $F_{count} (5.737) > F_{table} (4.043)$ and the value of $Sig. (0.021) < 0.05$, it is concluded that there is an influence on student learning outcomes that have high learning motivation with low learning motivation.
- Table 2 obtained the results of data analysis on the interaction between learning media and learning motivation, which is analyzing the variance in 4 groups of learning outcomes data (groups A1B1, A1B2, A2B1 and A2B2) obtained $F_{count} = 4.931$ and $Sig. = 0.031$. Because of the value of $F_{count} (4.931) > F_{table} (4.043)$ and the value of $Sig. (0.031) < 0.05$, it is concluded that there is an influence of learning media interaction and learning motivation on student learning outcomes.

Because there are interactions between all three variables, then carried out the Advanced Test (t-Test) to find out the significance of the differences between each group significantly. The t-test is used to find out which sample group has higher learning outcomes. The results of the advanced test counting are shown in Table 3.

- The results obtained in the t-test show that there are significant differences between the average student learning outcomes with high learning motivation (A1B1) against students with low learning motivation (A1B2) in groups taught using mobile cultural heritage learning media.
- The results obtained in the t-test showed no significant difference between the average student learning outcomes with high learning motivation (A2B1) against students with low learning motivation (A2B2) in groups taught using conventional learning media.

Table 3. Summary of the advanced test (t-Test)

Counting	Group			
	A1B1-A1B2	A2B1-A2B2	A1B1-A2B1	A1B2-A2B2
Average A	82.85	68.77	82.85	68.61
Average B	68.61	68.23	68.77	68.23
t_{count}	3.202	0.126	3.238	0.088
$T_{table} (5\%, 24)$	2.064	2.064	2.064	2.064
Sig. (2-tailed)	0.004	0.901	0.004	0.931
Interpretation	significant	not significant	significant	not significant

- The results obtained in the t-test showed that there were significant differences between the average learning outcomes of students taught using mobile cultural heritage learning media

(A1B1) and students taught using conventional learning media (A2B1) in groups that had high learning motivation.

- The results obtained in the t-test showed no significant difference between the average learning outcomes of students who were taught using mobile cultural heritage learning media (A1B2) and students who were taught using conventional learning media (A2B2) in groups that had low learning motivation.

4.2. Discussion

Based on the results of testing the application of mobile learning, proving that the use of cultural heritage learning media is able to arouse student learning motivation. The learning process that uses mobile learning media is not just using text (verbal symbols) but is given an external stimulus through the direct application of cultural objects that are being learned in real terms. Thus the results of student learning experiences are more meaningful.

¹⁶ In groups taught with mobile cultural heritage learning media, the average learning outcomes of students who have high learning motivation (82.85) are higher and are significantly different from students who have low learning motivation (68.61). Whereas in the group taught using conventional learning media, the average learning outcomes of students who have high learning motivation (68.77), there is no significant difference in students' low learning motivation (68.23).

In groups that have high learning motivation, the average learning outcomes of students taught with mobile cultural heritage learning media (82.85) are higher and there are significant differences with students who are taught using conventional learning media (68.77). Whereas in the low learning motivation group, the average learning outcomes of students taught with mobile cultural heritage learning media (68.61) there were no significant differences with students who were taught with conventional learning media (68.23).

5. Conclusion

The cultural learning using mobile learning media can arouse student learning motivation when compared to conventional learning media. The mobile learning process of cultural heritage can give the impression that cultural heritage is a fun lesson. Because utilize mobile learning media is able to stimulate the thoughts, feelings, attention, and willingness of students in a pleasant learning atmosphere so that the material presented becomes clear and eliminates verbalism. A pleasant environment in the process of learning culture will be able to improve student learning outcomes.

Furthermore, students who have high learning motivation will tend to be diligent, tenacious, an enthusiastic in learning, never give up and be happy with challenges. Students who have high motivation to learn and enjoy culture, learning culture is not just fulfilling obligations and the task of the teacher, but they make learning culture as a need that must be met. For them, whether or not there are stimuli from outside to study culture is no different. While students with low levels of cultural learning motivation, generally will be lazy to learn, tend to shy away from duties and occupations that are culturally related.

Therefore we need a high teacher's role in encouraging cultural learning in students who have low learning motivation. The process of cultural learning is appropriate for students' low learning motivation, because in cultural learning given external stimuli through the application of real cultural objects directly. In addition to arousing and developing the motivation to learn continuously, students can do so by determining/ knowing the learning goals to be achieved, responding positively to the praise/encouragement of others, setting targets for completion of learning tasks and other similar behavior. The better the motivation of student learning, the better the learning outcomes will be. Based on the foregoing it can be concluded that students learning motivation is high, more effectively taught with mobile learning media than conventional learning media.

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5

Acknowledgments

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