Mobile Technology in Mathematics: Students' Perspective towards Their Cognitive Styles and Academic Ability

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Abstract: The aim of this research was to look at student's perspectives in mathematics learning who had been applied mathematical learning assisted by mobile technology based on cognitive styles and academic ability. The type of research is Mixed Method, which was a combination of qualitative and quantitative. The sample in this study was students in the even semester of the academic year 2017/2018 in the calculus II course who received mathematics learning with using mobile technology. The instruments were questionnaires of interest in using mobile technology and interviews. The data analysis technique carried out was the analysis of qualitative data for data from interviews and quantitative data analysis for data from the questionnaire of interest in learning mathematics after using mobile technology. The results showed that the perspective of interest in mathematics learning by mobile technology was in the moderate category, meaning that almost all students were interested in mathematics learning by this mobile learning application. The interest in mathematics learning with mobile technology in terms of academic ability was high, medium and low ability, while the interest in mathematics learning with mobile learning applications in terms of cognitive styles learning, that is field dependent and field independent, had a view of interests that almost the same, this is indicated because in general, the average questionnaire score is in the "medium" category. This is also supported by the results of interviews in which students were very interested if this application is used in mathematics learning, and they also hoped that it will also be developed in different subjects.

1 INTRODUCTION

Technological advances can provide new methods of learning. It provides a new challenge for teaching staff or educators to be able to use optimally and provide new learning experiences for students. In some education institutions, the use of technology has been widely used such as online scoring systems, online registration, online credits programming printing, payment of online education fees, and others. Those utility of mobile devices are currently developing, including Android, iPads and Tablets. Mobile devices today are not luxurious items anymore and have become common daily thing making this mobile device can be interesting in the learning process in the classroom (Skillen, 2015).

The learning process in the classroom is an interaction between teachers and students or students with other students. The good quality of learning will certainly support the quality of education. However, the world of education continues to move in terms of creating interactive media and learning methods in a comprehensive manner. Hence, educators should concern the technological advancements in order to achieve quality education goals.

Recently, higher technology enthusiasts can be seen from the results of existing surveys. Based on the survey results of the Indonesian Internet Service Entrepreneurs Association (APJII), the profile of internet use in Indonesia was obtained in 2014 at 34.9% and 78.5% of all internet users living in the western part of Indonesia. Regarding internet-based technology, 85% of total users in Indonesia access the internet using mobile phones as stated by Pusakom in (Herlina and Istikomah, 2018). Based on the age of the user, the majority of internet users are 18-25 years old, which is equal to almost half of the total internet users in Indonesia, which is 49% and 60% who use mobile phones to access the internet.Based on the results of other surveys, the highest demand for mobile applications (StatCounter, 2016), can be seen in the following figure:

Based on the results of the questionnaire about the use of computers and mobile phones distributed to 50

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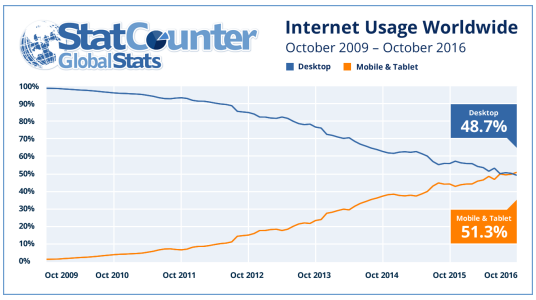

Figure 1: This caption has more than one line so it has to be justified.

students of FKIP UIR mathematics education, there are 3 people who do not have computers/laptops, all students have their mobile phones using them for the internet, accessing social media, and entertainment (Herlina and Istikomah, 2018). To access the internet, 36 out of 50 people access with personal data packages and 16 other people use Wi-Fi provided by the university.

Based on the survey data mentioned above, it shows the community's high interest in using technology. The high interest in using this mobile application is integrated with student interest in using applications in their learning process. However, can the differences in individual abilities and differences in the learning styles of each individual be overcome by the application of this mobile learning technology? Thus, based on the survey results researchers are interested in conducting research to see the interest perspective of mathematics education students who have implemented mobile technology-assisted mathematics learning based on academic abilities and cognitive style. By knowing student interest in mobile learning applications, educators can develop mobile technology application or mobile learning in mathematics learning in order to improve the quality of education.

2 RESEARCH METHOD

The type of research used in this study is mix method research (Creswell, 2014). The research was conducted at the Mathematics Education Study Program FKIP Riau Islamic University, which was addressed at Jalan Kaharudin Nasution No. 113 Perhentian Marpoyan, Pekanbaru. This research was carried out in the Even Semester 2017/2018 academic year, which was in February 2018 until May 2018. The research sample was students in the Mathematics Education Study Program FKIP Riau Islamic University, who too calculus 2 courses. The selection of sample members by purposive sampling technique was in the calculus class 2B. There are 2 research instruments, which are: Questionnaire Interest on the use of mobile learning applications, interview sheets and questionnaire to show cognitive style (Doc, 2017) and validity of test (Mohammad, 2015). The mathematics learning interest questionnaire sheet in this study aims to see the perspective of student interest after applying mobile technology-assisted mathematics learning or mobile learning. The questionnaire indicators in this study were developed by Djamarah in (Hendriana, 2017). Indicators of learning interest were linked to the use of mobile learning applications. The following are the number of statements before and after validation.

Table 1: Results of before and after validation.

No	Indicator	Statement Number	
		Before Validation	After Validation
1	Like or enjoy	1, 2, 3, 4, 5, 6	1, 3, 5, 6
2	Statement of like something more	7, 8, 9, 10, 11, 12, 13, 14	7, 8, 10, 11, 12
3	There is interest	15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28	15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 28
4	There is awareness to learn on their own without being told	29, 30, 31, 32	29, 30, 31, 32
5	Participate in learning activities	33, 34, 35, 36, 37, 38	34, 35, 38
6	Willing to pay attention	39, 40, 41, 42, 43, 44	39, 41, 42, 43, 44

In addition to use interest questionnaire validation with Anates v 4.0, this interest questionnaire was also done to the validator. The results obtained from the validator are in the form of language changes or editorial and adjustments to the statements with the given indicators. For the interview sheet (Sujarweni,), it is used to explore data verbally. Esterberg in (Sugiyono, 2013) suggested that interviews are exchanging information and ideas so that meaning can be constructed in a particular topic. In this study, researchers conducted an unstructured interview to 5 research subjects outside learning to explore the interests of learning mathematics after using the mobile learning application (Sugiyono, 2013).

The technique to fill the interest questionnaires in this study is each respondent filled out a questionnaire with a check mark (v). The format of the questionnaire response interest in learning mathematics after applying a mobile learning application uses a Likert scale (Brown, 2010). According to Likert in filling out the questionnaire, the choices are based on four answers which are: Strongly Agree (SS), Agree (S), Disagree (TS), and

Strongly Disagree (STS). In collecting interview data, the researcher made a list of questions related to the research problem that had been proposed. Data analysis which was conducted in this study was: 1) Questionnaire Data Analysis Interests; 2) Analysis of Interview Results; 3) Questionnaire Analysis of Interest in Cognitive Learning Styles and academic abilities.

The results of the interest questionnaire distributed were obtained criteria (Azwar, 2007) as follows:

Table 2: Criteria for Questionnaire Interest.

No	Score	Category
1.	$\bar{x} \leq 113$	Low
2.	$113 < \bar{x} \leq 156$	Medium
3.	$\bar{x} \geq 113$	High

3 RESEARCH RESULT

This study discusses the results of the use of mobile learning applications in terms of student interest in the use of the application and sees students who are interested in using mobile learning applications in terms of cognitive learning styles. Based on the results of the research, the findings of the research results will be described as follows:

3.1 Mobile Learning Interest Questionnaire Analysis

In this study, the interest questionnaire on mobile learning applications was validated in 59 students. After testing the validation of the questionnaire instrument, there were 34 valid statements from 44 statements. The following are the results of research on the profile of student interest after using the mobile learning application in calculus learning II. The following table 3 is regarding the indicators of interest questionnaire used in this study.

Based on the table 3, it can be seen that student interest in this mobile learning application is still in the moderate category. However, it is interesting to the indicator that there is a sense of attraction and the awareness to learn on their own, including the lowest percentage among other indicators. It shows that the interest for independent learning is still low, but in students there is an interest in using mobile learning applications, hoping that this application in the future can also improve the ability to learn independently.

Table 3: Summary of interest questionnaire score average results for mi

No	Indicator	Percentage (%)	Average of Questionnaire Score	Criteria
1	Like or enjoy	72,01	132,50	Medium
2	Statement of of like something more	71,09	130,80	Medium
3	There is interest	75,92	139,69	Medium
4	There is awareness to learn on their own without being told	69,43	127,75	Medium
5	Participate in learning activities	71,38	131,33	Medium
6	Willing to pay attention	75,54	139,00	Medium
	Total	72,56	133,54	Medium

3.2 Analysis of Interview Results

Before conducting the interview, the researcher asked whether the mobile learning application can be downloaded on the Smartphone they have. It turns out that there were those who could not download the application, after being investigated, it showed that this mobile learning application could only be opened on an android application, meanwhile in IOS, mobile learning application cannot be downloaded and opened. However, on some Android phones, it can be opened but there are some programs that are unreadable.

Based on the results of the interview, the display presented was good, but there were also students who said that the appearance was still monotonous. In the aspects of the material presented, some of them were easy to understand the material provided, and there were also students delivering material on the mobile learning application to be more detailed. For the training and evaluation aspects presented in the mobile learning application, generally, they asked for more and more variety. In addition, in terms of answers, they also hoped for a complete solution.

Students were also interested if this application is used in other subjects. They also hoped that there is a video in the mobile learning application. Students also said they were happy with this application because if they forget to bring books, the materials are already on their laptops. In addition, they can learn independently whenever and wherever, there are lecturers or not.

Based on the results of interviews with students about the interest in learning about the mobile

learning application that was made, it can be concluded that basically they like the mobile learning application that can be used in mathematics learning. However, there are many findings from the interviews so that the mobile learning application needs further improvement and development.

3.3 Analysis of Interest Questionnaire Reviewed Cognitive Style

In this section, researchers want to see whether there are differences in learning interest in mathematics by using mobile learning applications in terms of cognitive styles (Kozhevnikov, 2007), which is Field Dependent and Field Independent (Blanton, 2004). However, the researchers had a little difficulty analyzing this because when filling in the questionnaire of interest, most students did not want to fill their names. Thus, the data that can be analyzed is only student data that is known by name. Out of 46 students, only 20 wrote the name on the interest questionnaire sheet. Meanwhile, from the average mathematics learning interest questionnaire scores to the use of mobile learning applications it can be concluded that the Independent and Field Dependent Field cognitive styles have almost the same interest views, this is indicated because in general the average questionnaire scores are in the "medium" category. Thus, the researchers concluded that if the mobile learning application was developed again, it could facilitate different student learning abilities

3.4 Analysis of Interest Questionnaire Reviewed Cognitive Style

This analysis is based on student interest questionnaires and academic abilities. Academic ability here is taken from student learning outcomes consisting of high, medium and low abilities. Likewise, on the value of the interest questionnaire that has been filled by students, the average score of the questionnaire scores is grouped into three parts, which are: high, medium and low. The mathematics learning interest questionnaire analysis in terms of student academic ability can be summarized in the following table 4:

Table 4: Summary of interest questionnaire score average results for mi

Average of Questionnaire Score	Academic Competence			Total
	High	Medium	Low	
High	-	2	-	2
Medium	3	28	12	43
Low	-	-	1	1
Total	3	30	13	46

Based on the table above, it can be seen that in general, students for high, medium and low ability provide interest in learning mathematics by using mobile learning applications in the medium category. It means that students have a positive response to the application made. From the data above, there were also two students who were capable of giving interest in the high category in the use of mobile learning applications. It means that the mobile learning application can help them to learn. However, there is one person who showed low interest in using this application, it can be used as input for researchers so that the mobile learning application in the development process can facilitate high, medium and low academic abilities. Thus, the hope is that there is no longer a gap in the academic ability of students or it can be said that the ability of students can increase.

4 DISCUSSION

Based on the results of the research that has been conducted, the profile of interest in learning mathematics towards the use of mobile learning applications includes interest. This is based on the results of the interest questionnaire and the results of the interviews conducted. From the interest questionnaire distributed to 46 students, their interest in this application is in the medium category. In addition, from the results of interviews, their interest was shown in the presence of similar applications in other subjects other than II calculus courses that the researchers designed.

The design of this mobile learning application consists of front view, material, practice questions and evaluation. Then, this application can be downloaded on the Playstore, in the application entitled "Cara Mudah Belajar Kalkulus (How to easily learn calculus)". Here is a picture of the mobile learning application (Figure 2).

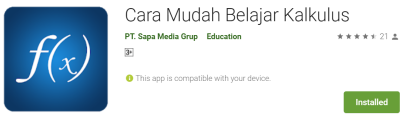

Figure 2: Mobile leaning application on Google Play.

Before students filling out a questionnaire on learning interest in mathematics by using a mobile learning application, they downloaded on the Google Playstore on their respective Smartphone, then, they were involved in classroom learning. When downloading this application, based on interviews

and observations while carrying out research, there were 6 students who could not download this application. It was because their Smartphones were not Android but IOS. Meanwhile, most of them were able to open this application. There were some students who could not open the application, when opening it, there was only a blank screen. Thus, in the future, this application still needs improvement. Furthermore, here is the display inside the application (Figure 3).

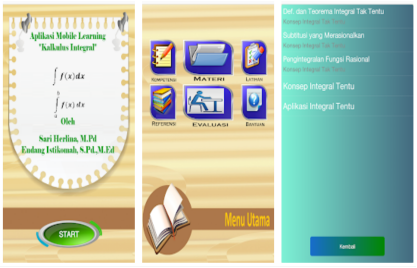

Figure 3: Some parts of a mobile learning application.

In the evaluation section, the evaluation question only contains five questions. Each student's question was asked to analyze the wrong answer. When they worked on the problem, most of the students had difficulty finding the answers, they conveyed the questions presented were quite difficult, but there were several students who wanted the evaluation questions to be presented from easy to difficult. After they worked on the evaluation questions, they could see the complete answer key, so they could evaluate themselves the answers they have found. The following is a picture of the evaluation section displayed on the mobile learning application (Figure 4).

In this evaluation section, students were not able to see the answers before completing the test questions given. The weakness of this evaluation problem is that students could answer by guessing from the answers given. This application is just designing questions and is answerable for students to analyze their answers. Their interest in the evaluation section is quite good.

Based on the results of research, findings during interviews and observations while conducting the learning process in the classroom using this mobile learning application, this application is good to develop. Development of this application really needs to be done in order to improve the quality of the content or material presented so that it can provide benefits in its use. Seeing the good interest of students in this mobile learning application, researchers will continue the development of mobile learning applications so that they can be used in

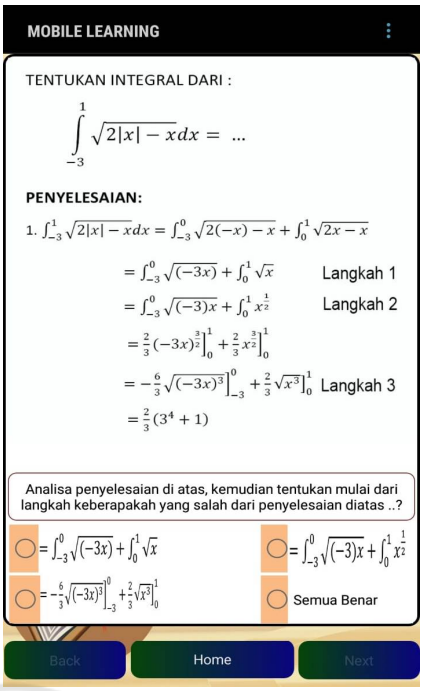

Figure 4: Display of the Evaluation Section of the Mobile Learning Application.

mathematics learning. Moreover, it is expected that this application can be used as one of the new learning methods that can improve student learning outcomes (Slavin, 2006) because it makes students easier to study anywhere and anytime without carrying a book (Skillen, 2015).

5 CONCLUSION

Based on the results of the research and discussion, it was concluded that the perspective of interest in learning mathematics by using mobile learning applications was included in the "medium" category. Overall, the use of mobile learning applications is in demand for the learning process in the classroom and for independent learning. This application is an innovative application for learning mathematics in the future and can give new contribution toward the teaching method.

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