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Mobile Project-Based Learning and Learning Motivation on The Competence and Performance of Teachers

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ABSTRACT

In this study, the developed learning model is mobile project-based learning, and the development of this learning model is combined with the teacher's learning motivation. The goal to be achieved is an increase in the competence and performance of the teacher. This research method uses a quasi-experimental research model with a non-equivalent control group research design. The sample for this study is Physics, Chemistry and Mathematics students from Madrasah Iftidqiyah Nahdatul Watan in the first semester of the 2020/2021 academic year. Data collection techniques are performed by quizzing the control and experimental classes. Data analysis was performed by MANOVA test. Results of this study (1) The impact of PjBL strategies supported by mobile learning applications on teachers' teaching ability and performance; (2) There is an effect of academic excellence on students with high motivation compared to low motivation to learn; (3) There is a correlation between the implementation of the PjBL program, which helps foster mobility and higher learning motivation in the teaching process, and teacher performance.

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1. INTRODUCTION

The ability of teachers to improve classroom performance through the use of mobile classroom methods enables children to seek guidance and classroom practice on their own (Walden, 2020) (Balacheff & Kaput, 1996). With active teaching, teachers' performance will improve. According to the results of a study by Hwang (2016), most studies on mobile learning perform well in the learning process. Infinite learning is now defined as a right (Kong et al., 2013), a "habit of mind" (L.H. Wong & Looi, 2011a) or a set of metacognitive skills (Kong et al., 2013), or a "schema" and Habitual Strategies" (Zhang, Hong,

Scardamalia, Teo, & Morley, 2011) argues that learning not only occurs in school, but can continue throughout life in daily life.

Mobile technologies can enhance mobile learning by creating connected learning experiences (Looi et al., 2010) (Caena, 2014). However, research on acceptance and learning in recent decades has shown the importance of combining teaching with classroom and field, which is the main characteristic of school learning. The focus is on individual acceptance, poor mental functioning, and much of the learning environment as a whole (Darling & Hammond, 2010). One of the mobile technologies used as a mobile learning medium is well-known (Miangah & Nezarat, 2012) (L.H. Wong, Milrad & Specht, 2015).

The advantage of mobile learning is that it supports the work of educators to enhance their learning experience and encourage practical and meaningful experiences (Krull & Leijen, 2015). Mobile education is the positive impact of technological advancements that are changing educational values, and learning has started outside of general traditional learning (Dee & Wyckoff, 2015). Birth can be an infinite rod (L.H. Wong, 2015). Students can use a variety of mobile media to support the learning process (L.H. Wong & Looi, 2011b). Teachers can use different tools such as the cloud to save tests and take them home for test analysis (Barden & Bygroves, 2018).

Using remote work-based learning focuses on developing teacher skills and performance. Mobile phones in the concept of the cloud are the technology that makes the internet a database and applications that computer users can access (link) (Georgieva, Smrikarov and Georgiev, 2005). Using the public cloud is almost a single shared server, where most users use 1 server (one).

Given the positive impact of this technology, the education system in Indonesia has changed (Kowi & Widyanigsih, 2017). Many Android-based tutorials have been developed to help educators improve their performance, ranging from simple tutorials to full-blown tutorials (K.T. Wong, bt. Osman, Goh, & Rahmat, 2013). Many students use computers to support computer-based learning, especially mobile learning.

The mobile learning style is used to describe situations where they can learn anytime and anywhere in different situations and they can move easily and quickly from one situation to another using one or more student baton ("one-to-one") as an intermediary a situation. (Balachev and Caput, 1996). It enables students to read anytime, anywhere and provides them with various opportunities to study throughout the day (Jafari & Kosasih, 2014). Unconstrained learning has also been used to describe longevity learning in diverse settings across time and space without using technology as a media tool (Looi et al., 2010).

Shofwani & Rochmah (2021) previously conducted research on the application of problem-based learning. This study explores the application of problem-based learning to increase interest and learning outcomes during the pandemic. However, in this study, problem-based learning processing is only supported by video conferencing applications such as Zoom. In another study by Nurrohma & Adistana (2021), problem-based learning using the Edmodo app was presented as e-learning. On average, based on existing research, research on problem-based learning supports applications in traditional ways or through e-learning such as the Edmodo website. The average research focus is also on students. While in this study, problem-based learning was applied with the help of a mobile application, which has the advantage of being more flexible and easier to use. Also, this research focuses more on improving teacher performance. The purpose of this study was to find out the value of the application of problem-based learning based on mobile learning in improving teacher performance. Importantly, this research addresses the challenge of improving teachers' ability to have an impact on the quality of classroom learning.

2. METHODS

2.1 Research Design

This result is based on an observational model (Shadish; Cook; Campbell, 2002). Such research aims to examine the impact of PjBL strategies through mobile learning applications and improve educator

learning and performance (White & Sabarwal, 2014). The design of this study was a 2 x 2 group non-randomized controlled trial, this study was not randomized, but an experimental class and a control group as described in (Setyosari, 2016) (Denny, Deniefe, & Pajnkihar, 2017). The protocol of this study is shown in Table 3.1.

Table 1. Research Design

Moderator Variables	Learning strategies	
Teaching motivation	PjBL Assisted by mobile learning application	PjBL(2)
High teaching motivation (1)	X1Y1	X2Y1
Low teaching motivation (2)	X1Y2	X2Y2

X1 Y1 : a teacher who has high teaching motivation in a class that uses PjBL strategy assisted by mobile learning application (Experimental Class)
X2 Y1 : a teacher who has high teaching motivation in a class that uses the PjBL strategy (Control Class)
X1Y2 : teachers who have low teaching motivation in a class that uses PjBL strategy assisted by mobile learning application (Experimental Class)
X2 Y2 : teachers who have low teaching motivation in class use the PjBL strategy (Control Class).

2.2 Research Subject

Teacher studies in various education programmes include Physics, Chemistry and Mathematics studies at Madrasah Iftidqiyah Nahdatul Watan in Semester 1 of the 2020/2021 academic year.

Table 2. Table of Research Subject

PjBL Learning Strategies	Teaching Motivation Moderator Variable	Total Number of Teachers	Total
PjBL assisted by mobile learning applications	High Low	17:15	32
PjBL	High Low	16:14	30
Total Research Subjects			62

2.3 Instrumental Trial

Instrument Validity Trial

Equipment support is used to measure equipment. The high capacity of the tool also has a high degree of accuracy. On the other hand, the effective ground of the tool, reduces the level of accuracy. The system used to check the accuracy of the equipment is a powerful combination of the products described as follows.

$$\frac{N\sum XY - (\sum X)(\sum Y)}{\sqrt{[(N\sum X^2 - \sum X^2)(N\sum Y^2 - \sum Y^2)]}}$$

(Arikunto 2006:170)

Information:

rxy : Correlation coefficient x and y
X : Score of each item
Y : Total score
N : Number of subjects/teachers researched

Principles are taken to determine whether it is worthwhile or not in terms of the current sale price which has a property level of 5% of the effective item if the calculated value is> rtable. To test the level of support for the test there are several options designed to determine if the teacher first understands the teaching of Skills 1, a group of teachers who did the first test, a total of 30 non-participating teachers. search box

Instrument Reliability Test

Trust means that the tool can be relied upon as a data collection tool because the tool has been designed so well. The reliability of a search engine is described as follows:

$$r11=(\frac{k}{k-1})(1-\frac{\sum\sigma b^2}{\sigma 1^2})$$

(Arikunto, 2006:170)

Information:

r11 : Instrument reliability
k : Number of instrument items
Σσb^2 : Number of variants of question items
σ12 : Total number of variants

Variants of question items can be searched using the formula.

$$\sigma b^2 = \frac{\sum X^2 - \frac{(\sum x^2)}{N}}{N}$$

"Information":

σb^2 : Variants of instrument items
x : Total score of question items
N : Number of respondents

If the price of r11 is looked up using a table with a significance level of 5%, it is found to be larger, which means that the instrument is reliable. r11 > rtable, so the instrument is reliable in this study. Below are the reliability results of the test instrument.

2.4 Data Collection

The researchers have gone through several sites so far. First, the researchers collected the basic data and learning outcomes of the experimental and control classes. This is believed to determine whether the two classes in these groups have the same or nearly the same learning outcomes. Second, the researchers collected data on learning motivation and quality of learning outcomes for both classes. Using the above method, the researchers provided an experimental treatment class with a PjBL protocol using a mobile learning app, and for the treatment management class, a PjBL protocol was used without an app wizard.

Data Analysis

Analysis Prerequisite Test

A randomized controlled trial was conducted to determine whether data obtained using a systematic review process based on study objectives met study requirements. The main concepts that must be satisfied before analyzing the data using the MANOVA method of analysis are (1) the data distribution is normal and (2) the data are equal.

Normality Test

Normal test data Shared servers also have normal servers. This generic test is used to determine whether the data distribution is in the form of a regular server. Standard tests and Kolmogorov-Smirnov tests can also be considered the most common data if they mean (p) greater than 0.05 (Andy Field, 2009). Also, data is often split when skewness and sharpness values are between 2 and +2

(George & Mallery, 2010). Field (2009) provides another approach, stating that "when the search question exceeds 30, the data can be as close as possible to a normal server". In other words, frequently distributed data can symbolize learning populations. Another common test that involves more than just numerical data can use the QQ plot pattern, and the QQ test produces a QQ plot pattern that shows the distribution of the data.

Homogenity Test

The homogeneity assumption aims to determine whether measured differences in scores (differences between sample groups) are equal (Andy Field, 2009). The homogeneity test is multidimensional because it also includes a dependent variable. Homogeneity test for Box-M-Test, significance level α = 0.05. The decision criterion is that if the resulting mean is greater than 0.05, the variance-covariance matrices of the two classes are equal or homogeneous. The homogeneity of the dispersion test is used to determine whether the collected sample is homogeneous. There were 59 separate tests for the variable. One-component homogeneity tests were performed using Levene's test using IBM SPSS 22 for Windows. Levene's test was used to test for the unity of differences between data groups. decision, if it means greater than 0.05, the difference of the data is equal (one).

Experimental hypothesis

Hypothesis analysis is used: a two-way descriptive analysis in MANOVA based on the choice of Tuckman (1999) and Kerlinger (2000). This method is useful for analyzing change-dependent variables by using time and scale. The interest and validity of learning outcomes was a variable in this study. The significance level of the MANOVA test procedure is = 0.05. The solution is to accept H0 if score > 0.05 and reject H0 if score < 0.05.

3. FINDINGS AND DISCUSSION

3.1 Instrument Validity Result

Teacher Competency Validity Test

This first test was given a number of optional options and after being approved based on an accuracy and reliability test, 25 questions are proven to be effective and can be used at the next level. The calculation results of each item are shown in the table below.

Table 3. Result of Validity Testing of Teacher Competency Instruments

Items	rcount	rtable	Information	Items	rcount	rtable	Information
KPTS 1	0.436	0.3061	Valid	KPTS 16	0.313	0.3061	Valid
KPTS 2	0.292	0.3061	Invalid	KPTS 17	0.392	0.3061	Valid
KPTS 3	0.356	0.3061	Valid	KPTS 18	0.492	0.3061	Valid
KPTS 4	0.368	0.3061	Valid	KPTS 19	0.438	0.3061	Valid
KPTS 5	0.094	0.3061	Invalid	KPTS 20	0.208	0.3061	Invalid
KPTS 6	0.681	0.3061	Valid	KPTS 21	0.369	0.3061	Valid
KPTS 7	0.371	0.3061	Valid	KPTS 22	0.362	0.3061	Valid
KPTS 8	0.347	0.3061	Valid	KPTS 23	0.34	0.3061	Valid
KPTS 9	0.422	0.3061	Valid	KPTS 24	0.645	0.3061	Valid
KPTS 10	0.413	0.3061	Valid	KPTS 25	0.419	0.3061	Valid
KPTS 11	0.434	0.3061	Valid	KPTS 26	0.392	0.3061	Valid
KPTS 12	0.340	0.3061	Valid	KPTS 27	0.492	0.3061	Valid
KPTS 13	0.383	0.3061	Valid	KPTS 28	0.438	0.3061	Valid
KPTS 14	0.303	0.3061	Invalid	KPTS 29	0.205	0.3061	Invalid
KPTS 15	0.430	0.3061	Valid	KPTS 30	0.369	0.3061	Valid

Keypoints with an overall score can be retrieved from the search results. Compare this value with the table value. If in a two-tailed test with n = 30, the value of rtable is 5%, the result of rtable is 0.3061. If the r-values of the search results are less than (<) rtable, then it can be concluded that these values are not significant (negative) relative to the entire row and should be removed or corrected. The validity of the application is determined by the borrowed link column.

Tags below rtabel (0.3061), the element is classified as negative. A total of 30 subjects were born, with 25 positive and 5 negative for KPTS 2, 5, 14, 20, and 29, based on the positive test results of the teacher test kit in Table 3.1 above, i.e., H. according to. test results. By default, 25 items are available to answer pre-test and post-test questions.

Table 4. Result of the Validity of Teacher Competency Instruments

Items	rcount	rtable	Information	Items	rcount	rtable	Information
KPTS 1	0.378	0.3061	Valid	KPTS 14	0.384	0.3061	Valid
KPTS 2	0.343	0.3061	Valid	KPTS 15	0.490	0.3061	Valid
KPTS 3	0.430	0.3061	Valid	KPTS 16	0.422	0.3061	Valid
KPTS 4	0.701	0.3061	Valid	KPTS 17	0.390	0.3061	Valid
KPTS 5	0.472	0.3061	Valid	KPTS 18	0.429	0.3061	Valid
KPTS 6	0.366	0.3061	Valid	KPTS 19	0.369	0.3061	Valid
KPTS 7	0.383	0.3061	Valid	KPTS 20	0.651	0.3061	Valid
KPTS 8	0.427	0.3061	Valid	KPTS 21	0.510	0.3061	Valid
KPTS 9	0.416	0.3061	Valid	KPTS 22	0.384	0.3061	Valid
KPTS 10	0.318	0.3061	Valid	KPTS 23	0.490	0.3061	Valid
KPTS 11	0.323	0.3061	Valid	KPTS 24	0.422	0.3061	Valid
KPTS 12	0.422	0.3061	Valid	KPTS 25	0.390	0.3061	Valid
KPTS 13	0.346	0.3061	Valid				

As a result of Pearson's academic test, the value of each rcount met the requirement, which is> 0.3061, for the object to be effective and durable. The results of the Cronbach Alpha trust test meet the desired level of> 0.600, i.e. the variables used are reliable.

Teacher Motivation Validity Test

The Teacher Motivational Support Test consists of 16 items, all or 16 items are good and passable after supporting the Model-Based and Confidence Test. even. The calculation results of each item are shown in the table below.

Table 5. Result of the Validity Testing of Teacher Motivation

Items	rcount	rtable	Note:	Items	rcount	rtable	Note:
MTVS 1	0.814	0.3061	Valid	MTVS 9	0.788	0.3061	Valid
MTVS 2	0.727	0.3061	Valid	MTVS 10	0.776	0.3061	Valid
MTVS 3	0.831	0.3061	Valid	MTVS 11	0.721	0.3061	Valid
MTVS 4	0.765	0.3061	Valid	MTVS 12	0.802	0.3061	Valid
MTVS 5	0.781	0.3061	Valid	MTVS 13	0.747	0.3061	Valid
MTVS 6	0.771	0.3061	Valid	MTVS 14	0.728	0.3061	Valid
MTVS 7	0.774	0.3061	Valid	MTVS 15	0.716	0.3061	Valid
MTVS 8	0.798	0.3061	Valid	MTVS 16	0.795	0.3061	Valid

The result of Pearson's acceptance test for stimulus questions is that each subject's rcount satisfies the required >0.3061 for the subject to be valid and move on.

Teacher Performance Validity Test

The teacher's test score is 18 points and is supported based on what is being tested and reliable, found that all or all eighteen items are safe and able to use it. next level. The results of the calculation of each element are shown in the following table.

Table 6. Performance Validity Test Result

Items	rcount	rtable	Information	Items	rcount	rtable	Information
KNJR 1	0.700	0.3061	Valid	KNJR 10	0.674	0.3061	Valid
KNJR 2	0.475	0.3061	Valid	KNJR 11	0.528	0.3061	Valid
KNJR 3	0.769	0.3061	Valid	KNJR 12	0.754	0.3061	Valid
KNJR 4	0.513	0.3061	Valid	KNJR 13	0.711	0.3061	Valid
KNJR 5	0.693	0.3061	Valid	KNJR 14	0.605	0.3061	Valid
KNJR 6	0.667	0.3061	Valid	KNJR 15	0.455	0.3061	Valid
KNJR 7	0.632	0.3061	Valid	KNJR 16	0.798	0.3061	Valid
KNJR 8	0.776	0.3061	Valid	KNJR 17	0.526	0.3061	Valid
KNJR 9	0.765	0.3061	Valid	KNJR 18	0.730	0.3061	Valid

The result of Pearson's acceptance test for stimulus questions is that each subject's rcount satisfies the required >0.3061 for the subject to be valid and move on.

3.2 Instrument Reliability Result

Teacher Competency Reliability Test

Table 7. Teacher Competency Reliability Testing Result

Reliability Statistics	
Cronbach Alpha	N of Items
0.866	25

Based on the results of the calculations in Table 3.5 above, it is known that the first teacher teacher with 30 questions got Cronbach's alpha of 0.860, and when incorrect entries were discarded, the remaining 25 effective items had Cronbach's alpha of 0.866. This app is included in the trust section because it has a Cronbach Alpha value over 0.600.

Teacher Motivation Reliability Test

Table 8. Teacher Motivation Reliability Test Result

Reliability Statistics	
Cronbach Alpha	N of Items
0.962	16

Based on the summary results in Table 3.5 above, the teacher's 16-question stimulus score appears to have achieved a Cronbach alpha of 0.962. This app is included in the Trust section because it has a Cronbach Alpha score above 0.600.

Teacher Performance Reliability Test

Table 9. Results of Teacher Performance Reliability Testing

Reliability Statistics	
Cronbach Alpha	N of Items
0.939	18

From the calculations in Table 3.5 above, the scores on the 18 teacher achievement tests give an alpha Cronbach value of 0.939. This application is included in the reliable version because its Cronbach Alpha value is higher than 0.600.

3.3 Analysis Prerequisite Test

Below are the results of the hypothesis tests that are the premise of the MANOVA test, namely the normality test and the test for homogeneity of variances. Shapiro-Wilk test method was used for physical analysis, and Levene test method was used for dispersion uniformity test.

Normality Test Result Based on Learning Method Factors

Table 12. Normality Test Result Based on Learning Method Factors

Tests of Normality							
	Method	Kolmogorov-Smirnova			Shapiro-Wilk		
		Statistics	df	Sig.	Statistics	df	Sig.
Competence	PjBL Control	0.219	30	0.101	0.898	30	0.108
	PjBL Mobile Experiment	0.121	32	0.200	0.940	32	0.077
Performance	PjBL Control	0.136	30	0.167	0.979	30	0.791
	PjBL Mobile Experiment	0.156	32	0.145	0.904	32	0.108

The results of standardized test scores for skill and performance change based on the learning curve have been rated as important at 0.05 (p> 0.05), so they are usually rated. This means that technical data and performance changes based on the learning process have the same data level and there is no need to worry about data collection.

Table 13. Normality Test Result Based on Motivation Factors

Tests of Normality							
Motivation		Kolmogorov-Smirnova			Shapiro-Wilk		
		Statistics	df	Sig.	Statistics	df	Sig.
Competence	High	.104	34	.200	.981	34	.801
	Low	.122	47	.077	.977	47	.474
Performance	High	.100	34	.200	.970	34	.470
	Low	.105	47	.200	.968	47	.717

Results testing common theories of stimulus economy and performance volatility were assigned significant scores greater than 0.05 (p > 0.05). thus distributing them worldwide. This shows that the performance and competence of teachers seen from motivational factors are normally distributed and there is no concern. Normal distribution of data can provide accuracy to the data obtained from research.

Homogenity Test Result Based on Learning Method Factors

Table 14. Result of Homogeneity of Variety

	F	df1	df2	Sig.
Competence	1,223	3	60	0.546
Performance	1.433	3	60	0.455

Hypothetical results of homogeneity experiments and the ability to alter performance based on the learning process were significantly improved by more than 0.05 (p>0.05), a result of differences between groups.

3.4 Hypothesis Test Result

The text below shows MANOVA results based on changes in capacity and performance of learning process (PjBL configuration with mobile app for learning and PjBL configuration) and motivation (high and low motivation).

Table 15. MANOVA Test Result on Competence

Factor		M	SD	F	Sig.	Note.
Learning methods	PjBL Assisted by Mobile Learning Applications	5.2500	2.27185	22.041	0.000	Significant
	PjBL	2.8333	1.72374			
Motivation	High	4.1515	2.27927	11,063	0.008	Significant
	Low	4.0000	2.46403			
Interaction	PjBL Assisted by High Motivation Mobile Learning Application	6.2500	1.34185	7.759	0.009	Significant
	PjBL Assisted by Low Motivation Mobile Learning Application	4.2341	1.4932			
	High Motivation PjBL	4.2342	1.5383			
	PjBL Low Motivation	2.6681	1.2232			

Table 16. MANOVA Test Result on Performance

Factor		M	SD	F	Sig.	Note.
Learning methods	PjBL Assisted by Mobile Learning Applications	60.4062	6.4400	164.742	0.000	Significant
	PjBL	39.5667	6.3337			
Motivation	High	52.8276	10.4575	12,323	0.001	Significant
	Low	48.1212	13.7997			
Interaction	PjBL Assisted by High Motivation Mobile Learning Application	64.0787		8.189	0.006	Significant
	PjBL Assisted by Low Motivation Mobile Learning Application	53.4761				
	High Motivation PjBL	54.3423				
	PjBL Low Motivation	46.5486				

DISCUSSION

4.1 The Effect of Mobile Project-Based Learning on Teacher's Pedagogic Competence

As a first hypothesis, the MANOVA test score for the learning method factor known to be based on teacher ability achieves an F-score of 22,041 with a significance of 0.000. The results showed that there was a significant difference (0.05) between the mobile project-based learning and the traditional PjBL group in terms of teachers' teaching ability. The results of this study show that the ability of teachers to teach can be significantly improved by applying learning models through the use of technology. These results suggest that incorporating mobile learning into teacher education can improve performance. It doesn't affect motivation either. Whether high or low motivation, the results achieved due to the inclusion of mobile learning are equally high. Without teachers integrating mobile learning, different results are shown, with only high motivation leading to good results. Teachers with low motivation tend to underperform. These results are consistent with research conducted by (Mohrman & Lawler, 2017) that high growth in performance must also be accompanied by high motivation. These findings are also supported by research from (Simanjuntak, 2019) which reveals that technology has a role that can no longer open up human life. Various learning facilities have been supported by technology to make it easier to gain knowledge.

4.2 The Effect of Mobile Project-Based Learning on Teacher's Pedagogic Competence

The second hypothesis, called the MANOVA test of teacher performance based on the learning method factor, has an Ftest value of 164.742 and a significance of 0.000. These results showed that there was a significant difference in teacher performance between the project-based mobile learning group and the traditional PjBL group ($p<0.05$). These results support research conducted by (Fernández-Batanero, Román-Graván, Reyes-Rebollo, & Montenegro-Rueda, 2021). Which showed that previous performance improvements were influenced by the presence of technology that could not be taken from the elements of the learning process. Technology is a real effort that can be easily given. Improving teacher performance can be done remotely with technological devices.

4.3 The Effect of Mobile Project-Based Learning on Teacher Competence is moderated by High and Low Motivation

The third hypothesis, known to have the results of the MANOVA test based on the motivation factor based on the teacher's teaching ability, the Ftest value is 11.063, and the significance is 0.008. These results showed that there was a significant difference between the high and low motivation groups in terms of teachers' teaching ability ($p<0.05$). This suggests that the presentation of mobile item-based learning has an impact on teacher competencies, moderated by high and low motivation. The traditional PjBL can only improve the teacher's ability when the motivation is high.

This is consistent with research conducted by (Ma'ruf, N.A., & Siswanto, 2012), which noted that when a person is motivated, their abilities increase. High motivation has a greater impact on work done. This effect can have a positive impact on work. Among the findings, high motivation can improve teachers' abilities even without experimental treatment in the form of implementing a mobile item-based learning model.

4.4 The Effect of Mobile Project-Based Learning on Teacher Performance Moderated by High and Low Motivation

The fourth hypothesis, the known F-test value of the results of the MANOVA test based on teacher incentives is 12.323 and the significance value is 0.001. These results showed that there was a significant difference between the high and low motivation groups in terms of teacher performance ($p<0.05$). (Lai, Hsiao, & Hsieh, 2018) also conducted the results of a similar study, which suggested that motivation plays

a role in teacher performance. Teachers who continue to give good performance even though they are faced with various kinds of conditions.

4.5 Interactions Obtained from Learning Method Factors and Motivational Factors on Teacher Competence

The fifth hypothesis is that the MANOVA test results based on the interaction of learning method factors and motivation factors on teachers' teaching ability reach the F-test value of 4.177 and the significance of 0.044. These results indicated that there were significant differences in the effects of interaction based on learning method factors and motivational factors on teachers' teaching ability ($p<0.05$). The results show that learning method factors and motivation factors have a significant interaction effect on teacher competency. Teacher competencies have grown in the new learning method mobile project-based learning, which is balanced with motivating factors. Both have a simultaneous impact on improving teacher competence. The findings of this study are supported by research by (Jamun, Zephisius Rudiyanto Eso Ntelok, & Rudolof Ngalu, 2020), which shows that technology is helping to empower teachers. (Keiser & Pringgabayu, 2017) research clearly shows that teachers' motivation affects their competence.

4.6 Interactions Obtained from Learning Method Factors and Motivational Factors on Teacher Performance

The sixth hypothesis is that MANOVA test scores are based on the interaction of learning method factors and motivational factors on teacher performance, with an Ftest value of 8.189 and a significance of 0.006. These results showed significant differences ($p<0.05$) based on the interaction of learning method factors and motivational factors on teacher performance. Increased interaction occurs in teacher performance, which is influenced by learning method factors and motivational factors. The findings of this study are consistent with research by (Backfisch, Lachner, Hische, Loose, & Scheiter, 2020) showing that teacher performance can improve and influence professionalism as it is influenced by motivational factors. Through the provision of relevant learning methods and supported by high motivation, teachers can more quickly capture information. The impact can be seen in the performance it has.

4. CONCLUSION

Based on the results of the research conducted and the data processing and discussion of the results, it can be concluded that the application of mobile project-based learning in the experimental group can improve teachers' competence and performance. However, given the moderator variables, high and low motivation, improvements in teacher competency and performance can only occur in teachers who receive mobile project learning. In this study, the limitations of the researchers were related to the limitations of the devices and connections teachers had. In addition, the moderator variables in this study only focus on high and low motivation, while among teachers, there are many factors other than motivation that affect teachers' ability and performance. By using project-based mobile learning, the implications of this research's findings for the education community can be more widely and widely applied. In addition to teachers, it is hoped that the use of mobile project-based learning can also be applied to students in formal schools and higher education.

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Conflict of Interest: State a conflict of interest or statement: "The authors declare no conflict of interest." Authors must identify and disclose any personal circumstances or interests that may reasonably be believed to unduly influence the presentation or interpretation of the reported research.

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