Universal Journal of Educational Research 8(5): 1687-1697, 2020 http://www.hrpub.org
DOI: 10.13189/ujer.2020.080505

Ethnopedagogy Integration with Mobile Learning to Improve Students' Learning Achievement in Remote Areas

Ucu Cahyana[1,*], Yuli Rahmawati[1], Maria Paristiowati[1], Sasmoko[2], Ahman[3], Jujuk Ferdianto[4], Agus Dudung[5]

[1]Department of Chemistry Education, Faculty of Mathematics and Natural Science, Universitas Negeri Jakarta, Indonesia
[2]Department of Primary Teacher Education, Faculty of Humanities, Universitas Bina Nusantara, Indonesia
[3]Department of Educational Psychology and Guidance, Faculty of Educational Sciences, Universitas Pendidikan Indonesia, Indonesia
[4]Department of Education and Culture, East Lombok, Indonesia
[5]Department of Mechanical Engineering, Faculty of Enginering, Universitas Negeri Jakarta, Indonesia

Received December 11, 2019; Revised March 26, 2020; Accepted April 19, 2020

Abstract The aim of this study is to integrate mobile learning with an ethnopedadogy approach to improve teaching and learning in remote areas in Lombok. The research method used in this study is a mixed-method approach following the steps of research and development (RnD), and by quantitative and qualitative data for implementing the product. The study was conducted at three high schools in a remote area of East Lombok, West Nusa Tenggara Province, Indonesia. The research helped develop a prototype of mobile learning media for chemistry learning by integrating the Ethnopedagogy approach. Mobile learning was implemented using three approaches complementary to the desired outcomes. The research revealed that the prototype of mobile learning can be implemented in chemistry learning in remote areas. The effectiveness of using mobile learning integrated with an ethnopedagogy approach shows that learning by using fully mobile learning can provide better results than using blended learning and mobile learning as a complementary. Results indicate that the use of mobile learning integrated with an ethnopedagogy approach can provide students' in remote areas with meaningful learning experiences to improve achievement. The approach is suitable for use with students in remote areas who face difficulties in accessing learning resources, in engaging in local culture, in schools with limited teaching staff, with students suffering low motivation and who have little parental support.

Keywords Mobile Learning, Ethnopedagogy, Chemistry Learning, Remore Areas

1. Introduction

Chemistry learning plays an important role in engaging students to relate their knowledge to their daily lives. Teachers need to be aware of students' understanding of concepts contextually which depends on appropriate teaching strategies. Conditions in remote areas such as limited teacher' availability and distribution, teacher competences and qualifications, the relevance of teachers' educational qualifications and the subjects being taught, the issue of student motivation, and problems with infrastructure all contribute to a unique context for learning that teachers need to understand.

In the current educational climate, digital technology can be used as an effective and efficient learning media. One learning medium that can be used to improve the quality of education in remote areas is mobile learning integrated with an Ethnopedagogy approach which helps familiarise students with their cultural context. According to [1], the use of technology-based learning media is one application of a 21st century learning style. Technology-based learning media can create meaningful learning experiences that have a positive impact on students' motivation and outcomes [2]. The use of technology-based learning media can make learning chemistry more effective and help support teachers to convey information with limited class hours. Mobile learning media, an application that operates on smart phone devices, contains subject matter, learning videos, games, animations, quiz questions and feedback. It is developed in accordance with different levels of education and the curriculum. Mobile technology defines two types of distance education technology namely media information in the form of text, audio, video, images, graphics, and communication media to define interactions between various members [3]. Mobile learning

(M-Learning) is called learning done by students mediated through mobile devices, which can occur anytime, anywhere, both formally and informally [4]. The most dominant use of mobile learning is that it can combine learning activities inside and outside the classroom with a student-centered approach [5]. Mobile learning ++makes it easy for students to learn anytime, anywhere [4].

An ethnopedagogy approach is a learning methodology based on culture to develop social and cultural identity [6]. Ethnopedagogy was developed in Indonesia as a model for developing values and culture. By using Ethnopedagogy [7] [8], learning can be conducted through a set of values in the culture of a society and in everyday life [9]. Therefore, an Ethnopedagogy approach is suitable to be developed in the areas that have a distinctive cultural background such as in remote regions. To be effective, science needs to be relevant to indigenous knowledge and practice, especially where it interacts with the environment [10].

The study focused on the topic of colloid in chemistry which can be readily contextualised with social and cultural identity in the community. Lombok cultural practices related to chemistry, called ethnochemistry, formed the basis of this study. It provided opportunities for students to learn from their own culture as a way to motivate them to develop their cultural and learning identity. The study signals the importance of integrating scientific knowledge with traditional community practices into chemistry teaching to eliminate the idea that chemistry is abstract and has no relevance to daily lived experience [11].

Therefore, this research aimed at developing mobile learning that can be used anytime and anywhere integrated with an ethnopedagogy approach to improve the quality of education in the remote areas. The research can be seen as a complementary effort to support government programs in implementing accelerated development in remote areas. This research is expected to contribute to policy development aimed at improving the quality of education in remote regions by developing mobile learning media that is relevant to local cultural wisdom and remote regional characteristics.

2. Research Methodology

This research used a mixed method approach, the first step of research and development (RnD) for mobile learning development which are followed by-product implementation for remote regional schools using quantitative and qualitative data collections. Quantitative being the Quasi-Experiment method, by using Pre-Post test. Participants were chosen using a purposive random sampling method from students at three schools in East Lombok, West Nusa Tenggara. The effectiveness test was continued by using a qualitative interview and reflective journal for selected students. This study also measured student achievement in using the mobile learning ethnopedagogy approach.

Stages of activities as in the following chart:

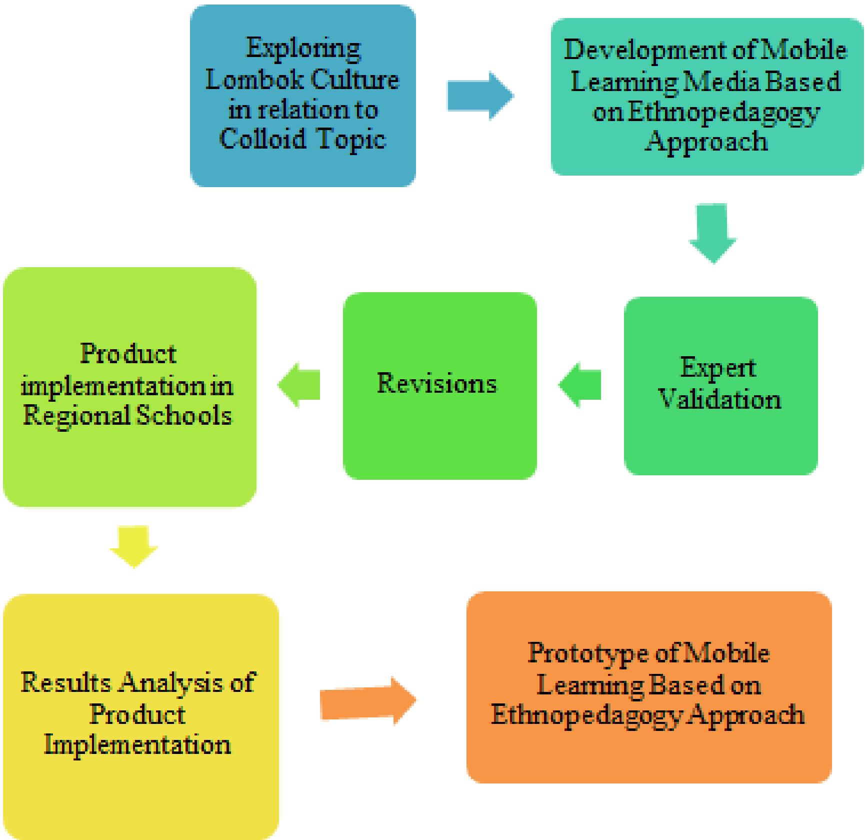

Figure 1. Development and testing of Mobile Learning based on Ethnopedagogy approach prototype in the remote Region (Year 1 Research)

Data collection techniques used in this study were three questionnaires, an interview, and a reflective journal. A needs analysis of the students and teachers, media feasibility for material and language experts, and media experts and small-scale and large-scale field trial questionnaires were used. Questionnaire data was processed and analyzed for use as a reference in developing mobile learning products. A Likert rating scale used in the questionnaire.

Table 1. Likert Scale assessment

Answer	Score Weights
Strongly agree	4
Agree	3
Disagree	2
Strongly disagree	1

To calculate the percentage of the Likert scale, a percentage of product eligibility formula was used. Percentage results are categorized according to criteria using a rating scale. Product criteria based on the results of research developed are feasible to use if the interpretation is $\geq$ 60%.

Table 2. Quality Criteria with Rating Scale

Assessment Level	Information
Figures 0 – 20%	Very less
Figures 21 – 40%	Less
Figures 41 – 60%	Good enough
Figures 61 – 8-%	Good
Figures 81 – 100%	Very good

The reliability tests intra-class coefficients to assess the reliability between two or more observers by using a ratio between variances between groups. The statistical test to calculate reliability in this study used the Hoyt test. The data obtained was categorized in the reliability criteria as follows:

Table 3. Reliability Category

Reliability Value	Information
0.0 – 0.20	Poor
0.21 – 0.40	Less than moderate
0.41 – 0.60	Medium
0.61 – 0.80	Good
0.81 – 1.00	Very good

3. Results and Discussion

3.1. Mobile learning Development

Product development is the stage where a prototype is made in accordance with the results from the needs analysis conducted with students and teachers. Based on the results of the needs analysis, the teachers require instructional media that can help delivering material relevant to the students' context. Teachers needed media that can combine multiple representations of writing, pictures, and sound. In response to these requirements, mobile learning media were developed that consisted of learning videos, materials, practice exercises, and educational games.

Mobile learning developed several stages; designing the media, making storyboards, choosing appropriate software and creating the media media. Mobile learning media are made according to the needs of students and teachers and adapted to the curriculum used in schools. Storyboards were used to simplify the development process where researchers identified a learning flow to ensure the media could be structured and systematic. The software chosen to develop mobile learning media was Adobe Flash Professional CS6 that uses action scripts as a programming language. Corel Video Studio X10 and Wondershare Filmora 9 software was used to make learning videos and image design and media animation was undertaken using the CorelDraw X8 (64-bit) software program.

3.2. Media Trial Phase

A media trial was conducted by four media experts, three material and language experts, students and teachers. The aspects evaluated in the expert feasibility test by media were 1) Visualization and audio display and 2) Implementation and software engineering. The results of the final assessment of the two aspects can be seen in Table 4. Based on the results of media trials by media experts the percentage of overall aspects was 91.2%.

Table 4. Media Feasibility Test by Media Experts

No.	Aspect	Item no.	Average Eligibility Pct.	Criteria
1	Audio and visual display	1 - 9	90,74%	Very Good
2	Implementation and software engineering	10 – 14	91,67%	Very Good
Average overall rating			91,20%	Very Good

The results of the assessment carried out calculations between the reliability of the rater against the results of the media feasibility test. The reliability test aims to see the consistency of opinions between the rater. The result of the reliability of the media feasibility test was 0.85 and was classified as "Very Good". These results indicate the consistency of the results of the rater assessment is very good, and the quality of the developed mobile learning media is good.

After the mobile learning media was evaluated by media experts, the media feasibility test was carried out by the material and language experts. The aspects evaluated in the feasibility test by these experts experts were 1) The relevance of content to competencies; 2) related to the material; 3) The relevance of contents and experiments with etnopedagogy approach; 4) The relevance of questions to the discussion; and 5) Language. The results of the final assessment of material and language can be seen in Table 5. Based on the results of media trials by media experts, the percentage of overall aspects was 85.81%.

Table 5. Feasibility Test Results by Material and Language Experts

No.	Aspect	Item no.	Average Eligibility Pct.	Criteria
1	The relevance of content to competencies	1 - 4	83.33%	Very Good
2	Relevance of material	5 - 8	81.25%	Very Good
3	The relevance of content and experiment with ethnopedagogy approach.	9 - 13	86.67%	Very Good
4	The relevance of questions to discussion	14 - 16	91.67%	Very Good
5	Language	17 - 19	86.11%	Very Good
Average overall rating			85.81%	Very Good

The results of the reliability of the media feasibility test were 0.85 and classified as "Very Good". These results indicate the consistency of the results of the rater assessment is very good, and the quality of the material and language used in the developed mobile learning media is good. Next, a media trial was run with 16 students from 11 grade science. The following aspects were evaluated in the media trials. 1) Material and questions; 2) Language; 3) Audio and visual display; 4) Implementation and software engineering; and 5) Benefits. The results of the assessment can be seen in Table 6. Based on the results of the media trials by students, the average value of all aspects was 81%.

Table 6. Results of Feasibility Tests by Students (Small Scale)

No.	Aspect	Item No.	Average Eligibility Pct.	Criteria
1	Material and question	1 - 3	78%	Good
2	Language	4	78%	Good
3	Audio and visual display	5 - 7	80%	Very Good
4	Implementation and software engineering	8 and 9	81%	Very Good
5	Benefit with ethnopedagogy approach	10 - 12	87%	Very Good
Average overall rating			81%	Very Good

After student testing, improvements were made to the mobile learning media under development. The next step in the process was to test the media on a larger scale. The purpose of conducting media trials on a large scale was to determine the response and final assessment of the developed mobile learning media.

119 students in 11 grade science participated in the second media trial. The same aspects were tested as for the previous smaller scale test. The results of the final large scale student assessment can be seen in Table 7.

Table 7. Results of Media Trials by Students (Large Scale)

No.	Aspect	Item No.	Average Eligibility Pct.	Criteria
1	Material and question	1 – 3	84%	Very Good
2	Language	4	87%	Very Good
3	Audio and visual display	5 – 7	85%	Very Good
4	Implementation and software engineering	8 and 9	87%	Very Good
5	Benefit with ethnopedagogy approach	10 - 12	92%	Very Good
Average overall rating			87%	Very Good

The large scale student trials obtained an average value of all aspects evaluated by 87%. There was an increase in the average of all aspects of the results from the previous smaller trial. The results obtained show an increase in the percentage of eligibility in media trials when applied to larger group of students [12].

Table 8. Teacher Media Trial Results

No.	Aspect	Item No.	Pct. of Feasibility	Criteria
1	The relevance of concepts to competencies	1 - 4	96,00%	Very Good
2	The relevance of content to aspects of ethnopedagogy approach	5 - 9	92,00%	Very Good
3	Material, experiments and questions	10 - 13	93,75%	Very Good
4	Language	14 - 16	93,33%	Very Good
5	Audio and visual display	17 - 25	95,00%	Very Good
6	Implementation and software engineering	26 - 29	93,75%	Very Good
7	Benefits	30	90,00%	Very Good
Average overall rating			94,12%	Very Good

A the media evaluation was then undertaken by the four chemistry teachers in aspects that included 1) Relevancy of the content with competencies; 2) The relevance of the substance of the content with aspects of ethnopedagogy approach; 3) Materials, experiments and questions; 4) Language; 5) Audio and visual display; 6) Technical and software literacy; 7) Benefits. The results of the final assessment of the first stage of the teacher evaluation can be seen in Table 8. Based on the results of the media trials by teachers, the percentage of overall aspects of the assessment can be interpreted as 94.12%.

Figure 2. East Lombok culture is integrated in colloid materials (pearl and pumice)

Based on media trials conducted with teachers and students, the resulting mobile learning can be categorized as "Very Good". It can, therefore, be concluded that the mobile media is a feasible alternative for learning chemistry.

The Etnopedagogy approach that was developed based local cultures, has the potential to be explored as a way of involving students in their culture and to maintain the students' cultural identity challenged by globalization. The approach will initiate and contribute to the integration of digital learning media with cultural studies in Indonesia. This is in line with previous research that the Etnopedagogy approach can help construct social and cultural identities through learning processes related to local wisdom (local wisdom and indigenous knowledge) [13].

3.3. Test Effectiveness of Mobile Learning Based on Ethnopedagogy Approach

3.3.1. Quantitative Method

Once validation tests by experts and field trials by teachers and students, the effectiveness of the media to improve cognitive abilities (learning outcomes) of students was tested using evaluation instruments in the form of pre-test and post-test. Ethnopedagogy-based mobile learning was implemented in three schools in East Lombok as follows:

1. School A, learning was undertaken using full mobile learning from the beginning to the end of the unit of work.
2. School B, learning was undertaken using mobile learning as a supporting media (using a mobile learning as a complementary).
3. School C, students learnt without using mobile learning

From the explaination above, all the school do the same treatment with the model of blended learning. Each participant was given a pre-test and post-test. The normality requirements test found that all the analysis groups were normally distributed which meant that the sample came from a normal distribution population.. Whereas, in the test of variance homogeneity requirements, it was found that the analysis groups had homogeneous variance. Thus, the pre-test and post-test difference data should then be evaluated for t to see the effect of the treatment given. T test results for each experimental class are as follows:

1. *Student achievement between in classes taught by using full mobile learning and blended learning (School A).*

Both classes are given a pre-test and a post-test, with the results shown in table 9 and table 10 below.

Table 9. Blended class pre-test and post-test data

	Pre Test	Post Test	t Count	t Table
Average	23,97	76,91	29.37	1.99
Raw Materials	10,21	7,28		
Varians	104,21	53,05		
Degree Of Freedom	66	66		

Table 10. Full pre-test and post-test mobile learning class data

	Pre Test	Post Test	t Count	t Table
Average	24,41	80,73	45.54	1.99
Raw Materials	10,79	7,79		
Varians	116,31	60,81		
Degree of Freedom	66	66		

In the blended learning of school A, t count (29.37)> t table (1.99) and in the full mobile learning t count (45.54)> t table (1.99). Both data indicate that Ho was rejected. T test results show a significant increase in average learning outcomes in both classes. Results can be interpreted that using mobile learning media based on an ethnopedagogy approach improved student learning outcomes in schools in the East Lombok area. This is in accordance of the results of research which states that learning by using media technology has a significant influence on learning [14]. According to research, the use of instructional media encourages students to actively participate in question and answer activities and discussions, improving their critical thinking skills [15].

Different test was conducted between the two classes to analyses the effective learning models in the use of mobile learning based on the ethnopedagogy approach. Hypothesis test data shows the average value of student learning outcomes in classes taught by using full mobile learning was higher than the classes taught by blended learning models. Research data can be seen in table 11.

Table 11. Data on blended classroom learning outcomes and mobile learning classes

	Blended	Full Mobile Learning
Average	76,91	80,73
Raw Materials	7,28	7,80
Varians	53,05	60,80
Degree of Freedom	66	66

The results indicate that the use of mobile learning combined with the ethnopedagogy approach is preferred by student and can develop students' understanding in learning. According to [16] mobile learning can be accessed using a small device (tablet or smart phone) that features animation, learning videos, materials and questions to facilitate students and teachers who can be used anytime and anywhere. According to [17], chemistry learning is represented at macroscopic, microscopic and symbolic levels and understand requires a high level of competence. Mobile learning encompasses the three representations and helps facilitate understanding.

2. *Student achievement in classes taught by using the blended learning approach compared with the group using mobile learning as a complementary (School B).*

Both classes are given a pre-test and a post-test, with the results shown in table 12 and table 13 below.

Table 12. Blended class pre-test and post-test data

	Pre Test	Post Test	t Count	t Table
Average	22,71	80,14	40,62	1,99
Raw Materials	8,94	6,36		
Varians	79,92	40,42		
Degree of Freedom	68	68		

Table 13. Pre-test and post-test data on mobile learning classes as supporting media

	Pre Test	Post Test	t Count	t Table
Average	22,71	77,71	39,56	1,99
Raw Materials	8,94	7,11		
Varians	79,92	50,50		
Degree of Freedom	68	68		

In the blended learning of school B, t count 40.62> t table 1.99 and in the mobile learning as a complementary t count 39.56> t table 1.99. Both data indicate that Ho was rejected. T test results show a significant increase in average learning outcomes in both classes.

A different treatment test was conducted between the two classess to find s more effective learning model for the use of mobile learning. Hypothesis test data shows that the average value of student learning outcomes in classes taught using the blended learning model was higher than the classes taught with mobile learning as a support model. Research data can be seen in table 14.

Table 14. Data on learning outcomes of blended classes and mobile learning classes as supporting media

	Complementary	Blended
Average	77,71	80,14
Raw Materials	7,11	6,36
Varians	50,50	40,42
Degree of Freedom	68	68

Results indicate that the use of mobile learning in a blended learning model is preferred by students because they are able to explore learning materials over a longer period of time. The increased exposure to concepts helps students develop better understanding of the required subject matter concepts.

3. *Student achievement between in classes taught by without using mobile learning and blended learning (School C).*

Both classes were given pre-test and post-test, with results as in table 15 and table 16 below.

Table 15. Data pre test and post test classes without using mobile learning

	Pre Test	Post Test	t Count	t Table
Average	20.43	75.22	29.26	2.01
Raw Materials	8.78	4.88		
Varians	77.07	23.81		
Degree Of Freedom	44	44		

Table 16. Blended class pre-test and post-test data

	Pre Test	Post Test	t Count	t Table
Average	20.38	77.31	29.34	2.06
Raw Materials	10.30	3.30		
Varians	106.09	10.90		
Degree Of Freedom	14	14		

In the blended learning of school C, t count (29.34)> t table (2.06) and in the without using mobile learning, t count (29.26)> t table (2.01). Both data indicate that Ho was rejected. T test results showed a significant increase in average learning outcomes in both classes. Based on the data obtained the t count of the blended learning class has a greater value than the t count for the class without using mobile learning. This shows that blended learning classes have a significantly higher average of learning outcomes. T-test results from both classes showed no difference in the average value of learning outcomes between classes without using mobile learning and blended classes. The results are in table 17 below:

Table 17. Class data without using mobile learnin and blended classes.

	Control	Blended
Average	75.21	77.30
Raw Materials	4.87	3.30
Varians	23.81	10.89
Degree of Freedom	44	44

3.3.2. Qualitative Method

The development of students' learning was analysed after mobile learning implementation. There are several findings in qualitative data that reflect students' conceptual understanding, meaningful learning experiences, motivation, independent learning, and cultural awareness.

a. Conceptual Understanding

Analysis of tests showed that students developed a good understanding of chemistry concepts.

"Coconut milk is a type of colloidal emulsion because coconut milk has many nutrients that are good for the hair shaft and head. High oil and nutrient content can provide natural moisture from the roots to the ends of the hair. "
(Chemistry Test, Student 1, School B)

"*The type of colloid in coconut milk is a liquid emulsion because coconut milk contains oil. So, coconut milk can nourish hair properly. "*
(Chemistry Test, Student 10, School B)

"*Coconut milk is a type of colloidal emulsion. Coconut milk can nourish hair because coconut milk contains a substance and has many nutrients that are good for the hair shaft and scalp "*
(Chemistry Test, Student 3, School C)

"Coconut milk is a type of liquid emulsion, because the content of coconut milk produces oil so that the hair does not become dry and branched"
(Chemistry Test, Student 11, School A)

Based on these answers it was concluded that all four students understood the colloidal material well. Using the same question, students were also able to explain that coconut milk had oil content that can nourish the scalp demonstrating a connection between the concept of colloids and East Lombok culture.

"*Colloids are related to everyday life, what I know of examples of colloids is pearls, milk and butter."*
(Interview, Student 1, School A)

"Detergents and liquid soaps are colloids."
(Interview, Student 3, School B)

"*I do not understand the concept of alum, but I know that alum is used to sterilize dirty water"*
(Interview, student 1, School C)

"Colloids are related to daily life. Examples are soaps, which are colloquial type foam with a liquid dispersing phase and a gas dispersed phase. Then coconut milk which is a type of colloidal emulsion with a solid dispersing phase, and a liquid dispersed phase. "
(Reflective Journal, Student 5, school A)

Results of interviews and reflective journals indicated that students were able to analyse information and make connections between concepts by using mobile media. Most students understood the concept o and examples of colloids. This outcome concurrs with research by [18] that the use of interactive multimedia can improve students' conceptual understanding.

b. Meaningful Learning Experience

Data from interviews revealed that most students did not connect chemistry to the local wisdom of the Lombok area. This study provided an opportunity for students to find out about the application of chemistry concepts in the local environment through the use of a mobile media and ethnopedagogy approach.

Figure 3. Students using mobile learning media

Various exploration activities were carried out by finding and grouping information using mobile learning. Therefore, mobile learning can stimulate and facilitate students to interact with their group of friends so that students become more active in their learning.

"In the study of chemistry, there has never been a link between *chemistry learning with Lombokl. After using mobile learning, I know that pearls and pumice in Lombok are categorised colloidal material. "*
(Interview, Student 1, School A)

"Before using mobile learning, I did not know the application *of the culture of Lombok to chemistry conceptrs."*
(Reflective Journal, Student 2, School A)

"I only know examples of colloids, namely pearls, whereas I only *learned that pumice is a type of colloid and is the wealth of the Lombok area when I use mobile learning to study*"
(Reflective Journal, Student 4, School B)

Interviews and journal reflections show that the use of Ethnopedagogy-based mobile learning fosters students' curiosity and interest because of the connection to local wisdom in the Lombok area. [19] contends that meaningful content design that is adaptive to local conditions can promote greater learner satisfaction. Meaningful learning provides stronger support for students who have gained basic knowledge by shaping their understanding through personalized experiences.

c. Motivation

The effect of using the mobile learning based on the ethnopedagogy approach to students' learning motivation indicated that students felt more motivated to study chemistry after using mobile learning in chemistry and relating it to everyday life.

"*I feel more interested in using mobile* learning *because learning becomes easier. So I am more motivated to study independently because it can be accessed anywhere. "*
(Interview, Student 2, School A)

"In mobile learning, there is material in everyday life and elevating the rich culture of Lombok region, I have become increasingly motivated to learn so I know the examples *that are in Lombok and can be linked to the subject matter, I know pearls and its process. I am motivated to look for other examples in everyday life. "*
(Interview, Student 1, School B)

"*I became more interested in studying chemistry and learning chemistry became more fun"*
(Reflective Journal, Students 3, School B)

Students' interest lead to increased motivation because, according to [20], mobile application tools cause a higher level of motivation. Motivation was also heightened by reference to the rich culture of East Lombok.

d. Independent Learning

Independent learning was explored in the study by observing how well the students could organise themselves to work on their own mobile. Self-learning is identified by motivation from within the student so that they can organize themselves to improve their competences. Animated content allowed students to visualize the concept of colloidal material making it easier for them to understand.

"*Using mobile learning allows me to learn by my own, because I can learn the material from my cellphone and access it at home so that I find it* easier *for me to repeat and remember the material."*
(Interview, Student 1, School A)

"During using mobile learning, I became faster at understanding *chemical materials, besides being bored. I feel more interested in learning because it looks interesting compared to using books. Because mobile learning is contained in a smart phone device, I can access it anytime because it is practical and easy to carry anywhere. "*
(Interview, Student 2, School B)

"I feel learning to use mobile learning is more effective because *I can learn anywhere, besides that mobile learning can be used offline so that learning becomes easier."*
(Reflective Journal, Students 5, School B)

Mobile learning media based on the Ethnopedagogy approach allowed students to have organize themselves to learning and understand the subject matter, so that learning independently can be developed. Prior to using mobile learning, students depended on traditional learning resources which limit learning independence. This study supports research by [21] that shows mobile learning will help to increase flexibility of learning inside and outside classroom because students have access to learning materials anywhere and anytime resulting in better learning outcomes.

e. Culture Awareness

The concept of local wisdom carried out in this study is associated with the region of East Lombok that has a significant cultural identity that can be explored through chemistry . The role of education is an important conduit through which to introduce students early on to the local wisdom of their region. The culture of Lombok, developed through the medium of mobile learning, provides students with knowledge about the relationship between colloidal material and everyday life.

"I became motivated to develop something, for example, Jelly can be used to make something other than food and be associated with chemicals"
(Interview, Student 3, School A)

"*Studying the culture of Lombok in mobile learning makes me interested to explore any information that can be associated with chemical materials. I am proud of my area that has rich cultural and natural resources"*
(Interview, Student 2, School B)

"By *using mobile learning, I am more aware of the* pearls *that characterize my area and know the process of its formation"*
(Reflective Journal, Students 3, School B)

Using mobile media to integrate the local cultural wisdom of East Lombok into the learning environment shows that an ethnopedagogical approach makes students proud of their culture whilst achieving success in chemistry education and, at the same time, engender a desire to protect the local wisdom and culture.

Figure 4. Participants explain the local wisdom of pearls and pumice using mobile learning

4. Conclusions

This research succeeded in developing a prototype of mobile learning media based on an ethnopedagogical approach using cultural resources from Lombok. Results from the implementation of the prototype show that the product can be used in chemistry learning in the remote areas and it can be adapted for use in other subject areas. In addition to the effectiveness of learning using mobile learning based on an ethnopedagogy approach shows that using full mobile learning for students in the remote areas gives them a better chance of success compared to using blended learning and the use of mobile learning as a complementary. The integration of ethnopedagogy with mobile learning can help develop students' conceptual understanding, provide them with meaningful learning experiences, motivate learners, develop independent learners, and promote cultural awareness. Therefore, the use of mobile learning integrated with an ethnopedagogical approach is suitable for use with students who face learning challenges such as difficulties in accessing learning resources, typically those students in remote regions. Further research needs to be conducted in different areas of Indonesia using different subject matter.

REFERENCES

[1] J. Nealbert, V. Calimag, A. G. Miguel, R. S. Conde, and L. B. Aquino, "Ubiquitous Learning Environment Using Android," *Int. J. Res. Eng. Technol.*, vol. 2, no. 2, pp. 2321–8843, 2014.

[2] T. Y. Chuang and W. F. Chen, "Effect of digital games on children's cognitive achievement," *J. Multimed.*, vol. 2, no. 5, pp. 27–30, 2007.

[3] D. Alrazeeni, "M-Learning in EMS Education--Saudi Arabia Perspective," *J. Educ. Pract.*, vol. 7, no. 2, pp. 95–106, 2016.

[4] A. Kukulska-Hulme and L. Shield, "An overview of mobile assisted language learning: From content delivery to supported collaboration and interaction," vol. 20, no. 3, pp. 271–289, 2008.

[5] L. Nguyen, S. M. Barton, and L. T. Nguyen, "IPads in higher education - Hype and hope," *Br. J. Educ. Technol.*, vol. 46, no. 1, pp. 190–203, 2015.

[6] D. Gollnick and P. Chinn, *Multicultural education in a pluralistic society*, 9th ed. London: Pearson, 2013.

[7] A. C. Alwasilah, K. Suryadi, and T. Karyono, *Etnopedagogi: Landasan Praktek Pendidikan dan Pendidikan Guru*. Bandung: Kiblat Buku Utama, 2009.

[8] S. Kartadinata, "Etnopedagogik: Sebuah Resureksi Ilmu Pendidikan (pedagogik)," in *Practice Pedagogic in Global Education Perspective*, 2010.

[9] K. Klara, O. Baktiyar, K. Sandygul, U. Raikhan, and J. Gulzhiyan, "Ethnic pedagogy as an integrative, developing branch of pedagogy," *Mediterr. J. Soc. Sci.*, vol. 6, no. 1S1, pp. 612–619, 2015.

[10] K. B. Nuffic, *Best Practices using Indigenous Knowledge*. Paris, France, 2002.

[11] Ugwu, "Creating Change Through Integration of Indigenus Knowledge and Practices Into Chemistry Teaching for Sustainable Living," *Dep. Sci. Educ.*, 2012.

[12] U. Cahyana, M. Paristiowati, D. A. Savitri, and S. N. Hasyrin, "Developing and application of mobile game based learning (M-GBL) for high school students performance in chemistry," *Eurasia J. Math. Sci. Technol. Educ.*, vol. 13, no. 10, pp. 7037–7047, 2017.

[13] D. Akmal, "Impact of Web Based Learning on EFL: Using On-line Discussion Forum (ODF) to Enhance Students' Writing Skill," *Univers. J. Educ. Res.*, vol. 5, no. 8, pp. 1345–1348, 2017.

[14] A. A. Sakat, M. Z. Mohd Zin, R. Muhamad, A. Ahmad, N. A. Ahmad, and M. A. Kasmo, "Educational technology media method in teaching and learning progress," *Am. J. Appl. Sci.*, vol. 9, no. 6, pp. 874–878, 2012.

[15] M. Duran and I. Dökme, "The effect of the inquiry-based learning approach on student's critical-thinking skills," *Eurasia J. Math. Sci. Technol. Educ.*, vol. 12, no. 12, pp. 2887–2908, 2016.

[16] A. I. Khan, H. Al-Shihi, Z. A. Al-Khanjari, and M. Sarrab, "Mobile Learning (M-Learning) adoption in the Middle East: Lessons learned from the educationally advanced countries," *Telemat. Informatics*, vol. 32, no. 4, pp. 909–920, 2015.

[17] S. M. Al-Balushi, A. S. Al-Musawi, A. K. Ambusaidi, and F. H. Al-Hajri, "The Effectiveness of Interacting with Scientific Animations in Chemistry Using Mobile Devices on Grade 12 Students' Spatial Ability and Scientific Reasoning Skills," *J. Sci. Educ. Technol.*, vol. 26, no. 1, pp. 70–81, 2017.

[18] Saprudin, "The Effectiveness of Using Interactive Multimedia to Increase Students Mastery of Concept on Topic of Fluid Dynamics on Senior High School in South Halmahera Regency," *Int. Semin. Math. Sci. Comput. Sci. Educ.*, 2015.

[19] K.-K. Fan et. al, "The Effects of Learning Styles and Meaningful Learning on the Learning Achievement of Gamification Health Education Curiculum," *Eurasia J. Math. Sci. Technol. Educ.*, vol. 11, no. 5, pp. 1211–1229, 2015.

[20] L. M. Jeno, P. J. C. Adachi, J.-A. Grytnes, V. Vandvik, and E. L. Deci, "The Effects M-learning on Motivaton, Achievement and Well-being: A Self-Determination Theory Approach," *Br. J. Educ. Technol.*, 2018.

[21] M. A. Almaiah, and M. M. A. Jalil, "Investigating Students Perception on Mobile Learning Services" *Int. J. Interac. Mob. Technol.*, vol. 8, no. 4, 2014.