

A SMARTPHONE-BASED ADAPTIVE LEARNING APPROACH TO ENHANCE STUDENTS' LEARNING OUTCOMES IN ENGLISH SUBJECT

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Abstract

The purpose of this study is to improve student learning outcomes through a smartphone-based adaptive learning approach to 28 students from the 11th grade students in the 2020/2021 academic year. It is important to consider the educational context when evaluating the barriers to adopting adaptive learning approaches on digital platforms. The method used in this study is a quantitative method, everything observed was measured and converted into numbers so that statistical analysis techniques were possible. The author chose a pre-experimental design with a pre-test post-test group design, in which a group of subjects is taken from a certain population and performed in a pre-test and then undergoes treatment one after another. After the treatment, the person received a posttest to measure the learning outcomes of the group. The grades given have the same weight. The difference between the results of the pretest and the post-test shows the results of the treatment performed. The results of this study were analyzed using the t-test by comparing the mean values of the pre-test and post-test. The results showed that the t-observation value (7.8) was higher than the t-table value (1.70562) at the 5% significance level. It can be concluded that the learning approach adaptive smartphone-based improves student learning outcomes in English subjects.

Keywords: Adaptive Learning, Smartphone, English Education

INTRODUCTION

The use of the internet, especially smartphones in the Indonesian education life continues to increase from year to year. Almost every individual, from young learners to adults, now owns a smartphone. Of course, this does not happen without reason, because consumption power and people's needs today are very different from those in the past few decades.

A smartphone is a mobile phone with a touch screen and several built-in applications. More applications, commonly called 'apps', are available for download on application stores accessed via the internet. According to Williams & Sawyer (2011), a smartphone is defined as a cellular phone using various services such as memory, screen,

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microprocessor, and a built-in modem. So that the features on this smartphone feel more complete compared to other cellphone features.

Moreover, (Saufi, 2018) also maintains, smartphones are an update of communication technology from HandPhone. Smartphones are made to make it easier for humans to manage and improve their thinking through the various features provided. These features are generally such as data access, estimates, access to positions, services, registration, as well as stalls for selling, and so on. In short, a smartphone is a cellphone that has functions such as a personal computer and can perform functions such as that of a personal computer. The cellphone is slightly larger than a normal cellphone and has a larger screen than a normal cellphone. The cellphone has additional capabilities such as accessing the internet, sending an email, and others.

With the development of technology, many new innovative innovations have emerged to the public with the presence of smartphones. As with the presence of many interesting applications and camera features which are mandatory components for almost all smartphones. Now the need for communication and information is the most important thing for all people, and according to (Williams & Sawyer, 2011) Smartphones are multimedia phones that combine the functionality of a personal computer and a handset to produce a luxurious gadget, in which there are text messages, cameras, music players, videos, games, email access, digital tv, search s, personal information managers, global positioning system features, and internet telephone services. From the above statement, the writer can conclude that smartphones very possible to be used as a learning tool because various kinds of features that can be used for learning, meaning that with a smartphone a person can learn new things through content or messages that are transmitted and can also be used by the teacher in the learning process. (Kitchenham, 2011) argues that the use of smartphones in education programs makes this device a form of device that can be used as an alternative in media development. Therefore, teachers and students must begin to adapt to the use of smartphones in the learning process and teachers should be brave enough to create smartphone-based learning media.

The use of smartphones in education is known as mobile learning (m-Learning) technology and the use of m-Learning according to (Martin, 2015) can make a positive contribution to students to access learning materials or as learning media. The use of smartphones as learning media is supported by (Rogozin, 2012) who states that using smartphones as learning media provides deeper learning opportunities for students because using smartphones students can develop learning through searching for

information from the internet, and he also said that with smartphones students can dynamically build their competences. Smartphones as a learning media can be used in various subjects and in this study the writer discusses their use in the learning process of English subjects.

According to (Quinn, 2011) The intersection of mobile computing and e-learning: accessible resources wherever you are, strong search capabilities, rich interaction, powerful support for effective learning, and performance-based assessment. M-Learning was independent of location in time or space. Based on this definition, mobile learning is a model learning that utilizes information and communication technology. In this learning concept, mobile learning brings the benefits of teaching materials that can be accessed at any time and visualization of interesting material.

M-Learning is unique learning because learners can access learning materials, directions, and related applications with learning, anytime, and anywhere. This will increase attention to learning material, make learning pervasive, and can encourage learners' motivation for lifelong learning (Saufi, 2018).

In the context of implementing mobile learning, deep readiness using smartphone or computer technology is indispensable, and this readiness can be understood as the willingness and ability to organize and participate in mobile learning. More practically, mobile Learning can be accessed with a smartphone. With a smartphone that can access computer work, students or students can easily find the information needed quickly. With the existence of a smartphone, it is an additional alternative for a teacher or student when there are limited teaching materials or teaching materials.

Adaptive learning can be defined as a range of learning experiences, instructional approaches, and academic support strategies designed to address the learning needs of students (Holmes et al., 2018). As every teacher knows, every student is different or there are no students who are equal to each other. Each has its abilities, peculiarities, characteristics, and weaknesses, and broad-based learning approaches may not be effective for embracing these dynamic complexities in the long term.

According to (Ma, 2014) Adaptive learning can significantly outperform (1) large group teacher-led instruction, (2) non-adaptive computer-based instruction, and (3) paper-based instruction in generating learning gains. However, adaptive learning includes several experts who focus on the following areas: (i) Sustainability and relevance of platforms and how to integrate local decisions around education and local context (Barteit et al., 2018). (ii)

Increasing the quality of learning content and adapting available learning materials to the local context (Barteit et al., 2018).

Although theoretically adaptive learning is carried out without the encouragement of technology, in practice this situation is not often tried. Therefore, adaptive education is often described as a technology.

On the other hand, opportunities for adaptive learning are becoming increasingly possible mainly due to the growth in low-end smartphone ownership (Nye, 2015). Thus, smart-based and context-relevant learning interventions that aim to evaluate new instructional strategies are recommended as a step forward for adaptive learning (Conn, 2017). This step forward has remained largely unexplored to date, however, it is guaranteed (Blanchard, 2015).

It is important to consider the educational context when evaluating the barriers to adopting adaptive learning approaches on digital platforms; if progress is to be made, the subject-domain cannot be separated from the learning platform (Nye, 2015). Barriers are more likely to influence educational technology adoption, such as (1) if and how pedagogy using adaptive learning approaches can complement traditional learning modes, (2) limited training time and available resources, (3) subject-domain restrictions on instructional approaches that are "permitted", needs to be addressed (Blanchard, 2015).

In the use of adaptive learning technology in the classroom, teachers may have collected information, targeted specific subjects, researched software, and identified larger strategic objectives. According to (Gavrilović, 2018). There are three stages of the adaptive learning process: preparing for learning, learning, and evaluating learning

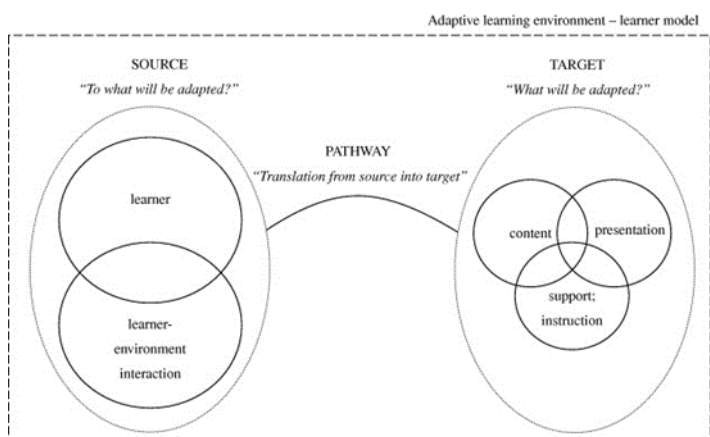
According to (Luckin, 2016), an adaptive learning environment can be conceptualized as "a digital learning environment that adapts teaching, material approaches and learning to the needs and abilities of each student" These digital platforms are designed to interact with student support capabilities and intelligent behavior that are human and are considered Artificial Intelligence-based systems: they rely on knowledge about the world and algorithms to intelligently process that knowledge.

Adaptive learning environments provide basic information processing to diagnose learners' learning needs during teaching, then provide appropriate instructional prescriptions for identified needs, ideally in the learning process (Tuti, 2020). They also dynamically determine which instructional treatment is most suitable for learners in certain situations. This is achieved by using the results of students' assignments to measure or characterize learners such as the level of motivation from time to time (Vandewaetere,

2013). Intelligent Tutoring Systems (ITSs) are examples of adaptive systems, using artificial intelligence techniques to provide students with tailored and timely instruction.

Any digital learning approach, in which the component for separating the individual necessities of students isn't a basis in the learning task measure, barely qualifies as a versatile way to deal with learning. This will preclude from the purported versatile climate that lone (1) permits students to travel through the course at a movement as indicated by their capacity and different requests on their planning, (2) utilizes pre-task fitness-based measures to endorse just a learning succession static during the learning cycle - as recommended by Vandewaetere et al. This, in my view, will in general, distort the perplexing connection between singular student contrasts and learning results and disregard the development of supporting information from communications with the learning climate.

Adaptive learning platforms can be conceptualized as being tripartite, consisting of (1) source of adaptation, (2) target of adaptation, and (3) relationship linking the source and target (Vandewaetere et al., 2011). This is illustrated in Figure below.



Vandewaetere et al. posit that the source of adaptive instruction is categorized based on learner’s cognitive (e.g. prior knowledge, learning orientation, learning goals, etc.), affect (e.g. self-efficacy, frustration, motivation, etc.), and behavior (e.g. the number of tries per task, etc.) characteristics.

The English learning process is designed to develop students' ability to use English in everyday life. Learning and assessment activities are an integrated process and assessments are carried out when the learning activities take place. Based on a study on the Education Unit Level Curriculum document (KTSP), that in general, assessment activities for English subjects are designed as a separate component of learning activities and seem

formal. Besides, the ability of teachers to design assessment assignments is also very diverse and it has an impact on the quality of student learning outcomes.

According to (Toronto, n.d.) Learning outcomes are statements that can describe the knowledge or skills that students must acquire at the end of a particular lesson assignment, class, course, or program, and assist students in understanding the importance of knowledge and skills that will be useful to them. They focus on the context and potential application of knowledge and skills, help students relate learning in various contexts, and help guide assessment and evaluation.

Good learning outcomes emphasize the application and integration of knowledge. Instead of focusing on material coverage, learning outcomes articulate how students will be able to use the material, both in a classroom context and more broadly.

Based on the researcher's observations on teaching program 3 at a school which was carried out during the Covid-19 pandemic, teachers and students have difficulty adapting to the online learning system. There are about 60% of students who do not understand learning materials and smartphone-based learning media that teachers use in the learning process. There are also 25% who understand using the learning media but do not understand the learning material and only 15% of students understand using smartphone-based learning media and understand the learning material. This has a huge impact on student learning outcomes in English subjects.

Teachers and students must adapt to learning using technology or smartphones. Because a learning system like this is relatively new to the education system in Indonesia, teachers and students find it quite difficult to undergo the learning process.

Based on the above background and problems, the authors conducted a study entitled: A Smartphone-based Adaptive Learning Approach to Enhance Student's Learning Outcomes in English. The author chose A Smartphone-based Adaptive Learning Approach because it is related to the current state of the education system in Indonesia.

RESEARCH METHOD

Research Design

This research used quantitative research, so that everything observed was measured and converted into numbers so that statistical analysis techniques were possible. The method used was a pre-experimental study. From the above statement, the author chose to use a pre-experimental design with one group pre-test post-test design where a group of subjects is taken from a certain population and is carried out on a pretest then subjected to treatment successively. After being given treatment, the subject was given a posttest to

measure learning outcomes in the group. The evaluations given carry the same weight. The difference between the pretest and posttest results shows the results of the treatment that has been given. According to Ary, (2016) The one-group pretest-posttest design usually involves three steps. First, managing the pretest and measuring the dependent variable. Second, applying experimental X treatment to participants/students. Third, managing the post-test, then re-measuring the dependent variable.

Research Site and Participants

This research was conducted at a S. The time needed for this study is for one month with two meetings each week. In conducting the research, the researcher used one class selection consist of 28 students from 11th-grade students in the 2020/2021 school year through the cluster sampling technique. The class was selected as the experimental group in this study.

Data Collection

The author uses the pre-test and post-test as a way to collect student data. A pre-test is given to students at the beginning of the meeting. The author asks students to take smartphone-based learning without doing an adaptive learning approach first then asks students to answer questions using the Quizizz application. For the post-test, the author asks students to do smartphone-based learning that has been designed, after doing the treatment students are asked to answer questions in the application to measure student learning outcomes.

The author experiment by providing smartphone-based teaching that has been tailored to the needs of students. The experiment was carried out in 4 meetings. After doing 2 treatments, the writer gave a post-test to the students. A post-test is given to see the progress achieved by students after being given an adapted smartphone-based teaching method.

Data Analysis

In the process of analyzing the data, this method is called the t-test (experimental research) which is used to test the significance. The T-test in analyzing data using pre-test and post-test. To find out the result, the researcher used statistical analysis by using this formula:

$$T\text{-test one group} = t = \frac{\bar{D}}{\frac{SD}{\sqrt{n}}}$$

$$SD = \sqrt{\text{Var}}$$

$$SD = \sqrt{\frac{1}{n} \sum (x_i - \bar{x})^2}$$

A t-test called paired sample t-test will be applied as follows:

1. Determining MEAN of DIFFERENCE score of 1 and 2.

$$\bar{D} = \frac{X_j - X_i}{n}$$

Note $X_j - X_i$ = total of Students' gained score of the experimental class.

2. Determining DEGREES of FREEDOM (df)

$$N-1$$

Note: N is all samples of the experiment.

3. Determining VAR

$$Var(S^2) = \frac{1}{n-1} \sum_{i=1}^n (x^2 - \bar{x})^2$$

4. Determining STANDARD DEVIATION

$$SD = \sqrt{Var}$$

5. Determining t_{cal} or T CALCULATION

$$t = \frac{\bar{D}}{\frac{SD}{\sqrt{n}}}$$

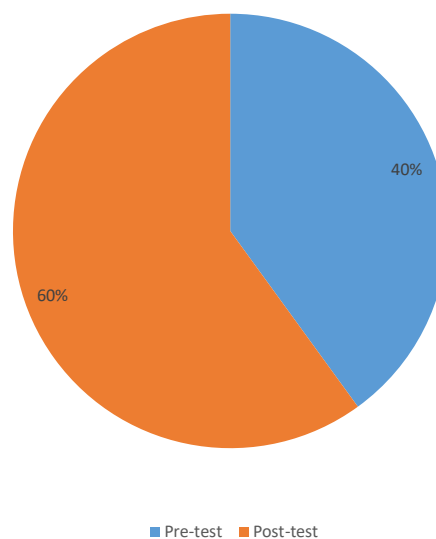
RESULT OF RESEARCH

The data were taken from tests given to one class selection consist of 28 students from 11th-grade students. The author uses a pretest before doing treatment and a posttest after being given treatment. The test is that students are asked to answer questions related to the learning material being studied. The application on the smartphone used in the pretest was Quizizz and for the posttest, it used Google form because the researcher adjusted it to the student's needs. The total number of students is 28 students. In this study, before calculating using the t-test, the data on the students' pretest and posttest scores were described in the table below.

No.	Students	Pre-test Score	Post-test Score
1	AAPS	80	100
2	AWI	60	100
3	CDP	60	80
4	DLZ	60	100
5	DPS	60	100
6	ENO	80	100
7	EM	40	80
8	FRD	60	80
9	FP	80	100
10	IN	40	100
11	ID	40	80
12	IW	60	100
13	LP	40	60
14	MA	40	80
15	MCC	40	60
16	MM	60	100
17	NS	60	80

18	NSA	80	100
19	OA	40	60
20	PH	60	80
21	RN	60	100
22	SBS	80	100
23	SA	80	100
24	SAP	60	100
25	SF	60	100
26	TEF	60	80
27	TA	80	100
28	VDP	60	80
TOTAL		1680	2500
MEAN		60	89

Based on the pre-test results of students' it could be seen from the table above that the lowest score of 28 students in pre-test was 40 and the highest score was 80. The total scores were 1680 with the mean score was 60. And based on the post-test results presented the total score was 2500 with the mean score was 89. The lowest score of students' post-test was 60 and the highest score was 100.



The diagram above showed that there was a significant increase in the mean scores of students before and after the writer gave treatment to the students. The mean score of students' post-test was higher than their pre-test.

a. Analysis of the Post-test (X1)

Post-test Analysis

No	Name	Post-test (X1)	X1 ²
1	AAPS	100	10000
2	AWI	100	10000
3	CDP	80	6400
4	DLZ	100	10000
5	DPS	100	10000
6	ENO	100	10000
7	EM	80	6400
8	FRD	80	6400
9	FP	100	10000
10	IN	100	10000
11	ID	80	6400
12	IW	100	10000
13	LP	60	3600
14	MA	80	6400
15	MCC	60	3600
16	MM	100	10000
17	NS	80	6400
18	NSA	100	10000
19	OA	60	3600
20	PH	80	6400
21	RN	100	10000
22	SBS	100	10000
23	SA	100	10000
24	SAP	100	10000
25	SF	100	10000

26	TEF	80	6400
27	TA	100	10000
28	VDP	80	6400
TOTAL		$\sum X_1 = 2500$	$\sum X_1^2 = 228400$

1. The analysis of Post-test (X1)

$$x_1 = \frac{\sum x_1}{N_1} = \frac{2500}{28} = 89.28$$

2. Determining of Standard Deviation score of X1 variable

$$SD_1 = \sqrt{\frac{SS_1}{N_1 - 1}}$$

$$SS_1 = \sum X_1^2 - \left(\frac{\sum x_1}{N_1}\right)^2$$

$$SS_1 = 228400 - \left(\frac{2500}{28}\right)^2$$

$$= 228400 - 223214$$

$$SS_1 = 5186$$

$$SD_1 = \sqrt{\frac{SS_1}{N_1 - 1}}$$

$$SD_1 = \sqrt{\frac{5186}{27}}$$

$$SD_1 = \sqrt{192.07}$$

$$SD_1 = 13.85$$

b. Analysis of the Pre-test (X2)

Pre-test Analysis

No	Name	Pre-test (X2)	X2 ²
1	AAPS	80	6400
2	AWI	60	3600
3	CDP	60	3600

4	DLZ	60	3600
5	DPS	60	3600
6	ENO	80	6400
7	EM	40	1600
8	FRD	60	3600
9	FP	80	6400
10	IN	40	1600
11	ID	40	1600
12	IW	60	3600
13	LP	40	1600
14	MA	40	1600
15	MCC	40	1600
16	MM	60	3600
17	NS	60	3600
18	NSA	80	6400
19	OA	40	1600
20	PH	60	3600
21	RN	60	3600
22	SBS	80	6400
23	SA	80	6400
24	SAP	60	3600
25	SF	60	3600
26	TEF	60	3600
27	TA	80	6400
28	VDP	60	3600
TOTAL		$\sum X_2 = 1680$	$\sum X_2^2 = 106400$

1. The analysis of Pre-test (X_2)

$$x_2 = \frac{\sum x_2}{N_1} = \frac{1680}{28} = 60$$

2. Determining of Standard Deviation score of X_2 variable

$$SD_2 = \sqrt{\frac{SS_2}{N_1 - 1}}$$

$$SS_2 = \sum X_2^2 - \left(\frac{\sum x_2}{N_1}\right)^2$$

$$SS_2 = 106400 - \left(\frac{1680}{28}\right)^2$$

$$= 106400 - 100800$$

$$SS_2 = 5600$$

$$SD_2 = \sqrt{\frac{SS_2}{N_1 - 1}}$$

$$SD_2 = \sqrt{\frac{5600}{27}}$$

$$SD_2 = \sqrt{207.40}$$

$$SD_2 = 14.40$$

3. Determining t-test

$$t = \frac{X_1 - X_2}{\sqrt{\left(\frac{SS_1 + SS_2}{n_1 + n_2 - 2}\right)\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

$$t = \frac{89.28 - 60}{\sqrt{\left(\frac{5186 + 5600}{28 + 28 - 2}\right)\left(\frac{1}{28} + \frac{1}{28}\right)}}$$

$$t = \frac{29.28}{\sqrt{\left(\frac{10786}{54}\right)\left(\frac{2}{28}\right)}}$$

$$t = \frac{29.28}{\sqrt{(199.74)(0.07)}}$$

$$t = \frac{29.28}{\sqrt{13.98}}$$

$$t = \frac{29.28}{3.74}$$

$$t = 7.8$$

4. Determining degrees of freedom (df)

$$df = N - 2$$

$$df = 28 - 2$$

df = 26

- Determining t-table in significance level 5% (0.05) with Degree of freedom (df). The value of df is 26 at degree of significance 5% or t-table is 1.70562, the result is $7.8 > 1.70562$. The result showed that t_0 (t-observation) was higher than t-table. It means Smartphone-based adaptive learning approach is effective to enhance students' learning outcomes in english subjects.

The Result of Hypothesis the Data

t-observation (t_0)	t-table 5% (0.05)	significant
7.8	1.70562	significant

DISCUSSION

Based on the result of the research, learning by applying a smartphone-based adaptive learning approach to understudies, which gives a learning prepare outlined to suit understudy learning needs has brought about in a critical increment in understudy learning results. This can be prove by the comes about of the subordinate t-test within the pre-test and post-test. The comes about appeared the esteem of t-observation 7.8 was higher than the esteem of t-table 1.70562 at the centrality level of 5% it can be concluded that smartphone-based adaptive learning approach progress understudy learning results in English subjects.

From the above results it can also be interpreted that adaptive learning environment can be conceptualized as a 'computerized learning environment that adjusts instructing, fabric approaches and learning to the requirements and capacities of each understudy' These advanced stages are planned to connected with understudy bolster capabilities and shrewdly behavior that are human and are considered Fake Intelligence-based frameworks: they depend on information approximately the world and calculations to scholarly people prepare that knowledge. Adaptive learning situations give essential data handling to analyze learners' learning needs amid educating, at that point give fitting guidelines prescriptions for distinguished needs, in a perfect world within the learning prepare. They moreover powerfully decide which directions treatment is most reasonable for learners in certain circumstances. Typically accomplished by utilizing the comes about of students' assignments to degree or characterize learners such as the level of inspiration from time to

time. Intelligent Tutoring Systems (ITSs) are examples of adaptive systems, using artificial intelligence techniques to provide students with tailored and timely instruction.

CONCLUSION AND SUGGESTION

Conclusion

Based on research that has been conducted at a school, the authors conclude that learning by applying a smartphone-based adaptive learning approach to students, which provides a learning process designed to suit student learning needs has resulted in a significant increase in student learning outcomes. This is evidenced by the results of the dependent t-test in the pre-test and post-test. The results showed the value of t-observation (7.8) was higher than the value of t-table (1.70562) at the significance level of 5% it can be concluded that the learning approach adaptive smartphone-based improve student learning outcomes in English subjects.

Suggestion

From the conclusion above, the writer would like to give some suggestions for students, English teachers, and also other researchers.

And the suggestions are as mentioned below:

1. For the students

The Covid-19 pandemic requires online learning and using a smartphone-based adaptive learning approach can also be fun so that it can improve understanding of learning materials and improve student learning outcomes in English subjects. Students do not need to worry that it will be difficult to follow the learning process because the teacher designs the learning process according to the learning needs of students so that students understand the material being taught.

2. For the teachers

The smartphone-based adaptive learning approach can be applied in learning English because this approach is very flexible and the teacher can adjust it to the learning needs of students and it is highly recommended for teachers to properly analyze what applications will suit their students and what learning materials are suitable so that they can improve student understanding and student learning outcomes

3. For the other researchers

This adaptive learning approach using smartphones can also have an impact on researchers, including researchers who can find out what kind of smartphone-based adaptive approach will be suitable in teaching students, understand what students want, and be more flexible in dealing with students in the classroom. The author suggests other researchers improve their ability to use a smartphone-based adaptive learning approach such as in this study.

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