

Review Article

Effect of Smartphones as Instructional Tool on Students' Interest and Retention in Agricultural Water Engineering in Colleges of Education in Benue State, Nigeria

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Abstract

This study used smartphones as an Instructional tool to determine their effects on students' Interest and retention in Agricultural Water Engineering in Colleges of Education, Benue State, Nigeria. Five purposes of the study were stated, five research questions were posed and answered with means and standard deviations, and five hypotheses formulated and tested at 0.05 level of significance using Analysis of Covariance (ANCOVA). Quasi-experimental design of non-randomized pre-test post-test control group design was utilized. The research was carried out in two Colleges of Education in Benue State, Nigeria, with a population of 410 NCE Students. The population size of 200 NCE III students was sampled from colleges of Education, Katsina-Ala and Oju in the study area. The research instruments were 'Basic Agricultural Water Inventory Test' (BAWEIT) and Basic Agricultural Water Retention Test (BAWERT), AND were validated by three experts. The reliability coefficient of the instruments was 0.74. The study found that the students who were taught with SIT demonstrated positive interest and enhanced their retention ($X_S=3.92$) in Basic Agricultural Water Engineering than those taught without Smartphones. Also, there was no significant difference in the mean interest and retention rating scores ($X_S = 1.24 > 0.05$), in Basic Agricultural Water Engineering (AGE, 324) concepts with Smartphone as an instructional tool (SIT). Based on findings, recommendations were made that smartphone (SIT) should be included among instructional materials in the scheme of lesson delivery for lecture by the National Commission for Colleges of Education (NCCE) in the curriculum for both teaching and learning activities at the Colleges of Education in Benue State. There should be constant, strong Wi-Fi connections power National Commission for Colleges of Education instructional via College administrators should orient lecturers and students by organizing workshops and seminars on how to effectively utilize smartphones for their academic activities. College administrators should endeavour to supervise implementation of smartphones as instructional tools in Agricultural Water Engineering and NCE courses for students

More Information

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Submitted: July 01, 2025

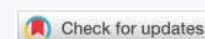
Approved: July 23, 2025

Published: July 24, 2025

How to cite this article: Christopher SM. Effect of Smartphones as Instructional Tool on Students' Interest and Retention in Agricultural Water Engineering in Colleges of Education in Benue State, Nigeria. Ann Civil Environ Eng. 2025; 9(1): 058-065. Available from: <https://dx.doi.org/10.29328/journal.acee.1001080>

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Keywords: Smartphone as Instructional tools; Basic agricultural water engineering; Interest; Retention; Colleges of education; Gender



Introduction

The development of any nation is dependent on its improved agricultural education programme, which establishes the basis for food technology advancement programmes. The twenty-first century has been associated with technology utilization becoming an essential part of life because of its advanced features, which enable students to use their tablets to accomplish various daily tasks [1]. Based on the Global Mobile Association Report (2015), half of the world's population possesses a mobile phone subscription, with tablet adoption already reaching critical mass in developed markets. It further explains that smartphones are now responsible for sixty percent (60%) of internet connections around the world.

The smartphones aid their associated technology to advance with simple calls and text messaging, being replaced with functions such as internet access, emails, camera applications, and multi-media services. The Apple Company, London 2007, launched its first-ever tablet application, simultaneously marking the bang of needed interest on education with its learning mobile application (Apple Press Information, 2013). The report asserts that the possible influence of mobile devices on higher education and their impact on life-long learning opportunities seems unclear because of technology utilization. The smartphone technology has taken to the doorsteps of teaching and learning in Colleges of Education, Benue State.



In the context of this study, it involves a wide range of applications, communication, and technologies utilized for information retrieval, research, and administration. According to Mtega, Bernard, Msungu, and Sanais [2], the smartphone as an instructional tool can provide suitable learning platforms as it has a lot of applications that both tutors and learners could use in their academic activities. Guy (2009) indicated that the smartphone as an instructional tool has the potential to improve the teaching and learning processes. The authors explained that it serves as an educational tool and has a sensor that uses learning programmes in the classroom and the outside environment, which could be in the framework of communication, interaction of lecturers and students in the learning process. In the context of this study, smartphones are the instructional tool that lecturers in Colleges of Education could use for more advanced applications in teaching and learning for enhanced interest.

According to Giginna [3], interest is the degree of likeness an individual has for something such as an activity, person, or situation. It concerns the individual preference for a particular type of ability. The authors explained that it serves as an educational tool and has a sensor. It uses learning programs in the classroom and the outside environment, which could be in the framework of communication, the interaction of lecturers and students in the learning process. Smartphone as an instructional tool in the learning environment can be used in bulk, large, small groups, or by individuals. In the context of this study, a smartphone is the instructional tool that lecturers in Colleges of Education could use for more advanced applications in teaching and learning for enhanced interest and retention in Agricultural Water Engineering in Colleges of Education in Benue State.

The content or synopsis of Basic Agricultural Water Engineering (AGE;324) as a course, deals with the meaning and importance of water engineering in agriculture; sources of water, soil and water conservation; prevention of soil erosion; irrigation systems; installation and maintenance; classification of soil water table; field investigation for drainage; water drainage and control; types and advantages of drainage systems; problems associated with irrigation and drainage; local harvestation of water for family and community uses; as is in the curriculum of Vocational and Technical Education in Colleges of Education in Nigeria [4]. The course focuses on giving students skills to manage water in the process of carrying out farming activities. The study could consider the Basic Agricultural Water Engineering concepts by using a smartphone as an instructional tool to enable lecturers and agricultural education students to have effective teaching and learning activities in the lecture room for enhanced interest and retention of knowledge.

Agricultural education students are those in Colleges of Education who are actively involved in classroom interaction with lecturers on the basic concepts of the Agricultural Water

Engineering course through lecture method and smartphone as an instructional tool in teaching and learning process [5]. The students are to be taught the concepts of Agricultural Water Engineering in the curriculum so that they could understand and develop skills in the application and problem-solving that would occur in an agricultural setting [6]. In this study, Agricultural Education students are those learners subjected to the study using a smartphone as an instructional tool and those who are not in the classroom environment for enhanced interest.

According to Chikendu and Okoli [7], interest is the degree of likeness an individual has to something, such as an activity, a person, or a situation. It is concerned with individual preference for a particular type of ability. Wordu and Akor [8] reported that interest facilitates teaching-learning, improves understanding, and stimulates group effort and personal involvement. Zakariyya [9], interest deals with being enthusiastic in the learning processes and skills that were learned. Custer and Ten [10] maintained that most knowledge does not last up to the final examination because of the interest of students no longer being there, which affects retention of the Basic Agricultural Water Engineering concepts.

Retention deals with recalling units of knowledge, processes, and skills that were learned earlier [9]. Retention is important not only for remembering events from the past, but also for dealing with daily activities such as the quality of the teaching method [11].

Furthermore, as a result of meaningful learning materials among other factors, when not properly delivered to students, knowledge is only memorized and can easily be forgotten after a while (Oludipe, 2012). Custer and Ten [10] indicated that the factor of forgetting and how to reduce it has become a controversial research area in education for over a century, since forgetting is complex to come by. Most students forget about sixty percent of the learned information just an hour after learning takes place, and some who are highly motivated still forget easily, even when learning occurs, because their memories were weakly stimulated for long-term retention. Since weak retention is a common scenario among students. Hence, there is a need to extend retention and lessen forgetting by "doing it repeatedly". Indeed, if male and female students can retain concepts learned, they will achieve better in their career aspirations [10].

Gender is the classification of individuals into male and female, which is determined biologically because of the sexual traits of an individual [12]. Gender is a socially ascribed attribute, which differentiates feminine from masculine. The value obtained will represent the effect of the treatment on each of the two groups of students (male and female). Therefore, there is a need to examine the effects of smartphones as an instructional tool and lecture method of instruction on students' interest and retention in Basic



Agricultural Water Engineering (AGE, 324) in Colleges of Education in North-central, Nigeria.

Statement of the problem

There is a need to explore more innovative and creative teaching methods to enhance students' interest and retention mean Higher learning institutions, such as Colleges of Education, Polytechnics, Universities, among others, need to determine good strategies to enhance students' smartphone use to create a more inspiring learning environment. The college students mostly use their smartphones for social media interaction and seem not to be exploring their maximum utilization in the academic environment. It has been observed that a good proportion of Agricultural Education students in different Colleges of Education in the study area Benue State usually performed very low in the Agricultural Water Engineering (AGE, 324) course in their Nigeria Certification in Education III program. Perhaps this could be due to several factors such as ineffective instructional strategies adopted by lecturers, inadequate innovative instructional materials, and low interest of the students, which are not comprehended by male and female NCE III students, due to inadequate instructional tools, inappropriate application of teaching methods in Agricultural Water Engineering (AGE, 324). It is therefore necessary the use Smartphone devices as instructional tools that could have the basis for this study, and answers to the following questions seem necessary. Would students' interest and retention in AGE 324 improve when taught using a smartphone as an instructional tool rather than when taught with the lecture method? Could male and female students improve in their interest and retention when taught with a Smartphone as an instructional tool?

The study, therefore, could attempt to proffer solutions to these questions to determine the effect of smartphones as an instructional tool on agricultural education students' interest and retention in basic agricultural water engineering in the College of Education in Benue State.

Purpose of the study

The main purpose of this study is to determine the effect of smartphones as an instructional tool (SIT) in Agricultural Water Engineering concepts classrooms. Specifically, it determined that the use of smartphones as instructional tools (SIT) could improve students' interest.

Research questions

1. What are the mean interest ratings of NCE III students taught Agricultural Water Engineering concepts with a Smartphone and those taught without a smartphone as an instructional tool?
2. What are the mean interest ratings of NCE III students' innovative techniques in learning of Agricultural Water Engineering concepts taught with smartphone and those taught without smartphone as instructional tool?

3. What are the mean interest ratings of the male and female NCE III students in learning Agricultural Water Engineering taught with a smartphone as an instructional tool?

Statement of hypotheses

1. There is no significant difference between the mean interest ratings of NCE III students taught Agricultural Water Engineering concepts with a Smartphone and those taught without a smartphone as an instructional tool.
2. There is no significant difference between the mean interest ratings of NCE III students' innovative technique in learning of Agricultural Water Engineering concepts taught with a smartphone and those taught without a smartphone as an instructional tool.
3. There is no significant difference between the mean interest ratings of the male and female NCE III students in Agricultural Water Engineering taught with a smartphone as an instructional tool.
4. There is no significant difference between the mean retention scores of NCE III students taught Agricultural Water Engineering concepts with a smartphone and those taught without a smartphone as an instructional tool.
5. Is there no significant difference between the mean retention scores of male and female NCE III students taught with a smartphone as an instructional tool?

Methodology

The research design was quasi-experimental. The design adopted was pre-test-post-test. The sample size of the population of the study comprises 200 NCE III students in two colleges of Education (Katsina-Ala and Oju) in Benue state. And the target population was 420 NCE III students in colleges of education in Benue for the study. The Instruments for the study were Basic Agricultural Water Engineering Interest Inventory Test (BAWEIIT) and Basic Agricultural Water Engineering Retention Test (BAWERT). The instruments were validated by three experts validated the instrument one in the Department of Mathematics Education, one in the Department of Educational Foundation and General Studies, Joseph Sarwuan Tarka University, Makurdi (JOSTUM), and one in the Department of Agricultural Education, College of Education, Oju. Basic Agricultural Water Engineering Interest Inventory Test (BAWEIIT) was trial tested at College of Education, Akwanga. Data was collected and subjected to Cronbach's alpha. The reliability coefficient was 0.74, signifying the validity of the instrument and setting it for use. BAWEIIT of 24 multiple-choice objective questions in Agricultural Water Engineering Instructional Tool.

The research was carried out where both groups were given a Pretest before the treatment, and after treatment



posttest was administered to them. The experimental group was exposed to the use of smartphones as instructional tools, treating the Agricultural Water Engineering concepts, while the control group was taught without smartphones. Analysis of covariance (ANCOVA) was used for testing hypotheses at the 0.05 level of significance. Conclusion: It was established that students taught Agricultural Water Engineering using a smartphone as an instructional tool demonstrate positive interest.

Results

Research question 1

What are the mean interest ratings of NCE III students taught Agricultural Water Engineering concepts with a Smartphone and those taught without a smartphone as an instructional tool (SIT)? The answer to this research question is presented in Table 1.

Table 1 shows that for pre-test, the experimental group (SIT) had a mean score of 2.86, with a standard deviation of 1.03, while the control group (without SIT) had a mean score of 2.64, with a standard deviation of 0.98. Their mean difference is 0.22. At post-test, the experimental group had a mean score of 3.89 with a standard deviation of 0.91, while the control group had a mean score of 2.70 with a standard deviation of 1.04. Their mean difference is 1.19. The mean gain was 0.97 in favour of the experimental group.

Research question 2

What are the mean interest ratings of NCE III students' innovative technique in learning Agricultural Water Engineering concepts of students taught with smartphones and those taught with a conventional method as an instructional tool? The answer to this research question is presented in Table 2.

Table 1: Mean and Standard Deviation of Interest Ratings of NCE III Students Taught Agricultural Water Engineering Concepts with SIT and Those Taught; with Conventional Method.

Group	N	Pre-BAWEIIT Mean	SD	Post-BAWEIIT Mean	SD	Mean Gain
Experimental Group (SIT)	92	2.86	1.03	3.89	0.91	1.03
Control Group (WSIT)	108	2.64	0.98	2.70	1.04	0.06
Mean Difference		0.22		1.19		0.97
Total	200					

Table 2: Mean and Standard Deviation of Mean Interest Ratings of NCEIII Students Innovative Technique in Learning Agricultural Engineering Concepts with Smartphones as Instruction Tools.

Group	N	Pre-BAWEIIT Mean	SD	Post-BAWEIIT Mean	SD	Mean Gain
Experimental Group(SIT)	92	2.92	0.83	3.65	0.65	0.73
Control Group(WSIT)	108	2.84	0.76	2.89	0.80	0.05
Mean difference		0.08		0.76		0.68
Total	200					

Table 2 shows that at pre-test, the experimental group had a mean score of 2.92 with a standard deviation of 0.83, while the control group had a mean score of 2.84 with a standard deviation of 0.76. Their mean difference was 0.08. At post-test, experimental group had a mean score \of 3.65 with a standard deviation of 0.65while control group had a mean score of 2.84 with a standard deviation of 0.80. Based on the mean achievement scores of two groups, the mean difference was 0.76. The mean gain was 0.68.The interest mean gain of 0.68 favours the experimental group.

Research question 3

What are the mean interest ratings of the male and female NCE III students in agricultural water engineering taught with a smartphone as an instructional tool? The answer to this research question is presented in Table 3.

Table 3 shows that at pre-test, the male students had a mean score of 2.68 with a standard deviation of 1.05 while female students had a mean score of 2.78 with a standard deviation of 0.11. Their mean difference was 0.10. At post-test scores, the male students had a mean score of 3.39 with a standard deviation of 0.98 while female students had a mean score of 3.45 with a standard deviation of 0.96. Their mean difference was 0.06. The interest mean gain of male and female was 0.04 favours the male group.

Research question 4

What are the mean retention scores of NCE III students taught Agricultural Water Engineering with Smartphone and those taught with a conventional method as an instructional tool? The answer to this research question is presented in Table 4.

Table 4 shows that at post-test, the experimental (SIT) group had a mean score of 16.09 with a standard deviation of 3.45 while the control had a mean score of 14.05with a standard deviation of 4.37. Their mean difference was 2.04.

Table 3: Mean and Standard Deviation of Interest Ratings of Male and Female NCE III Students Taught Agricultural Water Engineering Concepts with Smartphones as Instructional Tool.

Gender	N	Pre-BAWEIIT Mean	SD	Post-BAWEIIT Mean	SD	Mean Gain
Male	52	2.68	1.05	3.39	0.98	0.71
Female	40	2.78	0.11	3.45	0.96	0.67
Mean difference		0.10		0.06		0.04
Total	92					

Table 4: Mean and Standard Deviation of Retention Scores of NCE III Students Taught Agricultural Water Engineering with Smartphone and Those Taught with Conventional Method

Group	N	Post- test Mean	SD	Retn-test Mean	SD	Mean Gain
Experimental Group(SIT)	92	16.09	3.45	15.29	3.78	0.8
Control Group(WSIT)	108	14.05	4.37	14.03	4.68	0.02
Mean difference		2.04		1.26		0.78
Total	200					

For retention-test score of 15.29, for experimental group (SIT) with a standard deviation 3.78 while the control group had a mean score of 14.03 with a standard deviation of 4.68. Their mean difference was 1.26. The mean gain was 0.78 in favour of the experimental group.

Research question 5

What are the mean retention scores of male and female NCE III students taught with smartphones and those taught without smartphones? The answer to this research question is presented in Table 5.

Table 5 shows that at post-test, the male students had a mean score of 22.29 with a standard deviation of 4.98 while female students had a mean score of 18.29 with a standard deviation of 3.38. Their mean difference was 4.14. For retention-test scores, the male students had a mean score of 18.29 with a standard deviation of 3.38 while the female students had a mean score of 14.15 with a standard deviation of 2.83. Their difference mean was 4.14. The mean gain was 1.30 in favour of the male students.

Research hypothesis 1

There is no significant difference between the mean interest ratings of NCE III students who are taught Agricultural Water Engineering concepts with a Smartphone and those who are taught without a smartphone as an instructional tool (SIT). The test of this hypothesis is presented in Table 4.

Table 6 shows that the p - value of 0.01 was less than the significance level of 0.05. Since the p - value of 0.01 was less than the 0.05 level of significance, the null hypothesis of no significant difference was rejected. This means that there was no significant difference in the mean interest rating of NCE III students taught Agricultural water engineering concepts with (SIT) and those taught without Smartphones as an instructional tool.

Table 5: Mean and Standard Deviation of Retention Scores of Male and Female NCE III Students Taught Agricultural Water Engineering Concepts with Smartphone ((SIT).

Gender	N	Post-test Mean	SD	Retn-test Mean	SD	Mean Gain
Male	52	22.29	4.98	18.29	3.38	4.00
Female	40	16.85	3.69	14.15	2.83	2.70
Mean difference		5.44		4.14		1.30
Total	92					

Table 6: ANCOVA Result of Interest Rating of NCE III Students Taught Agricultural Engineering Concepts with SIT and Those taught without Smartphone Instructional Tool (SIT)

Source	Type III Sum of Squares	df	Mean Square	F	Sig	Partial Eta Squared
Corrected Model	10979.987 ^a	2	5489.994	315.372	.001	.068
Intercept	87.680	1	87.680	5.0367	.034	.028
Pre-test Achieve	6987.454	1	6987.454	400.813	.001	.058
Groups	667.352	1	667.352	38.336	.030	.128
Error	6649.968	382	17.408			
Total	48240.000	387				
Corrected Total	3369.820	386				

^aR. Squared = .068 (Adjusted R Squared = .047)

Research hypothesis 2

There is no significant difference in the mean interest ratings in learning Agricultural water engineering concepts of students taught with a smartphone and those taught without a smartphone as an instructional tool (SIT). The result of this hypothesis is represented in Table 5.

Table 7 shows that the p - value of 0.001 was less than the significance level of 0.05. Since the p - value of 0.001 was less than the significance level of 0.05, the null hypothesis of no significant difference was rejected. This means that there is no significant difference in the mean interest ratings in learning Agricultural water engineering concepts of the students who were taught with and those taught without a smartphone as an instructional tool (SIT).

Research hypothesis 3

There is no significant difference between the mean interest ratings of the male and female NCE III students in agricultural water engineering taught with a smartphone as an instructional tool (SIT). The result of this hypothesis is presented in Table 6.

Table 8 reveals that the p - value of 1.24 was greater than the 0.05 level of significance. Since the p - value of 1.24 was greater than the 0.05 level of significance, the null hypothesis of no significant difference was not rejected. This means that there was no significant difference between the mean interest ratings of male and female NCE III students taught AGE 324 concepts with a smartphone as instructional tool.

Table 7: ANCOVA Result of Mean Interest Ratings in Innovative Technique in Learning of Agricultural water engineering Concepts of NCE III Students Taught with Smartphone and those Taught without Smartphone as Instructional Tool (WSIT).

Source	Type III Sum of Squares	df	Mean Square	F	Sig	Partial Eta Squared
Corrected Model	48160.30	2	24080.15	248.46	.001	.413
Intercept	24387.48	1	24387.48	261.76	.127	.039
Pre-Interest	24083.82	1	24083.82	258.50	.001	.204
Groups	38819.76	1	38819.76	416.67	.001	.406
Error	35589.87	382	93.167			
Total	1600089.04	387				
Corrected Total	66848.24	386				

^aR = .413 (Adjusted R Squared = .410).

Table 8: ANCOVA Result of Interest Ratings of the Male and Female NCE III Students in Agricultural Water Engineering Taught with Smartphone as Instructional Tool (SIT).

Source	Type III Sum of Squares	df	Mean Square	F	Sig	Partial Eta Squared
Corrected Model	3240.309 ^a	2	1620.15	34.781	.000	.412
Intercept	134.628	1	134.628	2.890	.120	.028
Pre-Interest	3154.584	1	3154.584	67.721	.000	.424
Groups	5174.489	1	5174.489	111.083	.000	.447
Groups*Gender	137.948	1	137.948	2.961	1.243	.027
Error	5589.87	120	46.582			
Total	1600089.04	122				
Corrected Total	66848.24	121				

^aR Squared = .412 (Adjusted R Squared = .392)

Research hypothesis 4

There is no significant difference between the mean retention scores of NCE III students who are taught Agricultural Water Engineering concepts with smartphones and those who are taught without smartphones as instructional tools. The result of this hypothesis is presented in Table 9.

Table 9 shows that the p - value of .000 was less than the significant level of 0.05. Since the p - value of 0.00 is less than the significance level of 0.05, the null hypothesis of no significant difference was rejected. This means that there is a significant difference between the mean retention scores of NCE III students taught Agricultural water engineering concepts with SIT and those taught without a Smartphone as an Instructional Tool.

Research hypothesis 5

There is no significant difference between the mean retention scores of male and female NCE III students taught with smartphones and those taught without smartphones as an instructional tool. The result of this hypothesis is presented in Table 10.

Table 10 reveals that the p - value of 0.65 was greater than the 0.05 level of significance. Since the p - value of 0.65 is greater than 0.05 level of significance, the null hypothesis of no significant difference was not rejected. This means that there is no significant difference between the mean retention scores of male and female NCE III students who are taught AGE 324 concepts using a Smartphone as an instructional tool.

Table 9: ANCOVA Result of Retention Scores of Students Taught Agricultural Engineering Concepts with Smartphone and Those Taught without Smartphone as Instructional (SIT).

Source	Type III Sum of Squares	df	Mean Square	F	Sig	Partial Eta Squared
Corrected Model	678.404 ^a	2	339.202	51.686	.000	.026
Intercept	1843.349	1	1843.349	280.882	.000	.346
Pre-test	18.860	1	18.860	2.8738	.026	.347
Groups	578.365	1	578.365	88.129	.000	.260
Error	2428.097	382	6.5627			
Total	69873.009	387				
Corrected Total	6467.978	386				

^aR = .026 (Adjusted R Squared = .014)

Table 10: ANCOVA Result of Mean Retention Scores of Male and Female NCE III Students Taught Agricultural Water Engineering Concepts with Smartphone as Instructional Tool (SIT).

Source	Type III Sum of Squares	df	Mean Square	F	Sig	Partial Eta Squared
Corrected Model	7.987 ^a	2	3.9935	1.1840	.640	.006
Intercept	1487.143	1	1487.143	441.026	.001	.456
Pre-test Achieve	6.290	1	6.290	1.865	.001	.446
Groups	640.974	1	640.974	190.087	.000	.150
Groups*Gender	1.640	1	1.640	0.4860	.646	.001
Error	1288.020	120	3.372			
Total	24268.200	122				
Corrected Total	14279.000	121				

^aR Squared = .006 (Adjusted R Squared = .002)

Discussion of findings

The Students taught Agricultural Water Engineering concepts with a Smartphone as an instructional tool demonstrated more positive interest during the period of this study than those taught without a Smartphone. This means that the Smartphone as an instructional tool enhanced NCE III students' interest in Agricultural Water Engineering concepts. This finding is in agreement with that of Wordu and Akor [7], who found that interest facilitates learning, improves understanding, and stimulates effort and personal involvement. Interest is a strong factor in the teaching-learning of agricultural water engineering, which could enhance NCE III students' interest. Smartphone as an instructional tool is expected to be highly stimulating by transforming difficult and boring activities into easy and pleasurable experiences, thereby increasing students' interest in agricultural water engineering concepts. Students taught with smartphones must have experienced these possibilities and thus had their interest in agricultural water engineering increased more than those taught without smartphones as an instructional tool. Wordu, et al. [8] found that the usage of mobile devices helped students to solve academic problems and also got their information via visual tools like television, computers, and the internet. Getting their interest by traditional teaching methods, where a lot of channels compete for their attention, is becoming difficult. This finding is also in line with Emaikwu, Iji, and Abari [13], which reported that teaching Agricultural Water Engineering with innovative methods like the use of smartphones as an instructional tool to facilitate learning and teaching. A good teacher can use innovative techniques, such as a smartphone as an instructional tool, to inspire hope, ignite, and instill interest in learning a course at Colleges of Education. With technology nowadays, teachers can use innovative techniques in their classrooms to make their lessons more meaningful and interesting.

Another finding of the study was that the adoption of smartphones in the Agricultural Water Engineering classes enhanced male and female NCE III students' interest. Also, the findings revealed that both sexes demonstrated positive interest in Agricultural Water Engineering concepts with a Smartphone as an instructional tool. This was in agreement with Honmane, Takor, and Fekumo [14] toolsrest as a powerful motivational process, enhances learning, guides academics, and career. Interest does not come as a result of force; it is a result of an individual's eagerness to learn.

The findings also revealed that adoption of Smartphones in the Agricultural Water Engineering enhanced their retention during this study more than those taught without smartphones as an instructional tool. The reason for the better retention of NCE III students taught with smartphones than those who were taught without smartphones as an instructional tool was the interaction of learners with smartphones. The findings agreed with McCoy (2013), who found that students



exposed to learning methods with a good approach, such as use of a smartphone as an instructional tool, could attain high academic achievement and develop long-term retention. Adjei (2019) found that retention scores are measured after the completion of course content at some later date, during the period of the research.

The findings also showed that the use of smartphones in the Agricultural Water Engineering classroom enhanced male and female NCE III students' retention. Again, it was found that both sexes improved their retention in Agricultural Water Engineering with smartphone as instructional medium, though female improved more than their male counterparts. However, this difference was not statistically significant. The result confirms the finding of Alabi, Falode, and Jimoh (2020), who found no significant difference in mean retention scores of male and female students who were exposed to smartphones in learning activities. This implies that if male and female students were exposed to innovative use of smartphones as an instructional tool, the gender difference in agricultural water engineering retention would be a factor.

Conclusion

Based on the findings, it could be concluded that smartphones are an instructional tool, students taught with demonstrated positive interest, and enhance retention in Basic Agricultural Water Engineering (AGE, 324) irrespective of gender. This implies that if AGE 324 lecturers should use innovative instructional tools such as smartphones, which were found to have enhanced students' interest and retention, avoiding the issue of low interest and retention, the concepts taught in Basic Agricultural Water Engineering at the Colleges of Education level may become a thing of the past. Similarly, the gender gap created using smartphones as an instructional tool would also bridge the gap irrespective of gender.

Recommendations

Based on the findings of this, the following recommendations were made:

1. There should be constant, strong Wi-Fi connections power
2. College administrators should orient students to have an interest in smartphone utilization for their academic activities.
3. College administrators should endeavour to encourage lecturers' interest in utilizing smartphones as instructional material in teaching Basic Agricultural Water Engineering course for students in the colleges of education.
4. National Commission for Colleges of Education should organise workshops and seminars on how to use smartphones as instructional tools to sensitize lecturers of Basic Agricultural Water Engineering on the benefits derivable

from it.

5. Tablet should be incorporated among instructional materials for teaching and learning of Basic Agricultural Water Engineering course in colleges of Education in Benue and Nigeria at large.

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