

ICT skills, and benefits of teaching and learning animal science with blended learning at colleges of education in Ghana

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ABSTRACT

Animal science is an essential curriculum in animal husbandry and veterinary professional education. This study delved into the use of ICT in teaching animal science using blended learning and the benefits of blended learning for teachers and students. The study utilized a descriptive survey design. The target population consisted of animal science students and teachers selected colleges of education in the Volta region. The population of Agric science students was 100, and the Agric science tutors in the three colleges were 20. With the use of Yamane formula, the sample size was 80 and 19 respectively for students and the teachers. The fundamental instrument for data collection was questionnaires. Four and five scaled Likert like tests were designed to elicit information on the level of ICT skill of teachers and their students, and on benefits of blended learning to teachers and students respectively. The information gathered was analyzed using SPSS version 21 and the hypotheses were tested using Analysis of Covariance. The result established that both teachers and students of animal science department in the Colleges that participated in the study, are skilled in ICT and that both teachers and students benefited from using blended learning model in teaching animal science in colleges of education in Ghana. It was also discovered from hypothesis tested that no significant difference existed between the ICT skill level of teachers and students, and no significant difference also existed between the level of benefit derived from blended learning by both teachers and students. It was concluded that both teachers and students of animal science in the colleges of education in Ghana benefited from blended learning model because they are skilled in ICT. Hence, it was recommended that teachers and students must be well trained to acquire sufficient ICT skills in the usage of basic ICT applications in order to obtain the full benefits of the blended learning model.

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1. INTRODUCTION

The onset of the 21st century has shown that teaching is a rapidly changing landscape. In only a few years, the technological growth of the 21st century and the widespread introduction its associated innovations into our social fiber, coupled with access to 4G internet, have profoundly changed teaching [1,2].

The experiences that the current generation of young ones and possibly the generation that is going to follow them strongly brings to fore the great changes that have engulfed us both culturally and socially. More

than ever before, our lives are so dependent on the use of various digital technologies and their accompanying devices such as tablets, smart phones, the internet, and the like, to mention but a few [3]. These and many more advances are made possible by development and advances in Information and communication technology (ICT).

The last century has seen psychologists and scientists drawing up various hypotheses to understand how humans learn, coordinate, and apply intelligence and skills [4]. Indeed, as the benefits of contemporary teaching and learning methods are being clarified so too will researchers need to understand the factors that influence its future use [5].

It is no wonder that “policy makers around the world plea to rethink teacher education in order to meet the needs and challenges of the 21st century” [6]. This is rightly so since, some challenges in the face to face conventional teaching methods have been documented. As stated by [7], “schools with a large number of African-American and Hispanic students and colored immigrant students” (p. 426) face what other teachers have described as lack of confidence, and hopelessness.

Consequently, in lieu of these obvious changes in how we live in the 21st century, there is an urgent need to change the way we do things. Teaching cannot be left out if we as teachers want to remain relevant to our call to duty. The work of the teacher now needs to evolve around the use of contemporary technologies such as interactive boards, online teaching tools and the like. Indeed, in the words of [8], these new technologies are not going anywhere away from us. [8] continues that one of the teaching methods that might aid teachers and learners catch up with this fast pace of advancement is blended learning technique.

In recent times the word 'blended learning' has gained significant popularity as a way of depicting mostly the mode of teaching with the use of technology. It is probably the largest unrecognized phenomenon today in higher education [9].

In the work of [10] three definitions were given:

- a. the integrated combination of traditional learning with web-based online approaches (drawing on the work of Harrison);
- b. the combination of media and tools employed in an e-learning environment; and
- c. the combination of a number of pedagogic approaches, irrespective of learning technology use (drawing on the work of Driscoll).

These said differently, implies that we cannot do away with the human element no matter how much technology we will want to deploy in the process of teaching. Hence, we will be seeing a lot of intermingling or intertwining of the teaching process with the use of digital resources, e-learning the internet. In the use of the Blended Learning, the level of engagement of the learner is bound to be higher. This definitely results in richer and more enthralling learning experience This approach addresses or takes care of the learners' individual learning needs since most students have unique learning styles or needs, which are more effectively taken care of and accommodated than would be the case in a conventional teaching experience in the classroom [11].

The importance of ICT in education, ss [12] have stated, more learning problems of students are solved day in day out when we deploy the powers inherent in ICT in education. In other words, ICT makes it possible for us to have a more convenient way of learning. It has further shown that concepts can be explained in ways that enhances the understanding of the learners.

Students are currently regularly engaged in the meaningful use of computers [13]. Students construct new knowledge through accessing, selecting, arranging, and interpreting information. Based on learning through ICT, students are more capable of making use of information and data from different sources and assessing the nature of the learning materials [14].

ICT develops students' new understanding in their areas of learning [15]. That is to say, ICT offers a more ingenious alternative to all sorts of learning concerns. For example, e-books are usually used in reading out loud activities in a lecture class. Learners can easily access a wide range of documents through computers, workstations, personal digital assistants (PDAs), or iPads, from beginning to advanced levels. More precisely, these e-books may come with some reading applications, offering a read-out-loud interface, relevant vocabulary-building activities, reading-related games, and vocabulary-related games, and the sky is the limit from there. ICT therefore includes targeted applications that offer creative strategies to meet a variety of learning needs [15].

As stated by [16], that utilizing ICT enables students to communicate, share, and work collaboratively anywhere whenever. For example, a teleconference classroom could consider inviting students from all over the world to engage in a topical dialog. [17] concluded that blended learning is an important tool for helping students and is appropriate for different types of students. Students can analyze problems, study ideas, and develop theories in addition. You can further assess the arrangements for ICT study. Students learn together and share various learning experiences, aiming at expressing themselves and reflecting on their learning.

Based on a constructive learning approach, ICT helps students focus on higher-level concepts rather than less significant undertakings [18]. [19] showed that there were factually huge correlations between studying with ICT and the securing of basic reasoning aptitudes. When students and learners are well exposed to the use of digital technologies in the course of teaching and learning, they have the tendency to improve the way the students will analyze situations and concepts that they are exposed to. Indeed, findings from some studies indicate that integrated learning approach as a teaching strategy may encourage a positive learner attitude or mindset [20]. This is why many in these recent times are advocating for more reliance of these technologies in the classroom at all levels and elsewhere in the education environment. When this is done, students can be seen using technologies in specific learning situations to achieve higher levels of awareness [21].

According to [18] that three critical characteristics are needed to develop excellent quality teaching and learning with ICT: self-sufficiency, capacity, and creativity. Self-sufficiency means that students take control of their learning through their use of ICT. Along these lines, they become more capable of working without anyone else and with others. Teachers can likewise allow students to complete specific assignments with peers or in gatherings. Through collaborative learning with ICT, the students have more chance to construct new knowledge onto their experience knowledge and become more confident to take chances and learn from their mistakes.

Teachers and students are looking for computer skills in the 21st century. There is a sincere urge to combine ICT technologies in education. This is because it is believed to enhance teaching experiences and help to make their teaching careers eventful when appropriate technical assistance, resources, and assistance from schools for the teachers are given [22]. Such teachers will have a tremendous responsibility to change the course of their students, to create and explain new tasks and to monitor the code laboratory by means of their technical experts or collaborators. This view is supported by [23] and is the reason, stakeholders have responded to the crucial need of learners growth in computer literacy by inculcating it as part of the school curriculum, openly as a cross-curriculum ability, and by examining the level to which learners are computer literate [22].

In total, as [24] have indicated, ICT gives students more opportunities to explore material beyond mere course mechanics, thereby allowing them to grasp concepts better. The use of ICT additionally changes the teaching and learning relationship. A study conducted by Reid, as reported by [25], has come out to support the assertion that teachers and educators now support the belief that ICT is making it possible for the role of teachers and students to be flipped. This relationship supports students' confidence when they can help teachers with technical issues in the classroom. Therefore, ICT changes the conventional teacher-centered methodology and requires teachers to be more creative in redoing and adjusting their very own teaching materials.

While ICT is improving teaching and learning in several different ways, there is existing literature that likewise identifies some barriers. In the sections below, these barriers have been grouped into four categories based on the perspective of students, teachers, and ICT infrastructure. There is also a discussion of a variety of strategies for addressing these barriers. We have also discussed Staff development and teacher training because these have been noted as indispensable when it comes to supporting the educational modules with technology integration.

Blended learning models, according to [24] Because of the flexible nature of blended learning, it can come in several shapes and sizes, and be tailored to suit the person. Such types of activities that include: Online; training takes place via an online platform, with frequent face-to-face meetings. Rotation: Students switch between online self-paced learning and face-to-face instruction. Set schedules but versatile. Flex: The training is often provided online, with teachers providing support in small group environments if and when appropriate. Personalized blend: Teachers build solutions that straddle the physical classroom and virtual spaces face-to-face and anywhere, anywhere. Training is constant, and variable is time. Online laboratory: Directions are in a brick and mortar laboratory. Delivered by an anonymous instructor and supervised by paraprofessionals on-site. Self-blend: Students take online courses to complement their face-to-face inventory of classes in traditional schools. Face-to-face: Instructor mostly provides face-to-face training, supplemented by in-class or computer lab technology.

Importance of blended learning, blended learning courses are still relatively new to higher education and will therefore require further research and experimentation to enable us to understand and develop best practices more fully [26]. Blended learning is important as it tears down the conventional teaching barriers, even those not effective with all students. We will customize the learning environment for each student with access to present-day technology and tools. Blended learning also offers adjustable time scales that can be customized to each student / learner, enabling them to train at their own pace [24]. As per [25], the following are some of the advantages that come with the adoption of blended learning for both teachers and students.

Advantages of blended learning for teachers :

- a. Makes education less costly, more affordable and time-savings.
- b. Blended learning offers versatility with respect to access – anywhere, wherever. In other words, it helps the subject to view the content at anytime from anywhere.
- c. It provides access to global resources and materials which match the level of awareness and interest of the students.
- d. It provides self-pacing for both slow and fast learners, reduces tension, improves productivity, and retains knowledge.
- e. Blended learning facilitates very engaging communication with learners and their teachers through the use of blogs, chat rooms and message forums.
- f. In turn, the students will track their progress.
- g. Lastly, students should also learn through a range of exercises that relate to several different forms of study.

Blended learning also increases other aspects for the teacher, including more active students. More job knowledge and input, Team coaching, Longer time with students, More leadership opportunities, Emphasis on more in-depth instruction, Inspire hard to find youngsters, Innovative coaching choices at home, More earning capacity, Individualized career growth strategies, Enhanced teaching conditions. Blended learning breaks down the strict rules of conventional training methods, and this can boost circumstances such as decreased loneliness, more collaboration incentives, substantive career growth. Better results for pupils, better time usage, separation of tasks [1].

The Advantages of Blended Learning for Students, increase student interest: learners are more likely to engage in, focus on, and be enthusiastic about the topics they are learning as technology is introduced in school lessons. For some, certain courses may be monotonous, but they could still experience an increase in retention of knowledge.

Keep students focused for longer: Using technology to look up details & evidence is a huge help, paired with access to research services such as can be found on the internet. This involvement and contact with these productive tools keep students engaged for longer stretches of time; this participation also tends to improve learning through study and discovery.

Provides student autonomy: The use of blended learning materials increases the ability of a student to set realistic learning targets and accept responsibility for his or her learning and this facilitates the learner's ability to apply such experience all through other subjects.

It also instills a disposition of self-advocacy: Students are self-driven and accountable, and they are able to measure their accomplishments. This helps them improve their confidence to access the tools to get the support they need, self-advocating so they can accomplish their goals.

Promote student ownership: Blended learning instills a sense of control of learning in the students and this can be a strong factor propelling students learning. This sense of responsibility can contribute to the feeling of ownership of learning.

Allow instant diagnostic information and student feedback: The teacher is able to plan and execute his lessons in a timely fashion and also give timely reports to the students with the use of Blended learning because of the use of digital technology. This obviously is a plus for efficient time management.

Enables students to learn at their own pace: Due to the flexibility of blended learning and the ability to access the internet, resources allow students to learn at their own pace, meaning a teacher can help speed up the learning process or give more excellent resources if necessary.

Prepares students for the future: Blended learning offers a plethora of real-world capabilities that turn directly into practical skills, including analysis skills, self-development, self-engagement, creating a 'self-driving ability,' and a stronger decision-making capacity.

Indeed, the Center for Digital Education (CDE) in 2015 as reported by [27] found that:

- Student participation increased by 69%
- Student attrition rates increased by 39%
- Test scores enhanced by 28%
- Grade rates improved by 22%
- Attendance increased by 22%

2. STATEMENT OF PROBLEM

Animal science is a basic science for professionals and individuals who are into animal husbandry and veterinary education. Recent research suggests that the creative Blended learning method (conventional method of teaching face to face mixed with the use e-learning portals) gives a better result than traditional didactic instruction alone because it promotes creative thinking [28].

A lot of studies seem to point to the fact that blended learning yields a positive impact in other jurisdictions. However, the acceptability of this technique of teaching and learning has not been without issues of skepticism. [29-32]. The broader question could be why the skepticism about use of blended learning [33]. Could it be the influence of ICT skill on the teaching and learning experience of teachers and their students in colleges of education in Ghana using blended learning as a teaching method? This study is aimed at investigating the ICT skill level of teachers and student in colleges of education in Ghana and the benefits of using Blended Learning in teaching and learning of animal science in Ghanaian colleges of education.

3. AIM AND OBJECTIVES OF RESEARCH

The main aim of this research is to investigate and ascertain the level of ICT skill and benefit of a blended learning model to teachers and student as concern teaching and learning of animal science in colleges of education in Ghana, and the specific objectives are

- a. To ascertain the level of ICT skill among the teachers and students who are teaching and offering animal science respectively in colleges of education in Ghana
- b. To determine the benefit of teaching and learning using blended learning model among teachers and students who are teaching and offering animal science in colleges of education in Ghana

Research questions

- a. What is the ICT skill level of teacher and student who are teaching and offering animal science in colleges of education in Ghana?
- b. What is the benefit of Blended learning to teachers and student in teaching and learning animal science in colleges of education in Ghana based on blended learning model?

Testing of hypothesis

- a. H_0 There is no significant difference between the average rating of the ICT skill level of teachers and student who are offering animal science in colleges of education in Ghana?
 H_1 There is a significant difference between the average rating of the ICT skill level of teachers and student who are offering animal science in colleges of education in Ghana.
- b. H_0 No significant difference exists between the average rating of benefits of students and teachers on the use of Blended learning model in teaching animal science in colleges of education in Ghana.
 H_1 There exists a significant difference between the average rating of benefits of students and teachers on the use of Blended learning model in teaching animal science in colleges of education in Ghana.

4. METHODOLOGY

The study utilized a combination of descriptive survey design. The target population consisted of animal science students and teachers of three selected colleges of education in the Volta Region. These three colleges are St. Francis College of Education, Peki College of Education, and Ada College of Education. The fundamental instruments for the collection of data for the study were a set of questionnaires. The information gathered were analyzed with the use of the Statistical Package of the Social Sciences (SPSS). Descriptive Statistics, Tables, Percentages, Frequencies, Means, and Standard Deviations were depended on to do the analysis. The total number of Agric science students and teachers from the three colleges of education were 100 and 20, respectively. Taro Yamane formula was used to calculate the sample size of the study, which gave 80 students and 19 teachers. Four scaled Likert test was designed based on highly skilled (4) skilled (3) not skilled (2) and highly unskilled (1) to elicit information on ICT skill of students and teachers using some open-ended questions and another 5 point scale Likert like test was also designed on opened question based on scales of Strongly agree (5), Agree (4) Neutral (3) disagree (2) and Strongly disagree (1) to elicit information on benefits of Blended Learning model to teachers and students in teaching and learning animal science. Analysis of Covariance (ANCOVA) was finally used to test the hypothesis.

5. RESULTS AND ANALYSIS

Table 1 talks the data of the colleges that participated in the study.

Table 1: Sample size of respondents

Colleges	Teacher Population	Student Population
Peki College of Education,	6	25
Ada College of Education	6	25
St. Francis College of Education	7	30
Total	19	80

5.1. Access to computers at home

Upon asking whether they had a computer at home, the responses of the science teachers were illustrated in Figure 1 as follows:

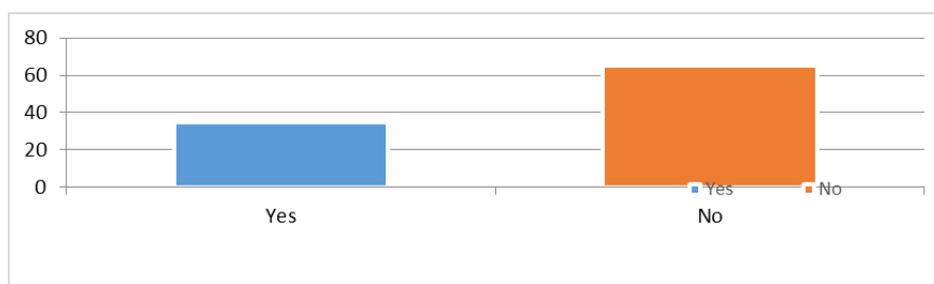


Figure 1. Access to computers at home (N=6)

Figure 1 shows that a third of the animal science teachers had computers and used them for school-related activities, which implies that some owned computers and used them at home after hours for school-related activities.

5.2. Connection to the internet

The animal science teachers were asked to indicate if their computers at home were connected to the internet. Their responses were illustrated in Figure 2 as follows;

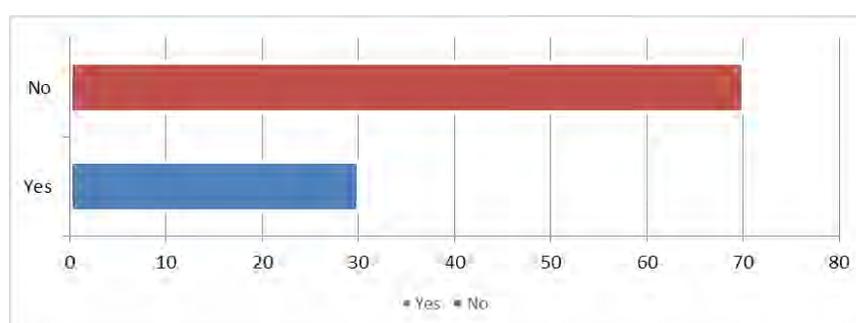


Figure 2. Computers connectivity to the internet (N=19)

Figure 2 above illustrates that approximately a third of the animal science teacher's computers were connected to the internet. This does indicate that animal science teachers who responded that they own computers were necessarily the same who indicated that their computers were connected to the internet. It was possible that some animal science teachers did have access to the internet through other devices, as demonstrated in Figure 1.

5.3. ICT skills level of animal science students and teachers

Animal science students and teachers were asked to indicate their level of ICT skills the response rate is showed in Table 2 as follows:

Table 2. Animal science students ICT skills Level (N=80)

Operational Software	Mean	Std. Dev.	Remark
Browsing on the web with the internet to search for information	3.42	0.62	Skilled
Microsoft Word	3.23	0.58	Skilled
Download and upload document on the internet	3.19	0.61	Skilled
Spreadsheet	3.01	0.94	Skilled
Power point presentation	2.96	0.70	Skilled
Email	2.80	0.99	Skilled
Database software	1.15	0.70	Not Skilled
Application of multimedia	2.73	0.69	Skilled
Data logging tools	1.31	0.52	Not skilled
MEAN RATING	2.65	.74	SKILL

The result from Table 2 revealed that students were skilled in browsing on the web with the internet to search for information, using Microsoft Word, downloading and uploading document on the internet, using spreadsheet, PowerPoint presentation, email, application of average mean value of 2,65 using that critical means value is 2.5 for five-point scale Likert like test indicates that most of the students responded that they are skilled in the usage of the above stated operational software on average, but lowest means scores were 1.15 and 1.31 for the statements "Database software" and "Data logging tools" respectively where the students disagree.

The result from Table 3 reveals that animal science teachers were skilled in browsing on the web with the internet to search information, using Microsoft Word, downloading and uploading document on the internet, using spreadsheet, PowerPoint Presentation, email, application of multimedia with average mean score of 3.25. compare to critical score of 2.5 this implied that the most teachers answered that they were skilled in the usage of the aforementioned operational software though lowest means scores recorded was 1.31 for the statements "Data logging tools" which means that they are unskilled in this aspect of ICT

Table 3. Animal Science teachers ICT skills level (N=19)

Operational Software	Mean	Std. Dev.	Remark
Browsing on the web with the internet	3.82	0.71	Skilled
Microsoft Word	3.73	0.69	Skilled
Download and upload document on the internet	3.49	0.62	Skilled
Spreadsheet	3.21	0.84	Skilled
Power point presentation	3.16	0.60	Skilled
Email	3.01	0.89	Skilled
Database software	2.42	0.72	Not Skilled
Application of multimedia	3.71	0.59	Skilled
Data logging tools	1.31	0.54	Not Skilled
MEAN RATING	3.25	0.69	SKILLED

5.4. Benefits of blended learning model on teacher and students of animal science

Animal science teachers and students were asked to investigate the benefits they derived in using Blended learning model in teaching and learning, and their responded rate is as shows in Table 4.

Table 4 revealed that blended learning offers teachers the following benefits; engage greater number of students, get accurate information and suggestions for improvement on work, teaching teams, extended periods of time with the students, more leadership roles, extensive focus on broader learning, empowering children who are hard to reach, new options for teaching at home, increased earning power, personalized career development plans, decreased seclusion, more collaborative opportunities, better student data, and improved time efficiency [1]. The average means scores of 3.87 imply that most of the teachers agreed to the statement listed above.

Table 4. Benefit of blended learning for teachers (N=19)

Variables	Mean	Std. Dev.	Remark
More engaged students	4.12	0.731	Agree
Better information and feedback on work	3.73	0.592	Agree
Team teaching	3.99	0.611	Agree
Extended time with students	4.01	0.834	Agree
More leadership roles	3.86	0.609	Agree
Focus on deeper learning	3.94	0.879	Agree
Motivate hard to reach kids	3.71	0.595	Agree
New options to teach at home	3.69	0.645	Agree
More earning power	3.54	0.584	Agree
Individualised professional development plans	4.13	0.729	Agree
Reduced Isolation	3.89	0.612	Agree
More opportunities for collaboration	3.57	0.586	Agree
Better student data	4.06	0.670	Agree
Improved Time efficiency	4.0	0.819	Agree
MEAN RATING	3.87	0.74	AGREE

Table 5 shows that blended learning offered students the following benefits; increase student interest, keep students focused for longer, provides student autonomy, instill a disposition of self-advocacy, promote student ownership, allow instant diagnostic information and student feedback, enables students to learn at their own pace, and prepares students for the future. The mean scores ranged from 3.59-4.26, indicating that a majority of the respondents agreed to the statement listed above.

Table 5. Benefits of blended learning for students (N=80)

Variables	Mean	Std. Dev.	Remarks
Increase student interest	3.62	0.591	Agree
Keep students focused for longer	3.93	0.618	Agree
Provides student autonomy	4.09	0.692	Agree
Instil a disposition of self-advocacy	4.21	0.804	Agree
Promote student ownership	4.26	0.810	Agree
Allow instant diagnostic information and student feedback	3.78	0.581	Agree
Enables students to learn at their own pace	4.31	0.829	Agree
Prepares students for the future	3.59	0.577	Agree
MEAN RATING	4.09	0.75	AGREE

Hypothesis testing

In order to discover whether there is a difference between ICT skills level of teachers and students and whether there is a difference in the degree of benefit derived by teachers and students in using blended learning model in teaching and learning animal science, ANCOVA was used to test for significant of their difference based on the hypothesis.

Hypothesis One

1. H_0 There is no significant difference between the mean rating of the ICT skill level of teachers and students who are offering animal science in colleges of education in Ghana?

H_1 There is a significant difference between the mean rating of the ICT skill level of teachers and student who are offering animal science in colleges of education in Ghana?

Table 6 is the ANCOVA analysis showing the difference in ICT skill of teachers and students as concern teaching and learning of animal science in colleges of education in Ghana using Blended learning. The result revealed a significance level of 0.057, which is higher than 0.05 stipulated level of significance. Hence, the null hypothesis is accepted which implied that there was no significant or notable difference between the ICT skill level of teachers and students as concern teaching and learning of animal science using blended learning model ($p = 0.0572$ and $F(1.42) = 3.505$).

Table 6. ANCOVA analysis results of ICT skill of teachers and student in animal science in colleges of education in Ghana

Dependent Variable: test						
Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	
Corrected Model	242.631 ^a	1	171.426	6.912	.004	
Intercept	122.863	1	122.863	186.837	.033	
ICT Skill	9.872	1	9.872	3.505	0.057	
Error	99.949	96	1.290			
Total	131.000	99				
Corrected Total	13.821	98				

Hypothesis Two

2. Ho There is no significant difference between the mean rating of benefits of teachers and students on use Blended learning model in teaching animal science in colleges of education in Ghana.

Hi There is a significant difference between the mean rating of benefits of teachers and students on the use of Blended learning model in teaching animal science in colleges of education in Ghana

Table 7 is ANCOVA analysis showing a difference in the benefits of teachers and students on the use of Blended learning model in teaching and learning animal science in colleges of education in Ghana. The result showed a significant level of 0.053, which is higher than 0.05 stipulated level of significance. Hence, the null hypothesis is accepted which implied that there is no significant difference between the mean rating of benefits of teachers and students on use Blended learning model in teaching animal science in colleges of education in Ghana. ($p = 0.053$ and $F(1.42) = 2.321$).

Table 7. ANCOVA analysis results on the benefits of teachers and students on the use of blended learning model in teaching animal science in colleges of education in Ghana

Dependent Variable:t-test						
Source	Type III Sum of Squares	D.F	Mean Square	F	Sig.	
Corrected Model	112.623 ^a	1	176.412	7.834	.002	
Intercept	72.228	1	72.228	193.738	.021	
Benefits	10.647	1	10.647	2.321	0.053	
Error	9.958	96	2.435			
Total	1411.000	99				
Corrected Total	141.100	98				

6. DISCUSSION OF FINDINGS

6.1. The level of ICT skill among the teachers and students who are teaching and offering animal science respectively in colleges of education in Ghana

From Table 2 above, it was revealed that the mean rating value of the animal science students as concerns the level of their ICT skill is 2.65 while table 3 also revealed that the mean rating of the animal science teachers as concerns the level of their ICT skill is 3.25. Therefore, based on the criteria that stated that we accept when a mean value is above 2.5 and reject when the means rating value is lower than 2.5, we accept that both the students and their teachers are skilled in ICT. However, the teachers having mean rating value of 3.25 are more skilled than the students with mean rating value of 2.65, but hypothesis testing using ANCOVA as shown in table 6 above confirms that this difference between the two mean rating values is not significant at a significance level of 0.05 (see hypothesis testing 1). This finding aligns with the statement from [21] who avers that teachers and students of the 21st century are striving to become computer literate and enjoy integrating technology in teaching and learning. Besides, ICT improves their teaching and learning experience and makes their teaching and learning eventful provided the encouragement, equipment, and necessary technical help are available from institutes for the teachers.

6.2. The benefits of teaching and learning using a blended learning amongst teachers and students who are teaching of animal science in colleges of education in Ghana

From table 4, it was shown that the mean rating value of benefit of teachers in using blended learning model in teaching animal science in colleges of education in Ghana is 3.87 while table 5 also revealed that the mean rating value of benefit of student in using blended learning model in teaching animal science in colleges of education in Ghana is 4.03. Therefore, based on the criteria that stated that we agree when a mean value is above 2.5 and disagree when means rating value is lower than 2.5, we agree that both the students and their teachers are benefiting from using blended learning model in teaching animal science in colleges of education in Ghana. However, the students having mean rating value of 4.03 benefited more compare to their teachers

with mean rating value of 3.87, but hypothesis testing using ANCOVA as shown in Table 7 confirm that this difference is not significant at a significance level of 0.05 (see hypothesis testing 2). This is in agreement with the report of [25] who stated that Blended learning also improves other factors for the teacher including more engaged students, better information and feedback on work, Team teaching, extended time with students, more leadership roles, focus on more in-depth learning, and motivate hard to reach kids. Moreover, [27] stated that because of the inherent tools in blended learning, which allows creativity in lessons and subjects, students are better able to use learning resources creatively and recreate what they are learning. Blended learning increased student interest, keep students focused for longer, provides student autonomy, inspire a disposition of self-advocacy, promote student ownership, allow instant diagnostic information and student feedback, enables students to learn at their own pace, prepares students for the future.

7. CONCLUSION

The teachers and students showed skills in using several ICT tools which includes ability to surf the web, ability to use Microsoft Word, ability to download and upload document on the internet, ability to use excel spreadsheet, ability to prepare PowerPoint, ability to open and use email but showed an inability to work with database software and Data logging tools. On the average and based on the results of the analysis, both the teachers and students of animal science in colleges of education in Ghana are considered skilled in the use of ICT for teaching and learning.

Several benefits emanated with the use of blended learning for both teachers and students in the colleges of education in Ghana. Some of the benefits with regards to teachers included individualized professional development plans, reduced isolation, more opportunities for collaboration, better student data, and improved time efficiency, better information and feedback on work, team teaching, and extended time with students. For students some of the benefits were; increase student interest, keep students focused for longer, provides student autonomy, inspire a disposition of self-advocacy, promote student ownership, allow instant diagnostic information and student feedback, enables students to learn at their own pace, and prepares students for the future. On the average and based on the results of the analysis, both the teacher and students of the animal science department in colleges of educations in Ghana benefited from the use of blended learning in teaching.

In summary, teachers and students' ICT skill level was appreciably and significantly high and because of this, teachers and student were able to benefit appreciably or significantly from blended learning model as concerns teaching and learning animal science in the colleges of education in Ghana. This is because the ability to use ICT tends to be a motivation to effective teaching and learning when using blended learning whereas inability to use ICT tends to be hindrance or limitation as concern effective teaching and learning when using blended learning model.

RECOMMENDATIONS

Based on these results and analysis it was recommended that

- a. For effective delivery of blended learning in Ghanaian colleges of education, teachers and students must be well trained to acquire sufficient ICT skills in the usage of basic ICT applications like MSword, PowerPoint, excel sheet, browsing on the internet, downloading and uploading of documents.
- b. Colleges of education must be brought to the awareness of the various benefits students, and teachers stand to gain when they adopt blended learning.

REFERENCES

- [1] Giarla, A, "The Benefits of Blended Learning." 2020, March 17 [Online] Available: <https://www.teachthought.com/technology/the-benefits-of-blended-learning>
- [2] Loughed, P. "Blended Learning Lab," 2015. [Online] Available: <https://www.scoop.it/topic/blended-learning-lab/p/4048992804/2015/08/05/the-architecture-of-open-source-applications-volume-2-moodle>
- [3] Driscoll, M, "Blended learning: Let's get beyond the hype," *E-learning*, vol. 1, no. 4, pp. 1-4, 2002.
- [4] Ifenthaler, D, "Encyclopedia of the Sciences of Learning." 2012. [Online] Available: <https://link.springer.com/referencework/10.1007/978-1-4419-1428-6>
- [5] Callum, K. Mac, and Jeffrey, L, "The influence of students' ICT skills and their adoption of mobile learning," *Australasian Journal of Educational Technology*, 2013.
- [6] Darling-Hammond, L, "Constructing 21 St century teacher education," *Journal of Teacher Education*, vol. 57, no. 3, pp. 300-314, 2006.
- [7] Pollock, M, "Three challenges for teachers in the era of Trump," *Educational Studies*, vol. 53, no. 4, pp. 426-427, 2017.

- [8] Graham, C. R., "Blended learning systems," *The handbook of blended learning*, 3-21. (2006).
- [9] Young, J. R., "'Hybrid' teaching seeks to end the divide between traditional and online instruction." *The Chronicle of Higher Education*, vol. 48, no. 28, 2002.
- [10] Whitelock, D and Jelfs, A, "Editorial: Journal of Educational Media Special Issue on Blended Learning," *Journal of Educational Media*, vol. 28, no. 2-3, pp. 99-100, 2003.
- [11] Rossett, A and Frazee, R. V, *Blended learning opportunities*, New York, NY. American Management Association, 2006.
- [12] Victor, A. A and Bolanle, R. R, "Extent of Information and Communication Technology (ICT) Utilization for Students' Learning in Tertiary Institutions in Ondo State, Nigeria," *IJARIE*, vol. 3, no. 3, pp. 2369-2376, 2017.
- [13] Barakabitze, A. A, "The Context of Education Initiatives, Importance and Inhibitors of ICTs towards improving teaching and learning in Tanzania: A Critical Literature review," *Information and Knowledge Management*, vol. 4, no. 10, pp. 16-23, 2014.
- [14] Jo Shan Fu and Fu, J. S, "ICT in Education : A Critical Literature Review and Its Implications," *International Journal of Education and Development Using Information and Communication Technology*, vol. 9, no. 1, pp. 112-125, 2013.
- [15] Nnadozie, C. O, "Utilization of e-Learning Technologies amongst Selected Undergraduate Students in a Nigerian University of Agriculture: The Umudike Study," *Journal of Applied Information Science and Technology*, vol. 11, no. 1, pp. 24-31, no. 2018.
- [16] Onwuagboke, B. B. C, Singh, T. K. R, and Fook, F. S, "Need for ICT Integration for Effective Instructional Delivery in Nigerian Colleges of Education," *Journal of Education and Practice*, vol. 6, no. 3, pp. 51-56, 2015.
- [17] Heinze, A and Procter, C, "Reflections on the use of blended learning. Education in a changing environment conference proceedings," *University of Salford, EDU*, 2004.
- [18] Ottenbreit-Leftwich, A. T, Kopcha, T. J, and Ertmer, P. A, "Information and Communication Technology Dispositional Factors and Relationship to Information and Communication Technology Practices," *Second Handbook of Information Technology in Primary and Secondary Education*, pp. 309-333, 2018.
- [19] Mintah, B. O, "The perception of Ghanaian senior high school teachers and students on the integration of information and communication technology into mathematics teaching and learning," (*Doctoral dissertation, University of Education, Winneba, Ghana*), 2015.
- [20] McMahon, G, "Critical thinking and ICT integration in a Western Australian secondary school," *Educational Technology and Society*, vol. 12, pp. 269-281, 2009.
- [21] Ainley, J, "Students and Their Computer Literacy: Evidence and Curriculum Implications," [Online] Available: <http://ijedict.dec.uwi.edu/include/getdoc.php?article=1541&id=5402&mode=pdf> (2018, October 8).
- [22] Buabeng-Andoh, Charles and Issifu, Yidana, "Implementation of ICT in Learning: A Study of Students in Ghanaian Secondary Schools," *Procedia - Social and Behavioral Sciences*, vol. 191, pp. 1282-1287, 2015.
- [23] Sharma, S, Thapliyal, and L, Godiyal, "ICT IN TEACHING: A CRITICAL OVERVIEW," *Indian Journal of Applied Research*, vol. 6, no. 6, 2016.
- [24] Dantas, A. M and Kemm, R. E, "A blended approach to active learning in a physiology laboratory-based subject facilitated by an e-learning component," *Advances in Physiology Education*, vol. 32, no. 1, pp. 65-75, 2008.
- [25] López-Pérez, M. V, Pérez-López, M. C, and Rodríguez-Ariza, L, "Blended learning in higher education: Students' perceptions and their relation to outcomes," *Computers & Education*, vol. 56, no. 3, pp. 818-826, 2011.
- [26] Shibley, B. I, Amaral, K. E, Shank, J. D, and Shibley, L. R, "Designing a Blended Course : Using ADDIE to Guide Instructional Design," 2005.
- [27] Dlamini, K, "How the Blended Learning Concept Refines Education," 2017, September 28. [Online] Available: <https://www.lcibs.co.uk/how-the-blended-learning-concept-refines-education/>
- [28] Ngan, O. M. Y, Tang, T. L. H., Chan, A. K. Y, Chen, D. M, and Tang, M. K, "Blended Learning in Anatomy Teaching for Non-Medical Students: An Innovative Approach to the Health Professions Education," *Health Professions Education*, vol. 4, no. 2, 149-158, 2018.
- [29] Oh, E and Park, S, "How are universities involved in blended instruction?," *Educational Technology & Society*, vol. 12, no. 3, 327-342. (2009).
- [30] Garrison, D. R and Kanuka, H, "Blended learning: Uncovering its transformative potential in higher education," *The Internet and Higher Education*, vol. 7, no. 2, 95-105, 2004.
- [31] Ginns, P & Ellis, R, "Quality in blended learning: exploring the relationships between on-line and face-to-face teaching and learning," *The Internet and Higher Education*, vol. 10, no. 1, pp. 53-64, 2007.
- [32] Mortera-Gutierrez, F, "Faculty best practices using blended learning in e-learning and face-to-face Instruction. In J. Nall, & R. Robson (Eds.)," *Proceedings of world conference on e-learning in corporate, government, healthcare, and higher education 2004* (pp. 845-850). Chesapeake, VA: ACE.
- [33] Ocak M. A, "Why are faculty members not teaching blended courses? Insights from faculty members," *Computers & Education*, vol. 56, pp. 689-699, 2011.

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