



ASSESSING THE FACTORS INFLUENCING LECTURERS' ADOPTION AND INTEGRATION OF BIOLOGICAL SOFTWARE PACKAGES IN THE TEACHING AND LEARNING OF BIOLOGY IN COLLEGES OF EDUCATION IN SOUTH-EASTERN NIGERIA: A CASE STUDY OF ANAMBRA AND ENUGU.

Ezenwobodo¹, Chidimma Adaeze²

Biology Lecturer, Nwafor Orizu College of Education, Nsugbe

MOBILE PHONE: 07035002147

E-mail: ezenwobodochy24@gmail.com

DOI: <https://doi.org/10.55248/gengpi.5.0424.1041>

ABSTRACT :

The study assessed the factors influencing lecturers' adoption and integration of biological software packages (bsp) in the Teaching and Learning of biology in Colleges of Education in South Eastern Nigeria, particularly Anambra and Enugu. The research design was descriptive survey research design. The study was guided by three research questions and two null hypotheses. The population of the study was 60, which consisted of lecturers from all the government colleges of Education in Anambra and Enugu; 10 from Enugu state college of Education Technical (Escet), 17 from Federal college of Education, Eha-Amufu, 23 from Federal College of Education (Technical), Umuze and 10 from Nwafor Orizu College of Education Nsugbe. All the subjects were used because the population of study was small. The instrument for data collection was a structured questionnaire. To ensure the validity of the instrument the researcher submitted the questionnaire to two experts in biology and measurement and evaluation, in Nsugbe and Eha-amufu. The reliability coefficient was established as 0.72 using test-retest method. Mean and standard deviation was used to answer the three research questions, while chi-square was used to answer the two null hypotheses at 0.05 level of significance. The findings of this study among others showed that inadequate training, seminars, workshops and conferences for lecturers on the use of bsp hinders lecturer's adoption and integration of bsp in teaching biology. Also the improvement of the computer laboratories in biology department improves the use of bsp in teaching and learning of biology. A recommendation made among others was that enough time should be allocated for the use of bsp in biology time table.

Keywords: biological software packages, bsp, colleges of education, descriptive Survey, Questionnaire.

Introduction :

Over the years, a lot of innovations have been integrated into college biology like Biological Oceanography, Evolution of infectious diseases, Cellular and molecular neuroscience laboratory, human cadaver dissection, Genetics, Anatomy, Ecology, Evolution, Biodiversity, marine biology, cancer biology, industrial biotechnology and so on. These concepts are really difficult to teach by the help of board and marker hence varieties of digital devices can be used for its effectiveness. Several biology teaching related software or digital resources are available in the Internet. Each software has separate functions and applications. Teachers can choose any application/software on the basis of nature of their subject matter. Biology teachers can use digital resources in varieties of ways to support their teaching-learning process, for that regard, they required high level of computer competency. Today there are several popular technological tools that are widely used in biology education. A number of software packages for biology courses are available such as Bioperl, ExPERt, RNAFold, R-project, VectorNTI, Bfast, Boost, FASTA, Cufflinks e.t.c., for education as well as research.

The field of biology has been affected by ICTs, which have undoubtedly affected teaching, learning and research (Adesanya, 2015). A great deal of research has proven the benefits to the quality of biology. ICTs have the potential to innovate, accelerate, enrich and deepen skills, to motivate and engage students, to help relate school experience to work practice, create economic viability for tomorrow's workers, as well as strengthening teaching and helping schools change (Okafor, 2020). According to Azuka (2003) "no nation can develop without technology and science. Okoye (2008) in her own contribution contends that biology is the bedrock on which modern day technological breakthrough is hinged. It was the light of this that Ibrahim (2018) opined that biology as a branch of science and pre-requisite subject for many fields of learning contributes immensely to the technological growth of any nation.

Many of the research report shows ICT is very supportive for teachers and students to learn biology easily and effectively. Dynamic software program, support students' collaboration and creative reasoning in biology practicals. Video classrooms, e-lesson preparation rooms, microteaching classrooms and Interactive Whiteboard for the training of teaching methods, become popular under multi-function classrooms. Computer software provides new opportunity to the teacher for better biology teaching. Pachemska et al (2014) found that biology achievement of ICT applied class students were very higher than other students. Genetics, evolution, epidemiology, anatomy e.t.c can easily be thought using *GelSite*, *Biodom Software*, *Bowtie*, *Bfast*, *RSEM*, *Bioperl*, *ExPERt*, *RNAFold*, *R-project*, *VectorNTI*, e.t.c.

ICT should be integrated into the curriculum and required hardware and software related ICT instruments should also be well managed in schools. ICT is useful for graphic representation, diagram drawing and to give real concept of genetic figure during teaching and learning period of biology. Several technological tools should be managed in the classroom for biology teaching such as computer applications, presentation technologies, digital and mobile technologies, and the Internet.

Keong, Horani& Daniel (2005) found some softwares used by Biology teachers in teaching such as; processing packages, spreadsheets, search engines, presentation software and drill and practice software. Teachers have to maximize the input of ICT in biology teaching as an instructional tool, developing knowledge of different relevant software and multimedia, and incorporating the use of convenient ICT equipments in teaching practices. R. F. Church house et al. (1986) mentioned four types of computer implications in the biology classrooms as graphic possibilities, self-evaluation and individualized instruction, assessment and recording and students errors.

A number of researches vividly pointed out the importance of biology softwares essentially, as it relates to inculcation of biological innovations and improvements among teachers and students. Biological softwares are established fundamentally to provide wide range of solutions to both simple and complex biology and chemistry problems in a fast and accurate manner. It encourages both individual and group usage. It encourages both teachers and students to spend less time in finding the solutions to problems rather to spend more time implementing the solutions already found. Teachers are expected to be abreast with the current and appropriate software packages to use that will be suitable and understandable at every level of their teaching bearing in mind the level of students they are teaching.

Statement of the Problem

Biology and Science students in general can only achieve their educational goal when there is provision of relevant resources, effective and efficient for their learning. Software packages are of great help in fulfillment of staff and students' educational needs. A well stocked computer laboratory in biology departments can make a difference in terms of school educational achievement and performance. Over the years there's been decline in the standard of biology being taught in colleges of education, especially in south-eastern part of Nigeria. The standard is dropping on a regular basis, and it has affected the quality of biology graduates being produced. This has been greatly attributed to the lack of biological software packages usage in schools.

Angaye (2005) noted that the problem of information technology illiteracy was a serious one among teachers in the country as it cuts across primary, secondary and tertiary institutions. He said that many teachers in the country did not have basic computer appreciation skills and noted that the problem was a hindrance to efforts at achieving the use of computers for educational purpose in schools. Busari (2006) is of the view that poor reading skills of science and technology students, the state of laboratory facilities, and dearth of science text books affect effective teaching and learning of science subjects.

Teachers' nonchalance to the use of ICTs in teaching biology has also contributed to the decline in the standard of education. According to Azuka (2003) the decline in the teaching of biology in colleges of education is highly contributed to the unavailability and use of technology in the teaching and learning process. This decline in the educational standard is not only affecting the colleges of education but also the basic and secondary schools as well. Because students at colleges of education are being trained to be teachers. Biology as a subject has evolved over the years; there have been a lot of innovations, improvements and developments. This evolution include the creation and introduction of biological related Software packages to biology, which most students and lecturers have not fully gotten acclimatized with and this in turn have reduced the academic standard of biology graduates especially in colleges of education.

Therefore, it is against this background, that the researcher wants to investigate the factors hindering lecturers' adoption and integration of biological software packages in the teaching and learning of biology in colleges of education in Anambra and Enugu.

Significance of the Study

The findings from this study will help the administration of the school system to come up with measures, policies that will bring about effective teaching and learning of biology in our colleges of education so as to improve the performance of students in biology.

The study when successfully completed will create in the teachers of biology the importance of the use of biology software packages towards effective teaching of biology.

The study will also create in the students of biology the pertinence of the use of these software packages in effective learning of biology. Thus, the students can then study and learn the subject on their own pace and with little or no assistance from the teachers, thereby reducing the problems encountered by lack of biology teachers.

The findings also serve as reference materials for further researches.

The study will also help learners in the study of other subjects effectively since biology is a pre-requisite for the study of some science courses.

The curriculum and education policy makers will also benefit from the result of the findings and will lay emphasis on the problems associated with the use of these software packages in the teaching and learning of biology in schools as well as ways of correcting them.

Research Questions:

The following Research questions guided the study

1. What are the challenges facing lecturers' implementation of biological software packages in teaching biology in colleges of Education in South Eastern Nigeria?
2. What are the types of biological software packages that are appropriate for lecturers to use in teaching biology in colleges of education?
3. Does the use of biological software packages enhance the teaching of biology in colleges of education?

Research Hypothesis

Two Null hypotheses were tested at 0.05 level of significance

1. There is no significant difference in the challenges encountered by lecturers when implementing various biological software packages in teaching biology in colleges of education in South Eastern Nigeria.
2. The use of biological Software Packages does not significantly enhance teaching and learning of biology in colleges of Education

Method

The study employed descriptive survey research design. The areas of study were Anambra and Enugu States of Nigeria. The study covers all Government Colleges of Education in the two states. There are two government owned colleges of Education in Anambra State; Nwafor Orizu College of Education Nsugbe, and Federal College of Education (Technical), Umuze. There are two government owned colleges of Education in Enugu namely; Federal college of Education, Eha-Amufu and Enugu state college of Education (Technical), Enugu. The population of the study was 60 lecturers, which consists of biology lecturers from all the government colleges of Education in Anambra and Enugu; 10 from Enugu state college of Education Technical (Escet), 17 from Federal college of Education, Eha-Amufu, 23 from Federal College of Education (Technical), Umuze and 10 from Nwafor Orizu College of Education Nsugbe. All the subjects in the population were used. A purposive sampling technique where the whole population is selected was adopted. This type of sampling method is used when the population of study is small. Due to the fact that the population was small, the researchers decided to use the entire population of 60 lecturers. The lecturers are the respondents. Structured Questionnaires constructed in a 4-point scale type format was used as instrument for collecting data from the respondents. Mean and standard deviation was used to answer the research questions. Chi-square was used to test the hypotheses at 0.05 level of significance. The mean value of 2.50 and above was accepted while mean value below 2.50 was rejected.

Presentation and Analysis of Data

Research Question 1: What are the challenges facing lecturers' implementation of biological software packages (bsp) in teaching biology in colleges of Education in South Eastern Nigeria?

Table 1: The responses of lecturers on the possible challenges hindering the effective implementation of bsp in teaching biology in colleges of Education in South Eastern Nigeria.

S/N	Items	VO	O	R	VR	N	\bar{X}	S.D	D
1.	Inadequate training, seminars, Workshops and conferences for Lecturers on the use of bsp in Teaching biology	24	20	9	7	60	3.02	0.98	Accepted
2.	Inadequate time allocation for Computer lab practicals in biology departments.	19	17	16	8	60	2.78	0.80	Accepted
3.	Inadequate maintenance of Computer laboratories in biology departments.	20	20	12	8	60	2.87	1.01	Accepted
4.	Unstable/inconsistent power Supply in schools	21	18	15	6	60	2.90	0.97	Accepted
5.	Inadequate motivation/incentives to embrace bsp	17	18	16	9	60	2.72	1.03	Accepted

6.	Students indifference towards the use of bsp in learning biology	15	17	15	13	60	2.57	1.08	Accepted
7.	Inadequate supply of modern computers that are bsp friendly	21	19	7	13	60	2.80	1.14	Accepted
Total		137	129	90	64				

From table 1 above, we can see that the mean responses of lecturers are above 2.50. This shows that the lecturers are of the opinion that inadequate maintenance of computer labs, unstable power supply, insufficient modern computers and inadequate training hinders them from implementing bsp in their teaching.

Research question 2: What are the types of bsp that are appropriate for lecturers to use in teaching biology in colleges of education?

Table 2: The mean responses of lecturers on the types of bsp suitable for teaching in colleges of education.

S/N	items	SA	A	D	SD	N	\bar{X}	S.D	D
8	GelSite	22	20	10	8	60	2.93	0.76	Accepted
9	Genamics Expression	14	19	16	11	60	2.60	1.04	Accepted
10	Data Pilot	19	16	15	10	60	2.73	1.09	Accepted
11	Cell Illustrator	20	17	12	11	60	2.77	1.09	Accepted
12	BioTest	13	20	12	15	60	2.52	1.08	Accepted
13	Biodom Software	21	15	10	14	60	2.72	1.16	Accepted
14	aminoXpress	15	18	20	7	60	2.68	0.98	Accepted

From table 2 above, all the items were accepted because their mean is more than 2.50. This means that lecturers are of the opinion that these Software packages are appropriate for the teaching of biology in colleges of Education.

Research question 3: Does the use of bsp enhance the teaching of biology in colleges of education.

Table 3: The mean responses of lecturers to whether the use biological software packages enhance teaching of biology.

S/N	ITEMS	SA	A	D	SD	N	\bar{X}	S.D	D
15	Bsp makes learning biology easier	15	19	15	11	60	2.63	1.19	Accepted
16	Bsp saves time	14	18	15	13	60	2.55	1.07	Accepted
17	Bsp makes lecturers lazy	10	7	19	24	60	2.05	1.09	Rejected
18	Bsp improves lecturers knowledge of computer and biology	20	20	11	9	60	2.85	1.05	Accepted
19	Bsp encourages implementation of results by reducing time and energy spent in finding the result	14	19	12	15	60	2.53	1.11	Accepted
20	Bsp offer the learners the opportunity to be creative, imaginative and positioned to acquire reasonable knowledge	21	15	9	15	60	2.70	1.19	Accepted
Total		94	98	81	87				

From item 15,16,18,19,20 we can see that lecturers are of the opinion that the use of biological software packages enhances the teaching of biology. From item 17, we can see that lecturers are not of the opinion that the use biological software packages make them lazy.

Research Hypothesis 1: There is no significant difference in the challenges encountered by lecturers when implementing various biological software packages in teaching biology in colleges of education in South Eastern Nigeria.

Table 4: Summary of research hypothesis 1, using chi-square analysis.

No. of Lecturers	DF	χ^2 Cal	χ^2 Crit	Level of Sign.	Decision
------------------	----	--------------	---------------	----------------	----------

60	18	14.4282	28.869	0.05	Accepted
----	----	---------	--------	------	----------

From table 4 above, the critical chi-square value at 18 d.f and 0.05 level of significance is 28.869, which is greater than the calculated value (χ^2_{cal}). Therefore, we accepted the null hypothesis. Hence there is no significant difference in the challenges encountered by lecturers when implementing various biological software packages in teaching biology in colleges of education in South Eastern Nigeria.

Research Hypothesis 2: The use of biological Software Packages does not significantly enhance teaching and learning of biology in colleges of Education.

Table 5: Summary of research hypothesis 2, using chi-square analysis.

No. of Lecturers	DF	χ^2_{Cal}	χ^2_{Crit}	Level of Sign.	Decision
60	15	26.8018	24.996	0.05	Rejected

From table 5 above, the critical chi-square value at 15 d.f and 0.05 level of significance is 24.996, which is less than the calculated value (χ^2_{cal}). Hence we reject the null hypothesis. Hence the use of biological software packages enhances teaching and learning of biology in colleges of Education.

Summary of Findings

From the study, the following findings were made:

- The use of biological software packages enhances the teaching and learning of biology.
- Biological software packages like *GelSite*, Genamics Expression, *Data Pilot*, Cell Illustrator e.t.c are appropriate for teaching biology in colleges of Education.
- Inadequate maintenance of computer labs, unstable power supply, insufficient modern computers and lack of lecturers' acquaintance with the softwares hinders lecturers from using bsp in teaching biology.
- Improvement of computer laboratories in biology departments and training of lecturers in the use of bsp will improve the use of bsp in teaching of biology in colleges of education.
- The use of biological software packages does not make lecturers lazy.

Discussion of the findings

The findings in research question 1, shows that the lecturers are of the opinion that inadequate maintenance of computer labs, unstable power supply, insufficient modern computers and inadequate training hinders them from implementing bsp in their teaching. Findings from research question 2, shows that *GelSite*, Genamics Expression, *Data Pilot*, Cell Illustrator, BioTest, *Biodom Software* and *aminoXpress* are suitable for teaching of biology in colleges of education. The findings from research question 3 clearly showed that lecturers are of the opinion that the use of biological software packages enhances the teaching of biology. Null hypothesis 1 was tested against research question 1. The result showed that there is no significant difference in the challenges encountered by lecturers when implementing various biological software packages in teaching biology in Colleges of Education in South Eastern Nigeria. Null hypothesis 2 was tested against research question 3. The result showed that the use of biological software packages enhances teaching and learning of biology in colleges of Education.

Implications of the Findings

The educational implications of the findings are stated as follows:

- Biological Software packages makes learning biology easier
- Inadequate training, seminars, workshops and conferences for lecturers on the use of biological software packages in teaching biology hinders lecturers' implementation of it.
- Students' indifference towards the use of bsp in learning biology is a challenge hindering lecturers from using it in their teaching.
- Bsp offer the learners the opportunity to be creative, imaginative and positioned to acquire reasonable knowledge.
- Bsp improves lecturers knowledge of computer and biology

Conclusion

The results drawn from this study has clearly identified some challenges lecturers are facing in adopting and using bsp in the teaching of biology in colleges of Education. Also the study showed that the use of biological software packages enhances the teaching and learning of biology in colleges of education. The study also revealed that the improvement of computer laboratories in biology departments may improve the use of biological software packages. Additionally, the study identified some biological software packages that are suitable for teaching and learning of biology in colleges of education.

Recommendations

The following recommendations were made based on the findings:

1. Lecturers should take advantage of the ongoing in-service training on biological software packages (bsp) by participating with enthusiasm and partnering with organizers to expand the tenure of such training or workshops
2. There should be steady supply of electricity in schools to enhance effective use of the computer laboratories in biology department.
3. Qualified computer technologist/analysts should be employed in colleges of education to assist the biology lecturers in using bsp
4. Newer versions of the softwares should be regularly checked and updated for effective use.
5. Enough time should be allocated by the departments for bsp training and usage in the time table.
6. Policy makers and curriculum planners should encourage the educational computer knowledge which is a viable option for improving the use of bsp. This should be done through in-service training, workshops and conferences.
7. More funds should be provided by the government for procurement of modern computers, installation of modern versions of bsp and maintenance of the computer laboratories in biology departments.

REFERENCES :

1. Adesanya, O. O. (2015). Strategies for improving biology education in Nigerian secondary schools (Doctoral dissertation). University of Lagos, Nigeria.
2. Azuka, D.S. (2003) *Journal of Educational Psychologist Volume 26, 3-4*
3. Busari, N.G. (2006) Students' Perception of Teachers' Characteristics and their attitude Towards biology in Oron Education Zone, Nigeria. *International Education Studies; 6(2)2013. 1913-9020.*
4. Ibrahim, S. A. (2018). Teaching biology through inquiry: A case study of Nigerian high schools. In M. J. Williams & E. O. Johnson (Eds.), *Innovations in Science Education* (pp. 87-102). Springer.
5. Keong, C. C., Horani, S., & Daniel, J. (2005). A Study on the Use of ICT in Science teaching. *Malaysian Online Journal of Instructional Technology (MOJIT)*, 2(3), 43–51.
6. Okafor, C. U. (2020). Integrating technology in biology education in Nigeria. *Nigerian Journal of Educational Technology*. Retrieved from <https://www.njet.com/articles/integrating-technology-in-biology-education>
7. Okoye, M.B (2008). Community involvement practice for facilitating secondary school administration in Enugu state. *Unpublished Ph.D. Thesis. UNN.*
8. Pachemska, S., Pachemska, T. A., Iliev D. &Kuzmanovska, M. S. (2014). Analyses of student's achievement depending on biology teaching methods. *Procedia - Social and Behavioral Sciences 116*, 4035 – 4039
9. R. F. Churchhouse et al. (1986). *The Influence of Computers and Informatics on Biology and its Teaching* 24-38. Cambridge University Press, Chapter DOI: <http://dx.doi.org/10.1017/CBO9781139013482.004>