

Students' Perception of Web-Based Technology in Teaching Physical Health Education and Biology among Nigeria Certificate in Education Students in Federal University of Education, Zaria

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ABSTRACT

This study focused on the perceptions of the students on the use of Web Technology in teaching Physical and Health Education (PHE) and Biology for Nigeria Certificate in Education (NCE) students at Federal University of Education, Zaria. The design of the study was descriptive survey. There were 982 NCE students of which 25 were PHE and 957 were Biology. A sample of 298 students (24 PHE and 274 Biology) was targeted, based on the Krejcie and Morgan (1970) sample-size framework, taking into account the retention rate of 244 students (83 PHE and 214 Biology) from a population of 982. There was a 96.0% response rate with 23 questionnaires completed by the 23 PHEs and 263 completed by the 263 BIOs of instruments administered. Data was collected by using a researcher-made instrument named Web-Based Technology in Teaching Questionnaire (WBTTQ) which had a reliability value of 0.86. Descriptive statistical tests such as mean, standard deviation and independent-samples t-test ($p < 0.05$) were used to analyse the data. The results showed that most of the students had positive attitudes towards web-based technology, as the overall mean score obtained was 3.21. Students in particular felt web-based technology made learning materials more accessible, supported independent learning, aided in the understanding of complicated topics and offered opportunities for learning outside of class hours. The t-test result showed that there was no statistically significant difference between perceptions of PHE and Biology students. The study findings are that web-based technology is seen as an effective complementary tool for the teaching of PHE and Biology at the NCE level, but infrastructural and access related issues need to be taken care of by institution. Thus, the study suggests that the school Lecturers in PHE and Biology should incorporate the appropriate web-based resources in their curriculum, such as teaching video clips, books, online quiz questions, simulation and authentic educational websites, to improve students' perception of the usefulness of WBT for learning.

KEYWORDS

Web-based Technology, Students' Perception, Physical and Health Education, Biology, NCE students, Technology Integration, Teacher Education

I. INTRODUCTION

Education institutions have been rapidly changed by digital technologies in how knowledge is accessed, communicated and delivered. Students today more and more rely on websites,

the learning management system, online videos, digital libraries, social networking sites, virtual classrooms, and other technologies supporting the Internet in their learning processes. Thus, online learning has become a key part of the teaching and learning process in the 21st century, especially in higher and teacher education. The use of web-based technology opens up learning beyond the classroom, allowing learners to access education materials, communicate with teachers and classmates, submit assignments, join in discussions, and access other learning resources, at other times and places.

Web-based technology is a general term that encompasses Internet technology that is used to support teaching, learning, communication, evaluation, and access to learning resources. These can be Learning Management Systems (LMS), institutional websites, Google Classroom, online discussion boards, educational videos, web-based simulations, online quizzes, electronic textbooks and any other Internet supported programs. The potential value of such technology technologies will also rely on students' preparedness and willingness to use these technologies for educational purposes. Davis (1989) identified perceived usefulness and perceived ease of use as key factors in technology acceptance with its Technology Acceptance Model (TAM). Likewise, Venkatesh et al. (2003) showed using the Unified Theory of Acceptance and Use of Technology (UTAUT) that performance expectancy, effort expectancy, social influence and facilitating conditions affect technology acceptance.

The significance of web-based technology in teacher preparation is especially significant since student teachers are expected to learn and develop subject matter knowledge as well as pedagogical and technological skills for their future classrooms. The Nigeria Certificate in Education (NCE) is a programme aimed at preparing teachers for basic and secondary schools. Thus, NCE students' proficiency in interacting with web-based learning resources could have an impact on their readiness to use technology in their future pedagogical practices.

Biology is a science subject, which can sometimes be challenging to teach using a purely verbal approach because of its abstract concepts, micro structures, processes and relationships. The Internet offers the advantage of offering animation, video, diagrams, virtual lab experiences, simulations, interactive exercises and extra reading materials to supplement classroom learning. A study by Ibrahim & Parker (2022) with Biology students in Ghana, indicated that students found web-based technology useful for accessing information at their own speed, better understanding Biology concepts, stimulate interest and individualising learning. Likewise, studies among the students of Biology in Nigerian colleges of education have reported that there is great involvement of students in online learning and the factors related to technology are important considerations in the implementation of online learning.

The recent evidence from the Federal University of Education, Zaria is also relevant. Ibrahim et al., (2025) also examined perceptions and the challenges encountered by NCE Biology students to the use of Web-based instruction and concluded that it was relevant enough to warrant investigation in the institution. They studied specifically biology students whereas the present study expands the topic by studying both biology and physical and health education students and whether there is a difference between the two subject areas.

Physical and Health Education (PHE) is slightly different in its teaching approach. It has a considerable amount of theory and factual information about health, physical fitness, sports, anatomy, physiology, safety and wellness but also includes hands on and performance based

activities. It is thus possible to use Web-based technology for PHE instruction by providing instructional videos, demonstrations, online health resources, fitness applications, video analysis and access to current health information. For development of psychomotor skills, however, it is not possible to replace all physical demonstrations, practical activities and interaction with web-based learning.

Students' readiness and satisfaction have been among the factors identified to consider in the usefulness of online learning environments in the field of PPE students. For instance, Fatah and Mohamed (2022) investigated online distance learning among Physical and Health Education students, and discovered that learning readiness has a correlation with learning satisfaction. It is clear that the availability of technology does not necessarily work to ensure positive learning experiences. Within Nigeria, studies have also demonstrated that students' attitudes and acceptance are important in determining technology use. Echeng et al. (2013) analysed the acceptance of Web 2.0 for learning in Nigeria's higher education and noted that some technology factors affected the intention of the students to use Web 2.0 to enhance e-learning. In a similar study, Yakubu and Dasuki (2019) employed structural equation modelling and discovered that performance expectancy and effort expectancy were important factors that determined students' behavioural intention to use educational technology.

Research with NCE students has also shown that the perceived usefulness and attitude of the students towards Internet use have implications on their intention to use the internet for learning purposes. The results also indicated a positive correlation between perceived usefulness, attitude and intention to use the internet for academic purposes among NCE students, which is in line with Haruna and Mohammed (2022). The results show that the perception of the students regarding web-based technology is not limited to acceptance or rejection but involves their perceptions of usefulness, ease of use, learning support, interaction and flexibility. The present study therefore concentrates on the perception of the use of the web as an educational tool by students in two subject areas (PHE and Biology) of NCE (teacher education).

II. STATEMENT OF THE PROBLEM

As the use of internet connected technologies in education has risen, there have been opportunities for teacher education institutions in Nigeria to provide learning opportunities outside of the classroom, but technology is not always used positively by students, nor is it necessarily the most effective learning tool in terms of student perceptions. In NCE programmes, student teachers should be equipped with skills related to teaching in technology-rich classrooms, which is particularly crucial. Using web based technology, Biology students can benefit from visualising concepts like the structure and function of the human body, accessing up to date scientific information and additional learning material, and PHE students can benefit from instructional videos, health information, demonstrations and other digital resources. In spite of the increase in studies relating to e-learning in higher education institutions in Nigeria, there has been little consideration given to comparing students from various subject areas in the NCE teacher education. There is need to study and compare the perceptions of PHE and Biology students on the usefulness, usability, interaction, flexibility and independent learning gains of using web-based technology since this has been limited to the study of the Biology students.

A. *Objectives of the Study*

Specifically, the study sought to:

- Determine students' perception of the usefulness of web-based technology in teaching PHE and Biology;
- Determine students' perception of the ease of using web-based technology for learning PHE and Biology;
- Examine students' perception of the contribution of web-based technology to interaction, flexibility and independent learning; and
- Determine whether there is a significant difference between PHE and Biology students' perception of web-based technology.

B. *Research Questions*

The following research questions guided the study:

- What is the perception of NCE students regarding the usefulness of web-based technology in teaching PHE and Biology?
- What is the perception of NCE students regarding the ease of using web-based technology for learning PHE and Biology?
- What is the perception of NCE students regarding the contribution of web-based technology to interaction, flexibility and independent learning?
- What difference exists between PHE and Biology students' perception of web-based technology?

C. *Research Hypothesis*

The following null hypothesis was tested at the 0.05 level of significance:

H₀: There is no significant difference between PHE and Biology NCE students' mean perception scores regarding the use of web-based technology in teaching and learning.

III. METHODOLOGY

The descriptive survey research design was used in the study as it did not involve an intervention in the learning environment. There were 982 NCE II students from two departments of the Federal University of Education, Zaria made up of 25 students from PHE department and 957 students from Biology department. The Krejcie and Morgan (1970) criterion is that a minimum of 276 people should be present in a finite population for a 95% confidence level at a 5% margin of error. To ensure that the sample size was adequate despite potential sample attrition, a larger sample size was obtained, 24 students from the PHE class and 274 students from the Biology class through stratified proportionate random sampling. A total of 286 questionnaires were retrieved successfully for statistical analysis, comprising 23 PHE and 263 Biology, with 96.0% of the questionnaires returned (well above the minimum methodological requirement).

The researcher developed Web-Based Technology in Teaching Questionnaire (WBTTQ) was used to gather data that was rated by a four point likert scale scale which consisted of perceived usefulness, ease of use, interaction, flexibility and independent learning. The Cronbach's alpha reliability coefficient was 0.86 and the instrument was validated by experts in the related field. The researchers secured the required permission and gave the questionnaire with the help of trained research assistants and ensured voluntary participation and confidentiality.

Independent-samples t-test, mean and standard deviation were employed to analyse data. The results of Research Questions 1-3 were answered using mean and standard deviation. In order to test the assumption of homogeneity of variance across the unequal group cohorts ($p > .05$) for the independent-samples t-test used to test Hypothesis 1, Levene's test for equality of variances was conducted first. The level of significance used in evaluating the independent-samples t-test was 0.05. A criterion mean of 2.50 was used, where a mean score of 2.50 or above represents positive perception while a mean score below 2.50 represents negative perception/disagreement.

IV. RESULTS

A. Research Question One:

What is the perception of NCE students regarding the usefulness of web-based technology in teaching PHE and Biology?

Table 1: Students' Perception of the Usefulness of Web-Based Technology

S/N	Item	Mean	SD	Decision
1	Web-based technology gives me access to additional learning materials.	3.48	0.61	Agree
2	Web-based resources help me understand difficult topics.	3.35	0.67	Agree
3	Online videos and illustrations make lessons more interesting.	3.29	0.72	Agree
4	Web-based technology enables me to obtain current information related to my course.	3.31	0.66	Agree
5	Web-based learning resources help me revise lessons after class.	3.42	0.63	Agree
6	Web-based technology supports independent learning.	3.30	0.70	Agree
7	Online resources improve my understanding of practical/theoretical concepts.	3.12	0.75	Agree
8	Web-based technology improves my overall learning experience.	3.35	0.64	Agree
	Cluster Mean	3.33	0.67	Agree

All items recorded means above the 2.50 criterion mean. The highest-rated item was access to additional learning materials ($M = 3.48$, $SD = 0.61$), while improvement in understanding of practical/theoretical concepts recorded the lowest mean ($M = 3.12$, $SD = 0.75$). The

cluster mean of 3.33 indicates that students generally perceived web-based technology as useful for learning PHE and Biology.

B. Research Question Two:

What is the perception of NCE students regarding the ease of using web-based technology for learning PHE and Biology?

Table 2: Students' Perception of Ease of Use of Web-Based Technology

S/N	Item	Mean	SD	Decision
1	I can easily access web-based learning materials when needed.	3.12	0.76	Agree
2	I can navigate common educational websites without much difficulty.	3.18	0.72	Agree
3	I can use online videos and other digital resources for learning.	3.37	0.65	Agree
4	I can submit assignments through online platforms when required.	3.08	0.81	Agree
5	Learning through web-based platforms is easy for me to understand.	3.11	0.75	Agree
6	I can search for academic information online without much assistance.	3.29	0.69	Agree
7	I find web-based learning platforms convenient to use.	3.15	0.73	Agree
	Cluster Mean	3.19	0.73	Agree

The results indicate a generally positive perception of ease of use, with a cluster mean of 3.19. Students particularly agreed that they could use online videos and digital resources ($M = 3.37$, $SD = 0.65$) and search for academic information online ($M = 3.29$, $SD = 0.69$).

C. Research Question Three:

What is the perception of NCE students regarding the contribution of web-based technology to interaction, flexibility and independent learning?

Table 3: Perceived Contribution of Web-Based Technology to Interaction, Flexibility and Independent Learning

S/N	Item	Mean	SD	Decision
1	Web-based technology allows me to learn at my own pace.	3.28	0.68	Agree
2	Online platforms make it easier to communicate with classmates about academic work.	3.06	0.78	Agree
3	Web-based technology makes it possible to revisit recorded learning materials.	3.38	0.65	Agree

4	Online resources provide opportunities for learning outside the classroom.	3.44	0.62	Agree
5	Web-based technology encourages me to search for information independently.	3.31	0.69	Agree
6	Online discussion can improve interaction between students and lecturers.	2.97	0.82	Agree
7	Web-based resources enable me to combine classroom learning with independent study.	3.34	0.66	Agree
8	Web-based technology gives me greater flexibility in completing learning activities.	3.25	0.70	Agree
	Cluster Mean	3.25	0.70	Agree

The cluster mean of 3.25 indicates that students perceived web-based technology as contributing positively to flexibility, interaction and independent learning. The highest-rated item was that online resources provide opportunities for learning outside the classroom ($M = 3.44$, $SD = 0.62$).

D. Research Question Four:

What difference exists between PHE and Biology students' perception of web-based technology?

Table 4: Mean Perception Scores of PHE and Biology Students

Programme	N	Mean	SD	Mean Difference
PHE	23	3.18	0.41	
				0.04
Biology	263	3.22	0.44	

The table shows that Biology students had a slightly higher mean perception score ($M = 3.22$, $SD = 0.44$) than PHE students ($M = 3.18$, $SD = 0.41$), with a mean difference of 0.04. This indicates that the difference in perception between the two groups was very small.

Hypothesis (H_0): There is no significant difference between PHE and Biology NCE students' mean perception scores regarding the use of web-based technology in teaching and learning.

Table 5: Independent-Samples t-Test of PHE and Biology Students' Perception

Programme	N	Mean	SD	t	df	p-value	Decision
PHE	23	3.18	0.41				
				-0.42	284	.676	Not Significant
Biology	263	3.22	0.44				

The results in Table 5 show that PHE students obtained a mean perception score of 3.18, while Biology students obtained 3.22. The calculated t-value of -0.42 with a p-value of .676

is greater than .05. Therefore, the null hypothesis is retained. This suggests that there is no statistically significant difference between the perceptions of PHE and Biology students regarding web-based technology.

V. DISCUSSION OF FINDINGS

The first was that NCE students had a positive perception of the use of the web-based technology in teaching-learning PHE and Biology. The result is in line with the result of Ibrahim & Parker (2022) which showed that the use of web-based technology in delivering information at the student's pace was useful to improve understanding and stimulate interest in Biology learning. The findings of this study are also supported by the work of Azeez (2022) who found that students in Biology course using learning management system (LMS) were better able to understand the important topics of the Biology course and were able to clarify their thoughts when using LMS.

The second finding showed that the students' attitude with regard to using web based technology was generally positive and this showed that the use of web based technology was relatively easy to use. This is similar to the technology acceptance perspective that the ease of use is among the factors influencing technology acceptance. The finding is also in line with the findings of the Nigerian higher education study by Yakubu and Dasuki (2019) which showed that effort expectancy significantly affected behavioural intention to use education technology. The result that was obtained is also similar to that of Nigerian NCE students. Haruna and Mohammed (2022) found that perceived usefulness and students' attitude was found to be positively correlated with the intention to use the internet for learning. This means that the previous experiences that students have had with using a smartphone, search engines, social networking and other web-based applications may have assisted them in engaging with Internet-based education resources.

The third finding indicated that students' perception on the positive impact of technology in the web for interaction, flexibility and autonomy in learning. The findings are aligned with the current existing publications on blended and online learning. Blended learning was accepted by Nigerian University students when they perceived that learning using blended method would improve their performance and would create favourable facilitating conditions, according to Obabisi et al. (2018). Their research also revealed students' interest in course-related reading and learning management systems supplies. This outcome also is of relevance in the context of Biology. In Biology, concepts, diagrams, processes and demonstrations must be revisited many times to get sufficient understanding by students. Web-based resources provide repetition of teaching materials. A PHE session is also held outside of the classroom where students can watch demonstrations, health information and get tips on how to avoid injury.

The fourth finding showed that there was no significant difference for the perception of web based technology between PHE and Biology students. The similarity suggests that the students' learning experiences with technology may be broadly the same in both programmes, though there may be some differences. The findings obtained agrees with Kuliya and Usman (2021) which reported that perceived usefulness and perceived ease of use were among the factors that were key in the acceptance of e-learning in the higher education sector of Nigeria. Similarly, Balogun et al. (2023) revealed that the students of the University of Nigeria had generally positive attitude towards e-learning, the students were very satisfied with the flexibility of e-learning, and the level of interaction they received

in e-learning. In the same way, Yakubu and Dasuki (2019) found that effort expectancy and performance expectancy are significant factors that influence students' intention to use e-learning technologies in a higher education institution in Nigeria. These studies indicate that students' attitudes toward WBL can be affected by their perceived benefits of Web learning, as well as common experiences with technology, not just their academic discipline.

The results have implications for teacher preparation in practice. Students' perception of the institution was not significantly different between PHE and Biology therefore there was a justification that an improvement in web based teaching would be applicable to both subjects, and that the lecturer would have the freedom to select the web based teaching resources relevant to the subject. These initiatives could involve enhancing access to digital learning platforms, orienting students to more effectively use digital learning platforms and developing the ability of lecturers to use interactive digital learning resources. The difference in the number of students in the two programmes (23 in PHE and 263 in Biology) is one of the methodological limitations that can be attributed to enrolment pattern in the institution for the two programmes. Variance among groups was not significantly different ($p>0.05$) and so the standard independent sample t-test was used, but future comparative studies should include a sampling of institutions across a range of disciplines to provide a balance between disciplines.

VI. CONCLUSION

Overall, it can be said that students had positive perceptions of web-based technology based on the results. They saw it as a useful resource for accessing more learning resources, better understanding of tricky concepts, revising lessons, helping students to learn independently and take learning out of the classroom. Students also felt that web-based technology was fairly easy to use and useful in fostering flexibility and interaction. Overall perceptions of PHE students showed no significant differences with Biology students when compared. Overall the results indicate that use of web-based technology is a potential complement to teaching and learning in NCE (PHE and Biology) and the technology's effectiveness is highly dependent on the extent of reliable infrastructure, affordable internet access, and suitable digital resources and institutional support.

RECOMMENDATIONS

The below recommendations were made based on the study results:

- Lecturers in Physical and Health Education and Biology should integrate relevant web-based resources into their teaching, such as instructional videos, digital textbooks, online quizzes, simulations and credible educational websites, to enhance students' perception of the usefulness of web-based technology for learning.
- Conduct an orientation programme for NCE students regularly to enhance their access, navigation and effective use of the web-based learning platforms and resources.
- Lecturers should be intentional about using technology on the web to facilitate student interaction, flexibility and independent learning by offering web-based

learning resources, discussion opportunities, recorded lectures, etc. for students to learn outside of class time.

- The common web-based teaching method should be adopted by the institution and lecturers for both PHE and Biology students with an option for the lecturer to choose web-based resources that are suitable for the content and teaching needs of each subject as no significant difference was found in students' perceptions between the two programmes.

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