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The Influence of Information and Communication Technology in the Teaching and Learning of Physics

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Abstract. This study analyses the significance of ICT apparatuses and factors influencing the utilization of ICT instruments in educating and learning physics. This investigation utilized a survey research design which involved the participation of 31,765 physics students and 103 physics instructors from selected public and private schools in northwest

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senatorial district of Jigawa State, Nigeria. A total of 379 participants were randomly chosen by 72 physics educators. The information gathered from the pilot study was utilized to figure the unwavering quality coefficient using the split-half technique and the Pearson product moment correlation coefficient (r) for the variables from the pilot study, which gave 0.87. Four exploration questions and four invalids hypotheses were defined to direct the investigation., A chi-square factual apparatus, at a 0.05 level of significance, was used to test the hypotheses. Our findings reveal that the ICT instruments available to impact physics education and learning were very much outfitted down to earth laboratories with ICT devices. ICT instruments ought to have attributes of perceivability, straightforwardness, fascination, and lucidity. The study also found that ICT is critical in influencing physics education and learning. However, educators' experience was the main factor influencing the utilization of ICT devices to impact instruction and learning in senior auxiliary schools. Proposals were made in light of the findings, which include physics educators attempting to use and ad lib ICT apparatuses for effective physics instruction in senior auxiliary schools. Appropriateness of utilizing ICT apparatus as teaching and learning tools in teaching physics is necessary to transmit knowledge to the learners effectively.

Keywords: education; ICT; Instruction; physics; student; learning; teaching

1. Introduction

The impact of Information and Communication Technology (ICT) on advancing instruction and learning in instructional improvement is undeniable (Emeka et al., 2023; Olusegun et al., 2023). Physics is a part of science that deals with energy, matter, and their interaction. It is sometimes referred to as the study of estimation, and its knowledge has greatly aided in the development of instruments and gadgets which have been of enormous benefit to humanity (Titilayo, 2019). In Nigeria, physics is being taught as one of the science subjects at the senior auxiliary school. The significance of physics can't be overemphasized as it frames the reason for mechanical progress in any country (Yusuf et al., 2019). Its investigation can prompt a few logical fields and callings like designing, assembling, mining, and developing enterprises. Likewise, the information on physics assumes a huge part in the monetary advancement of any country (Chukwunenye and Adegoke, 2014). Because of the various benefits of physics, it has been presented in Nigerian schools at the senior level to accomplish the accompanying targets: to impart fundamental physics knowledge to the general public for practical living; to obtain fundamental physics ideas and standards as a foundation for further research; to procure fundamental logical abilities and mentalities as a groundwork for the mechanical utilization of physics; and to animate and improve innovativeness (Yusuf et al., 2019).

The specialist of a subject is dictated by the presentation of the participants in a particular subject at a recommended assessment. Any collaboration between instructors and students is required to obtain the students' accomplishments. Nonetheless, when such action neglects to deliver an adjustment of the student's conduct, then, at that point, there is an issue.

The instructor cannot provide all of the conditions necessary for a viable educational and learning measure. Hence, additional supporting materials must be provided. The participants learn better when the greater part of the faculties is dedicated to the guidance and utilization of data correspondence innovations in the learning of physics, which has added another measurement to the positive advancement of the instruction and learning measures. This provides students with the genuinely required tactile encounters for compelling and significant social change. Data correspondence innovation is intended to work on personal satisfaction and comprehensive training. Its application in education promotes strong scholarly performance of physics students in schools (Emeka et al., 2023; Olusegun et al., 2023).

Education and learning on the planet have progressed past the instructor standing in front of a group of students and disseminating knowledge to them (Nwankwo & Ukhurebor, 2020). Educating has been made simpler by the utilization of innovatively improved tools. Educating is an endeavour to help participants secure or change a few abilities, information, ideals, mentalities, or appreciations (Lison, 2012; Odinakachi et al., 2023). Education has a test that requires extended periods of time and arrangements. As a result, the driving force of effective instruction is primarily dependent on academic educators, whose ability in utilizing data correspondence innovation offices should be related to the participants' exercises (Nneji et al., 2022).

The global pattern is currently revolving around innovative progression in all aspects of human events (Nwankwo et al., 2020; Aidonojie et al., 2023). The emphasis these days is on the application of data innovation in all aspects of life (Asanga et al., 2023). The personal computer (PC) has become a significant instrument in the present society. PC is currently being utilized to do, for all intents and purposes, everything in both public and private areas. Data and ICT devices have evolved into critical tools that have influenced how we perceive and live in the world (Odinakachi et al., 2023). Today, the role of ICTs in education and the world at large cannot be undermined. ICT apparatuses are strife that incorporates the use of PCs, the Web, and other media transmission innovations in all aspects of human endeavour (Emeka et al., 2023). ICT apparatuses are progressively assuming a significant role in associations and in the public's capacity to create access, embrace, and apply data (Asanga et al., 2023).

The field of education has unquestionably been influenced by the pervasive impact of ICT apparatuses both globally and in developed nations; ICT apparatuses have had a significant and astounding impact on the quality and quantity of educating and learning (Odinakachi et al., 2023). The use of ICT tools in education and learning is becoming more common. This is genuine on the grounds that its appropriation by educators will improve compelling instruction. Instruction and learning have gone beyond the educator remaining before a gathering of participants and dispersing data to them without the participants' sufficient cooperation (Olusegun et al., 2023). The use of ICT devices in Nigeria and other African countries is growing and expanding. Nonetheless, there is a lot

of information about how ICT apparatuses are being utilized in created nations just as data on how ICT devices are being utilized by instructors in developed nations to complete their educating and learning exercises across the globe (Onche, 2014; Oguguo et al., 2020). However, in developing countries such as Nigeria, there is little data on how educators use ICT tools to complete their means of teaching and learning-(Egunjobi & Adetunji, 2014).

Physics instruction and learning in senior secondary schools have long been reliant on standard reading material (both familiar and unfamiliar) and the application of teaching techniques. The circumstance has continued in spite of the development and accessibility of PCs and web offices, and a wide scope of physics shows materials that are PC-based. Regardless, there is still limited information about the various ways educators use ICT apparatuses as an instructive device in the instruction and learning measures, as well as the roles of partners in influencing the utilization of ICT in schools in Nigeria. Hence, this study expects to find out whether there are central offices at the senior auxiliary schools and, additionally, whether the educators could utilize these offices enough in the instruction of physics. The objective of this study was to determine the impact of data correspondence innovation apparatuses in educating and learning physics in senior auxiliary schools in the northwest senatorial region of Jigawa state, Nigeria. The study also looked into the impact of data correspondence innovation through ICT apparatuses in teaching and learning physics in senior secondary schools in Jigawa state's northwest senatorial district, and sought answers to the following questions:

1. Are ICT tools used in your school to teach and learn physics?
2. What are the qualities of the ICT instruments utilized in educating and learning physics in senior auxiliary schools in the northwest senatorial area of Jigawa state, Nigeria?
3. What is the significance of ICT apparatuses in educating and learning about physics in senior auxiliary schools in the northwest senatorial region of Jigawa State, Nigeria?
4. What factors influence the use of ICT devices in teaching and learning physics in senior auxiliary schools in the senatorial region of Jigawa state, Nigeria?

Also, the accompanying invalid theories (Ho) were expressed to direct the study.

1. There is no critical relationship between the use of ICT instruments in instruction and learning of physics and participants' academic performance in senatorial region Jigawa state, Nigeria.
2. There is no significant relationship between the qualities of ICT devices used in instruction and learning of physics and participants' scholarly performance in senior auxiliary schools in Jigawa state, Nigeria.
3. There is no critical connection between the significance of utilizing ICT devices in educating and learning physics and u participants' scholarly exhibition in senior auxiliary schools in the senatorial area. Jigawa State, Nigeria
4. There is no significant relationship between the factors influencing the use of ICT devices in educating and learning physics and the participants' academic performance in senior auxiliary schools in Jigawa state, Nigeria.

This exploration is huge and helpful in the instruction and learning of physics. Discoveries from this examination will assist with surveying the viability of the accompanying purposes.

1. Distinguish between the various ICT devices for instruction and learning of physics in senior auxiliary schools, decide the attributes of ICT apparatuses that can be utilized to impact educating and learning physics in senior auxiliary schools, assess the significance of utilizing ICT devices to accomplish educating and learning physics in senior auxiliary schools, and analyse the variables influencing the utilization of ICT devices to impact educating and learning physics in senior auxiliary schools.
2. Accordingly, the discoveries from the study would help physics instructors in picking the proper ICT devices to limit participants' strain towards the subject, thereby working on participants' scholastic exhibition. It will also spur physics instructors to foster revenue towards using reasonable teaching materials and ICT devices, which would be potential methods towards lessening disappointment in the teaching and learning of physics.
3. Furthermore, the results of this investigation will be extremely important to the organizers of physics educational programs. The work will be useful to educational program designers in checking on the physics educational program by genuinely emphasizing the use of ICT devices in order to meet the rising needs of the general public. This study will be of enormous help to physicists by providing a reason for further research into the use of ICT apparatuses and educators' quality all-around learning parts of physics as a subject.
4. The examination will also highlight partners and the need to provide data correspondence innovation devices to teach and learn physics in senior secondary schools. It's anything but a reference to the resulting scientists.

2. Materials and Methods

2.1. Research design

A survey research design was used in this study. Data on specific characters was collected from a randomly selected sampling of the target population located at various points throughout the study areas. The findings from the descriptive survey design were used to generalize the researcher's results about the target population. The subjects, or respondents, were given questionnaires as the instruments to collect the data. According to Castellacci & Tveito (2018), descriptive survey design gives an accurate assessment of the characteristics of the whole population of people. It is also more realistic than the experiment in that it investigates phenomena in their natural setting.

2.2. Population for the study

The total population for the study was ninety-two schools in government and private secondary schools in the four zonal offices of the twelve Local Government Areas in the northwest senatorial district. The physics students' target population was set at thirty-one thousand, seven hundred, and sixty-five, with a total of twenty-three thousand, seven hundred, and twenty-eight male physics students and eight thousand, thirty-seven female physics students. There was also a total of seventy-two physics teachers, comprising sixty-two male physics teachers and ten female physics teachers (see Table 1).

Table 1. Population of the study

Zonal Offices	Total Sampled School	Total Student Population	Total Sample Size for Student Respondents	Total Physics Teachers	Total Sample Size for Physic Teachers Respondents
Babura	18	26	21	5	3,998
Gumel	15	22	22	-	9,703
Kazaure	29	48	45	3	11,843
Ringim	30	45	44	1	6,221
Total	92	141	132	9	31,765

2.3. Sample size and sampling procedure

The selected schools that represent the sample were all the government and private senior secondary schools. There were ninety-two senior secondary schools, whose serial numbers were written on pieces of paper, and seventy-three schools were picked one after the other. The researcher wrote "yes" on some papers and "no" on others when selecting physics students to represent the sample. Students who answered "yes" were chosen to represent a sample of the population. Oguguo et al. (2020), confirmed that the more restricted part of that group or individuals that have one or more characteristics in common that are of interest to the researcher, the better, in order to generalize the result appropriately to the entire population. Those who picked "no" were not selected to represent the student's sample. There were two (2) physics teachers for each of the sampled senior secondary schools (see Table 2).

Table 2. A sample distribution of physics teachers and their students

Zonal Offices	Total Sampled School	Sample Physics Teachers	Sample Physics Students
Babura	14	23	76
Gumel	13	20	70
Kazaure	22	30	110
Ringim	24	30	123
Total	73	103	379

2.4. Instrument for data collection

A questionnaire, which contained questions ordered methodically based on the research topics, was utilized as the tool for gathering data from both physics' students and teachers in the 73 government and private senior secondary schools chosen for the study.

There were two (2) sections in the questionnaire for teachers and students (the questions are in 4 parts; Likert format). Section 1 was designed to gather information on the respondents' profile, while Section 2 contained questions pertaining to the study topics, and these were further divided into 4 parts as shown below:

Part 1: Identify the types of ICT tools available for use to influence the teaching and learning of physics.

Part 2: Determine the characteristics of ICT tools being used to influence the teaching and learning of physics.

Part 3: Evaluate the importance of using ICT tools to influence teaching and learning of physics.

Part 4: Examine the factors affecting the use of ICT tools to influence the teaching and learning of physics.

2.5. Validation and reliability of the instrument

The instruments used in data collection were reviewed and validated by experts. This was done to evaluate the instruments' face and content validity. Nonetheless, the item or study statement was rebuilt in accordance with all necessary revisions and modifications provided by the experts.

2.5.1. Pilot testing of the research instruments

A pilot testing was conducted at Ringim's Government Senior Secondary School Chai Chai. Jigawa State Local Government, which was not among the seventy-three (73) sampled senior secondary schools. A questionnaire was distributed to thirty (30) students and eight (8) physics teachers in total. The purpose of the pilot testing was to evaluate the reliability, level of difficulty, ambiguity of the questions, and discriminative power of the instruments. The researcher administered and graded the test themselves. This was done to allow time for any last-minute questionnaire item revisions before the potential start of fieldwork.

2.5.2. Reliability of the instrument

The reliability coefficient was calculated using the split-half method or other techniques using the information gathered from the pilot study. The reliability coefficient of the instrument was also determined using the Pearson Product Moment Correlation Coefficient (r), which was 0.87. This demonstrated that the goods' reliability was within reasonable bounds.

Oguguo et al. (2020) asserts that a correlation coefficient average value that is greater than 0.80 is necessary for internal consistency. With the assistance of four (4) research assistants, the researcher administered the instruments (questionnaires) to the subjects or responders. Approval was obtained from the Jigawa State Ministry of Education Science and Technology, Dutse, through a letter of introduction from the researcher before going to the sampled senior secondary schools. A questionnaire was given to physics professors and students at all the seventy-three (73) senior secondary public and private schools in Jigawa State's four (4) northwest senatorial districts. Three hundred and seventy-nine (379) copies of the questionnaire were given to the students over the course of two (2) weeks, and a total of 103 copies were given to the physics teachers.

2.6. Method of data analysis

The frequencies and percentages of the demographic factors for the respondents were used to examine the teachers' and students' biodata as well as the research topics. According to the Likert-type scale (Strongly Agree, Agree, Disagree and Strongly Disagree) was used, hence a percentage (%) was calculated for each:

Strongly Agree (SA) - 4 points

Agree (A) - 3 points

Disagree (D) - 2 points

Strongly Disagree (SD) - 1 point

The data was calculated using contingency chi-square (X^2) statistical tools. Null hypotheses (H_o) 1–4 was tested using contingency chi-square statistics at the 0.05 level of significance for a 2-tailed non-directional test as this was the most suitable inferential statistical tool that can determine whether significant relationships exist or not. It also examined the extent to which the frequencies that were actually observed in the study differ from the frequencies that would be expected if the null hypotheses were correct.

3. Findings

The exploration work was on the influence of data correspondence innovations in instruction and learning of physics. The first information arrangements in terms of frequencies and rates on segment factors of respondents were introduced quite some time ago. The exploration questions were introduced in a table of frequencies and rates for applicable things, while the last arrangements of information were the aftereffects of tried but invalid theories. In the investigation of the information, the two gatherings of respondents were dealt with independently, but the outcomes acquired were added together in addressing the exploration questions and the trial of invalid speculations. The information gathered was summed up into "concurred" and "conflicted." Aside from the bio-information investigation, all calculations were based on the rating scale design, as illustrated in the following passages. The examination of each exploration question displays the outline of reactions to investigation questions.

3.1. Demographic variables

The demographic variables of the respondents were presented in Table 3-6.

Table 3. Gender of Teachers

Gender	Frequency	Percentage (%)
Male	90	87.38
Female	13	12.62
Total	103	100

Table 4. Highest Qualification of Teachers

Highest Qualification	Frequency	Percentage (%)
NCE	25	24.27
HND/PGDE	13	12.62
B. Ed/ B.Sc.	20	19.42
B. Physics	15	14.56
B.A/B.Sc. (Ed).	30	29.13
M. A/ M. Ed	-	-
M. Sc/M.Sc. (Ed).	-	-
PhD	-	-
Total	103	100

Table 5. Number of Years of Teaching Experience

Years of Teaching Experience	Frequency	Percentage (%)
5-10	28	26.03
11-15	49	46.57
16-20	12	10. 96
21 and above	14	16.44
Total	103	100

Table 6. Gender of Students

Gender	Frequency	Percentage (%)
Male	197	51.98
Female	182	48.02
Total	379	100

Table 3 shows the distribution of respondents by gender. It indicates that 90 (87.38%) were males and 13 (12.62%) were females. This revealed that there were more male physics teachers than female physics teachers in the study area. Table 4 showed teachers' highest educational qualifications. Teachers who had B.A/B.Sc. (Ed) 30% (29.13%) formed the majority of the respondents. Those with N.C.E. followed with 25% (24.7%). While 20% had a B. Ed. or B. Sc. (19.42%), 15% (14.56%) had a B. Phys. had and 13 (12.62%) had a HND or PGDE. None of the respondents had an M.A., M.Ed., M.Sc., or M.Sc. Ed., or PhD degrees. This indicated that the majority of physics teachers were B.A. or B.Sc. (Ed.), which might mean that they did not go for further studies. Table 5 showed the distribution of teachers (respondents) by number of years of experience. Th results show that the majority of the respondents, 34 (46.57%), were in their 11–15 years of teaching experience, while those with 5–10 years of experience represented only 19 (26.03%). Also, 12 respondents (16.44%) had 20 or more years of experience, while 8 respondents (10.96%) had 16–20 years of teaching experience. This indicated that physics teachers had many years of teaching experience since the majority of them had 11–15 years of experience. Table 6 revealed that there were 97 male students, representing 51.98% of the total, and 82 female students,

representing 48.02% of the total. This indicate that there are more male physics students than females.

3.2. Types of ICT tools available for use to influence the teaching and learning of physics

In the course of the analysis, opinions of teachers and students were categorized into two groups of "agreed" and "disagreed" for a better understanding and clearer interpretation of the data, and the responses were scored using a four-point rating scale. Table 7 shows the responses of the respondents on the research question number 1 which is the determination of the ICT tools available for use in the school to influence the teaching and learning of Physics.

Table 7. The summary of responses on the types of ICT tools available for use

Qi	SA		A		D		SD		TA	TD	TR	%A	%D	Rate	Remark
	Std	Tch	Std	Tch	Std	Tch	Std	Tch							
1	403	92	174	87	178	68	114	23	755	383	1138	66.34	33.66	5th	N/S
2	340	76	267	84	174	68	118	22	767	382	1149	66.75	33.25	4th	Sig.
3	564	132	387	93	132	51	43	17	1176	243	1419	82.88	17.12	1st	Sig.
4	388	108	498	111	146	48	41	18	1105	253	1358	81.37	18.63	2nd	Sig.
5	336	88	327	78	174	68	98	23	829	359	1188	69.78	30.22	3rd	Sig.
		Total							4632	1620	6252	367.1	132.9		

Qi= Questionnaire item, TR=Total Response, SA=Strongly Agreed, %A=Percentage Agreed, A=Agreed, %D=Percentage Disagreed, D= Disagreed, Std = Student, SD =Strongly Disagreed, Tch=Teacher, TA=Total Agreed, N=Number of Respondents, TD=Total Disagreed, Sig.=Significant, N/S=Not Significant, Std = student, Tch = teacher

Table 7 displays the respondents' ratings of the various ICT tools available for use in influencing ICT in teaching and learning physics. This survey question as to evaluate whether great and significant course readings are important to impact the scholastic presentation of participants in physics. In light of this, respondents who unequivocally concurred scored 403 for participants and 92 for instructors, while individuals who concurred scored 174 and 87 for participants and educators separately. Respondents who differ scored 178 and 68 for participants and instructors separately, while individuals who emphatically differ had 118 and 23 for participants and educators individually. The score for complete concurrence for item one remained at 755, addressing 66.34%, as against a score of 243 for differ, addressing 33.66%. Two surveys were conducted to see if the media influenced physics instruction and learning. Reacting to this, respondents who firmly concurred scored 340 and 76 for participants and educators separately. There were 267 students and 84 teachers among those who agreed. Participants' respondents who differ scored 174, while instructors' respondents scored 68, while respondents who unequivocally differ scored 118 and 22 focuses for participants and educators separately.

The overall consensus for item two remained at 767 points, representing 66.75%, while distinction scored 382 points, representing 33.25%. Poll Item 3 tried to decide if a very well-equipped common-sense laboratory was needed. ICT apparatuses impact the instruction and learning of physics. Because of this, understudy respondents who firmly concurred scored 564, while educators

scored 132. Respondents who concurred scored 387 and 93 for participants and educators separately.

The individuals who differ scored 132 for participants and 51 for educators, while the respondents who firmly differ had 43 and 17 participants and instructors, respectively. The overall agreement for item three remained at 1176 points separately (82.88%), as opposed to 243 points for differing addresses (17.12%). The fourth step was to decide how programming carried out in the PC laboratory will impact instruction and learning of physics had on the participants' scholastic exhibition in physics. Reacting to this, respondents who emphatically concurred scored 388 and 108 for participants and instructors, respectively.

The individuals who confirmed received 498 points for participants and 111 points for instructors. Respondents who disagreed received 146 and 48 points, respectively, for participants and instructors, while understudy respondents who strongly disagreed received 41 points and educator respondents received 18 points. It was completely agreed that PC programming is done in the PC laboratory. Physics instruction and learning received 1105 focuses addressed by 81.37%, while 253 received 18.63%. Poll item five looked to see if instructors utilized fitting graphs and outlines for the prompt representation of physics exercise. Reacting to this, respondents who unequivocally concurred scored 336 and 88 for participants and instructors separately. Individuals who agreed scored 327 for students and 78 for educators. Respondents who disagreed scored 174 and 64 for participants and instructors separately, respectively, while understudy respondents who strongly disagreed scored 98, and educator respondents had 23 focuses. Respondents who concurred that inspiration and the premium educators place on ad lib ICT instruments impact participants' scholarly execution scored 829 focuses addressed by 69.78% as against 359 addressing 30.22%.

The general score of the individuals who concurred for research question one was 4,632, compared to a score of 1,620, for the individuals who disagreed. From the rating of the kinds of ICT instruments accessible for use to the impact of ICT in instruction and learning of physics in Table 7, item 3 (how a fully equipped functional laboratory with ICT apparatuses affects teaching and learning Physics was evaluated first because it is critical to influencing Physics participants' scholarly exhibition). The second evaluation discovered that PC programming in the PC laboratory has an impact on teaching and learning physics.

The third item is that educators utilized fitted graphs and charts for the quick outline of physics exercises. Items two and four: mixed media impact on education and learning in physics and an understudy's scholarly exhibition in physics Furthermore, item one was evaluated last (fifth) and stated that good applicable reading material was critical to impacting education and learning physics. This meant that both students and teachers agreed that the most important ICT device that could influence students' is the PC.

3.3. Attributes of data correspondence innovation in instruction and learning of physics

Table 8 shows the responses of the respondents regarding the research question number 2 which is the attributes of data correspondence innovation in instruction and learning of physics.

Table 8. The summary of responses on the characteristics of ICT tools being used

Qi	SA		A		D		SD		TA	TD	TR	%A	%D
	Std	Tch	Std	Tch	Std	Tch	Std	Tch					
6	736	116	348	105	88	44	34	17	1305	183	1488	87.7	12.3
7	648	148	369	81	76	38	40	18	1246	172	1418	87.9	12.13
8	784	172	360	78	42	36	28	26	1394	132	1526	91.4	8.65
9	292	84	231	78	211	80	105	25	685	421	1106	61.9	38.07
10	348	108	522	75	160	38	37	18	1053	253	1306	80.6	19.6
		Total							5683	1161	6844	410	90.75

Where, Qi= Questionnaire item, TR=Total Response, SA=Strongly Agreed, %A=Percentage Agreed, A=Agreed, %D=Percentage Disagreed, D= Disagreed, Std = Student, SD =Strongly Disagreed, Tch=Teacher, TA=Total Agreed, N=Number of Respondents, TD=Total Disagreed, Sig.=Significant, N/S=Not Significant, Std = student, Tch = teacher

Table 8 displayed the respondents' reactions to the characteristics of the ICT apparatuses being used to influence physics education and learning. Item six of the poll sought to determine whether the ICT devices to be used should be obvious to all students in the class. Because of this, respondents who firmly obtained a score of 736 and 116 for participants and instructors respectively, while individuals who obtained a score of 348 for participants and 105 for educators, respectively. Respondents who disagreed scored 88 and 44 points for participants and educators, respectively, while those who strongly disagreed had 34 points for participants and 17 points for instructors.

The overall concurrence remained at 1,305 points, addressing 87.70%, with an absolute difference of 183 points, addressing 12.30% for poll item six. Item seven investigated whether the ease of use of ICT devices influenced physics teaching and learning. Reacting to this, the understudy respondents who firmly agreed, scored 648 points, and the instructor respondents scored 148 points. Respondents who concurred had 369 and 81 for u participants and instructors separately. Respondents who disagreed scored 76 and 38 points for participants and educators separately, while those who strongly disagreed scored 40 and 18 points for participants and instructors separately.

The overall agreed score for item seven remained at 1246 points (87.87%) as opposed to 172 points (12.13%). Item eight of the survey sought to determine whether the ICT devices to be used were appropriate and applicable to both the point and the participants. Respondents who unequivocally agreed scored 784 and 172 points for participants and educators separately; those who agreed scored 360 and 78 points for instructors and participants separately. Respondents who disagreed had 42 and 36 points for participants and educators separately, while those who agreed had 28 and 26 points for participants and instructors separately. Absolute respondents who agreed received a score of 1,394, representing 91.35%, compared to a complete difference score of 132, representing 8.65%. Item nine looked at the adequacy and fascination of ICT devices impact instruction and learning of physics. Respondents who unequivocally agreed received 292 and 84 points for u participants and educators, respectively; those who agreed received

231 points for participants and 78 points for instructors. Individuals who strongly disagreed with participants scored 211, and instructors scored 80 points, while those who strongly disagreed with participants and educators scored 105 and 25 points, respectively. Item 10 attempted to determine whether ICT devices influence learning and work on physics educators' skills. Respondents who strongly agreed received 348 and 108 points, respectively, for participants and educators. Individuals who agreed received 522 and 75 points, respectively, for participants and educators. Respondents who disagreed had 160 and 38 points for participants and instructors separately, while those who strongly disagreed had 37 points for participants and 18 points for educators.

The overall disagreement remained at 1,053, accounting for 80.63% of the overall difference score of 253, which was addressed by 19.60% for survey item 10. On the generally agreed scale, the score remained at 5,682 points 48% for those respondents who agreed that perceivability, ease of use, significance to the theme, and allure were the characteristics of ICT instruments being utilized to impact educating and learning physics, as opposed to a different score of 1161 points, addressing 90.75%. This demonstrated that ICT tools for use, like participants, should have qualities of suitability and significance to the point.

3.4. Impact of ICT utilization to educating and learning Physics

Table 9 shows the responses of the respondents regarding the research question number 3 which is identifying the significance of utilization of ICT to impact educating and learning physics.

Table 9. The summary of responses on the importance of ICT tools.

Qi	SA		A		D		SD		TA	TD	TR	%A	%D
	Std	Tch	Std	Tch	Std	Tch	Std	Tch					
11	732	168	396	98	72	38	27	26	1394	163	1556	89.6	10.48
12	292	88	231	78	228	58	80	35	689	401	1090	63.2	36.79
13	284	88	276	69	270	52	46	41	717	414	1131	63.4	36.6
14	524	132	525	105	76	38	27	26	1286	167	1453	88.5	11.49
15	288	144	486	84	82	42	28	28	1002	180	1182	84.8	15.23
		Total							5088	1325	6412	390	110.6

Where, Qi= Questionnaire item, TR=Total Response, SA=Strongly Agreed, %A=Percentage Agreed, A=Agreed, %D=Percentage Disagreed, D= Disagreed, Std = Student, SD =Strongly Disagreed, Tch=Teacher, TA=Total Agreed, N=Number of Respondents, TD=Total Disagreed, Sig.=Significant, N/S=Not Significant, Std = student, Tch = teacher

Table 9 showed the reactions of the respondents to the significance of ICT instruments in impacting the instruction and learning of physics. Poll item eleven investigated whether ICT devices can rearrange and explain what is unpredictable and difficult to communicate in words. As a result, for unequivocally concurring, understudy respondents received 732 agreed and instructors received 168 focuses; respondents who concurred received 396 and 98 focuses, respectively, from understudy respondents and educators. Respondents who disagree scored 72 points for participants and 38 points for educators, while

those who strongly disagree scored 27 points for participants and 26 points for instructors.

The overall concurrence for item eleven remained at 1,394 points, representing 89.59%, with an absolute difference of 163 points, representing 10.41%. Item 12 tried to see if inspirational worth influences the utilization of ICT devices in instruction and learning of physics. As a result, students who strongly agreed received 292 points, while educators received 88 points. Individuals who agreed had 231 and 78 points for participants and educators, respectively. Respondents who disagreed scored 228 and 58 points for participants and instructors separately, while those who strongly disagreed scored 80 points for participants and 35 points for educators.

The overall agreed score for survey item twelve remained at 696 points, accounting for 63.39%, as opposed to 401 points, accounting for 36.79%. Question thirteen attempted to determine whether ICT tools save time and advance consideration. As a result, respondents who strongly agreed scored 284 and 88 points for students and educators separately, while those who agreed scored 276 and 69 points for students and educators separately. Respondents that differ scored 270 for participants and 52 for educators, while the individuals who emphatically differ scored 46 for participants and 41 for instructors.

The overall agreed score for poll item thirteen remained at 717 points, representing 63.39%, against an overall difference of 414 points, representing 36.60%. Item 14 tried to evaluate whether ICT instruments excite interest by standing out from physics participants. In response to the question, those who unequivocally agreed received 524 and 132 points, respectively, for participants and instructors. Individuals who agreed scored 525 points for participants and 105 points for instructors. Respondents who disagreed scored 76 points for participants and 38 points for educators, while those who agreed scored 27 and 26 points for participants and instructors separately. Absolute agreement for survey item fourteen remained at 1,286 points, addressing 88.51%, versus an overall difference score of 167 points, addressing 11.49%. Survey Task 15 investigated whether ICT devices piqued the interest of physics participants. Respondents who unequivocally agreed scored 288 and 144 points for participants and educators separately, while those who agreed scored 486 and 84 points for participants and instructors separately. Respondents who disagree scored 82 points for participants and 42 points for educators, while those who strongly disagree scored 28 points for all participants and educators.

The overall agreed score for survey item fifteen was 1,002 points, or 84.77%, compared to a score of 180 points, or 15.23%. The overall score of those who agreed with research question three remained at 5,088, focusing on addressing 389.47% versus an overall difference score of 1324, addressing 110.59%. This demonstrated that the two instructors and participants concurred that ICT apparatuses can rearrange and explain what is mind-boggling and hard to communicate in words.

3.5. Factors influencing the use of ICT devices to impact physics teaching and learning

Table 10 shows the responses of the respondents regarding the research question number 4 which is the factors influencing the use of ICT devices to impact physics teaching and learning.

Table 10. The summary of responses on factors affecting the use of ICT Tools to influence teaching and learning physics

Qi	SA		A		D		SD		TA	TD	TR	%A	%D	Rate
	Std	Tch	std	Tch	Std	Tch	Std	Tch						
16	904	168	255	81	70	36	30	26	1408	162	1570	89.68	10.32	1st
17	228	80	174	60	274	70	124	38	542	506	1048	39.94	48.28	5th
18	348	104	612	87	104	40	35	27	1151	206	1357	84.82	15.18	2nd
19	288	80	456	63	218	62	118	36	887	434	1321	67.15	38.85	4th
20	520	112	438	122	126	38	39	26	958	229	1187	80.71	19.29	3rd
		TOTAL							4946	1537	6483	362.3	131.9	

Where, Qi= Questionnaire item, TR=Total Response, SA=Strongly Agreed, %A=Percentage Agreed, A=Agreed, %D=Percentage Disagreed, D= Disagreed, Std = Student, SD =Strongly Disagreed, Tch=Teacher, TA=Total Agreed, N=Number of Respondents, TD=Total Disagreed, Sig.=Significant, N/S=Not Significant, Std = student, Tch = teacher

Table 10 displays the responses of students and educators to the factors that influence the use of ICT devices. The purpose of survey task sixteen was to determine if the instructors' experiences were the components that influenced the utilization of ICT devices in educating and learning physics. Respondents who strongly agreed scored 904 and 168 points for participants and educators separately, while those who agreed scored 255 and 81 points for participants and instructors separately. Respondents who disagree scored 70 points for participants and 36 points for educators, while those who strongly disagree scored 30 points for participants and 26 points for educators separately.

The total agreed score for poll item sixteen remained at 1,408 points, corresponding to 89.68%, versus a total differ score of 162 points, corresponding to 10.32%. Poll item seventeen investigated whether the number of students in crowded classes had an effect on the use of ICT apparatuses in instruction and learning of physics. As a result, understudy respondents who strongly agreed received 228 points, while instructors received 80 points. Respondents who agreed had 174 and 60 points for participants and educators separately; those who disagreed had 274 and 70 points for participants and instructors separately; and those who strongly disagreed had 124 points for participants and 38 points for instructors. Complete agreement for poll question sixteen remained at 542 points, addressing 51.72%, as opposed to 506 points, addressing 48.23%. Item 18 of the survey sought to determine whether physical offices and community assets influence the use of ICT tools in teaching and learning physics. In light of this, respondents who unequivocally concurred scored 348 focuses, while educators scored 104 focuses, and the individuals who concurred scored 612 and 87 focuses for participants and instructors separately. Respondents who differ had 104 for participants and 40 for educators, while the individuals who firmly differ scored

35 for participants and 27 for instructors. Absolute agreement for poll question eighteen remained at 1151 points, representing 84.82%, as opposed to an overall difference of 206 points, representing 15.18%.

Poll item 19 investigated whether the educator's instructional style influences the use of ICT tools in physics education and learning. Respondents who strongly agreed received 288 and 80 points for participants and instructors, respectively, while those who agreed received 456 points for participants and 63 points for educators. Respondents who disagreed scored 218 and 62 points for participants and instructors, respectively, while those who disagreed scored 118 points for participants and 36 points for educators.

The total agreed score for survey item 19 remained at 887 points, corresponding to 67.15 percent, as opposed to an absolute difference score of 434 points, corresponding to 38.85 percent. Poll item 20 attempted to determine whether an understudy's inspiration and interest influence the educator's use of educational materials. Because of this, respondents who unequivocally concurred scored 520 for participants and 112 for educators, while individuals who concurred had 438 and 122 for participants and instructors separately. Respondents who disagree scored 126 and 38 points for participants and instructors, respectively, while those who strongly disagree scored 39 points for participants and 26 points for educators.

The overall agreed score for survey item twenty remained at 958 points (80.71%), as opposed to an absolute difference score of 229 points (19.29%). Overall, for research question 4, the agreed score remained at 1408 points, equivalent to 89.68%, as opposed to an absolute difference of 162 points, representing 10.32%. From the rating of the elements that influence the utilization of ICT instruments in instruction and learning of physics in Table 10, item sixteen was evaluated first, followed by item eighteen in second, item twenty in third, item nineteen in fourth, and item seventeen in fifth. This inferred that educators' experiences were the main considerations influencing the utilization of ICT in instruction and learning of physics.

3.6. Testing of null hypotheses

Possibility Chi-squared insights were utilized to test every one of the four invalid theories. The decision to use this factual device for these invalid theories was based on the grounds that it gives a means of estimating the degree of connection among autonomous and subordinate factors. Nworgu (2006), expressed that it has broad applications in many fields of study since it is appropriate in the examination of information in terms of types of frequencies or classifications. Every one of the four invalid speculations was given a 0.05 degree of importance. Simultaneously, the invalid theory will be rejected if the determined chi-squared huge worth (X^2) is greater than the level of importance esteem (X^2). This infers that there is a critical connection between the factors. The invalid hypothesis will be held if the chi-squared huge worth (X^2) determined is not exactly the basic worth of level of importance esteem (X^2). This suggests that there is no huge connection between the factors. The synopsis of the outcomes for the trial of invalid theories is displayed in Tables 11–14.

Null hypothesis 1: *There is no significant relationship between the use of readily available ICT apparatuses and the teaching and learning of physics in senior auxiliary school.*

The possibility of chi-squared insights was utilized to test invalid speculations of 0.05 degree of importance, namely the utilization of accessible ICT instruments and instruction and learning of physics. As a result, the discovery is presented in Table 8.

Table 11. Summary of chi-square test result for research question one

	Value	df	Asymp.Sig (2 sided)
Person chi-square	20.000[a]	16	0.220
Likelihood Ratio	16.094	16	0.449
Linear by linear association	3.976	1	0.46
N of valid cases	5		

[a] 25 cells (100.0%) have expected count less than 5. The minimum expected count is 20. Df = degrees of freedom, Asymp. Sig. = Alpha value.

From Table 11, the chi-square significant value of 0.220 calculated is greater than the level of significance of 0.05 and therefore the null hypothesis was rejected. This implied that the use of available ICT tools can influence the teaching and learning of physics in senior secondary schools in the northwest senatorial district of Jigawa state.

Null hypothesis 2: *There is no huge connection between the qualities of the ICT apparatuses used to impact educating and learning physics in senior auxiliary schools in the northwest senatorial area. Jigawa state.*

A chi-squared analysis was used to test the relationship between ICT apparatus qualities and the teaching and learning of physics at 0.05 degree of importance. The outline is as introduced in Table 12.

Table 12. Summary of chi-square test result for research question two

	Value	df	Asymp. Sig (2 sided)
Person chi-square	20.000[a]	16	0.220
Likelihood Ratio	16.094	16	0.446
Linear by linear association	3.936	1	0.47
N of valid cases	5		

[a] 25 cells (100.0%) have expected count less than 5. The minimum expected count is .20. Df = degrees of freedom, Asymp. Sig. = Alpha value.

From Table 12, it was clearly seen that there is a critical connection between the attributes of the ICT instruments utilized and educating and learning physics. This was supported by the chi-square worth of importance switch (0.220), which is more prominent than the worth of dismissal limit (0.05). Consequently, the invalid theory was dismissed. This suggests that ICT apparatuses with fundamental qualities can have an emphatic impact on educating and learning physics.

Null hypothesis 3: *There is no huge connection between the significance of utilizing ICT instruments and instruction and learning of physics in senior auxiliary schools in the northwest senatorial area of Jigawa State.*

At a 0.05 level of significance, possible chi-square measurements were also used to test the invalid hypothesis of a link between the significance of utilizing ICT apparatuses and teaching and learning physics. The analysis is shown in Table 13.

Table 13. Summary of Chi-square test result for research question three

	Value	df	Asymp.Sig (2 sided)
Person chi-square	20.000[a]	16	0.220
Likelihood Ratio	16.094	16	0.446
Linear by linear association	3.337	1	0.064
N of valid cases	5		

[a] 25 cells (100.0%) have expected count less than 5. The minimum expected count is .20. Df = degrees of freedom, Asymp. Sig. = Alpha value.

Table 13 revealed a significant relationship between the importance of using ICT tools and teaching and learning physics. This was revealed by the chi-squared worth of the importance switch (0.220), which is more prominent than the worth of the dismissal limit (0.05). In this way, the invalid theory was dismissed. This demonstrated that ICT tools can be used as a significant fix to impact physics teaching and learning.

Null hypothesis 4: *There is no critical connection between the variables influencing the utilization of ICT devices and instruction and learning of physics in senior auxiliary schools in the northwest senatorial area of Jigawa State.*

At the 0.05 level of significance, the hypothesis was tested using possible chi-square insights to build up the relationship between the variables influencing the utilization of ICT apparatuses and instruction and learning of physics. The rundown of the outcomes is as introduced in Table 14.

Table 14. Summary of Chi-Square test Result for Research Question Four

	Value	df	Asymp.Sig (2 sided)
Person chi-square	20.000a	16	0.220
Likelihood Ratio	16.094	16	0.449
Linear by linear association	3.247	1	0.72
N of valid cases	5		

a. 25 cells (100.0%) have expected count less than 5. The minimum expected count is .20. Df = degrees of freedom, Asymp. Sig. = Alpha value.

From Table 14, it was seen that there is a significant connection between the elements influencing the utilization of ICT instruments and instruction and learning of physics. This was supported by the chi-square worth of the importance switch (0.220) and is more noteworthy than the worth of the dismissal edge (0.05). Along these lines, the invalid theory was dismissed. This showed that

components influencing the utilization of ICT instruments can impact instruction and learning of physics.

4. Discussion of Findings

The discoveries of the aftereffects of the tried and invalid hypotheses included, among other things, a very well-outfitted viable laboratory with ICT instruments that influence instruction and learning of physics. ICT devices should have the attributes of perceivability, adequacy, simplicity, fascination, lucidity, and other characteristics, since use of ICT apparatuses is critical to influencing teaching and learning physics. Hence, educators' and students' experiences are the primary factors influencing the use of ICT apparatuses.

The purpose of the investigation was to determine the impact of ICT on physics education and learning, and hence an investigation of some senior auxiliary schools in the northwest senatorial region, Jigawa State, Nigeria was carried out. To accomplish this goal, four explicit objectives, four examination questions, and four invalid speculations were formulated. Basic rates and frequencies were utilized in dissecting the individual information of respondents and addressing the examination questions. At the 0.05 level of significance, possible chi-square measurements were used to test the four invalid theories.

The second objective of the examination was to determine the qualities of ICT instruments that can be utilized to impact the teaching and learning of physics. On the basis of the investigation of the information gathered from the respondents, it was determined that ICT apparatuses should have the attributes of perceivability, adequacy, effortlessness, fascination, propriety, and importance to the subject, as well as straightforwardness on the off chance that they should be utilized to impact instruction and learning of physics. This finding is similar to that of Florin et al. (2019), who expressed that decent ICT instruments should be noticeable, appealing, and worthy of consideration.

The third goal was to assess the significance of utilizing ICT devices to impact education and learning in physics. Information gathered to accomplish this goal was introduced in Table 4.2.3, in which the outcome showed that ICT instruments are vital to impacting instruction and learning of physics. This finding was buttressed by Keskin & Yurdugül (2020), who expressed that ICT instruments ought to be utilized to enhance oral clarification and representations.

The fourth goal was to analyse the elements influencing the utilization of ICT devices to impact instruction and learning of physics. Information gathered in regard to this goal is presented in Table 4.2.4. The items were appraised, and it was seen that instructors' experience in the utilization of ICT apparatuses was the central point influencing the successful utilization of ICT devices to impact educating and learning physics. Additionally, it was found that inspiration, offices and materials, the amount of time available, the number of students, and others were factors that could influence the successful utilization of ICT devices. This finding concurs with Major (2020), who recorded variables influencing the

utilization of ICT devices to incorporate: nature of the topic, objective to be achieved, premium, educators' capacity, etc.

5. Conclusion

The investigation was done to determine the influence of ICT in instruction and learning of physics. An investigation of some senior auxiliary schools in the northwest area of Jigawa State, Nigeria, was carried out to accomplish this level-headedness. Four explicit goals were set, which included identifying the kinds of ICT devices for instruction and learning of physics in senior optional schools. In order to achieve these goals, four exploration questions were formulated and four invalid hypotheses were made. The absolute population for the study consisted of 92 government and private secondary schools, which were comprised of 31,765 physics participants and 141 physics teachers in the 4 instructional zones of the 12 local government areas in Jigawa State. The scientist utilized surveying questionnaires as the instrument for collecting data.

An aggregate of 482 respondents, comprising of participants and instructors, were utilized for the investigation. The information gathered was presented in tables and examined using simple rates and frequencies. At a significance level of 0.05, the four invalid theories were tested using possibility chi-squared insights.

In view of the findings obtained in this study, the following conclusions were drawn:

1. The disappointment level of participants will be reduced if physics instructors are made to use proper and pertinent ICT devices while showing physics in senior auxiliary schools.
2. Participants will perform better in physics if ICT devices have the qualities of fittingness, importance, perceivability, adequacy, straightforwardness, and fascination.
3. Because they could improve and explain what was difficult to communicate in words, ICT devices were essential for teaching and learning physics.
4. Physics information and subsequent execution become more fascinating when participants in senior auxiliary schools taking physics as a subject are educated by experienced, all-around committed, and qualified physics instructors.

6. Recommendations

The accompanying proposals were made following the discoveries of this study.

1. Physics instructors should try to use and improvise ICT apparatuses for successful physics education in senior auxiliary schools.
2. The government ought to guarantee the satisfactory work of devoted and qualified physics educators to teach the subject in all senior auxiliary schools in the examination region and in the state.
3. There is a need for an exceptional research facility to be viable. This will go a long way toward ensuring that u participants are exposed to various aspects of reasonable learning.

4. The government should make accessible assets and support the educators' participation at gatherings, courses, and workshops on the use of ICT instruments.
5. The public authority, through the Ministry of Education, Science, and Technology, should make physics ICT devices accessible for use by instructors to upgrade participants' scholarly presentations in physics.
6. Guardians must not be overlooked in the drive to provide and encourage the effective use of ICT tools by their children in senior secondary schools. When guardians and watchmen understand the significance of ICT apparatuses in the training of their kids and wards, they won't stop for a second to give good, material, and monetary help for the utilization of ICT devices.
7. A larger example from all the neighbourhood government spaces of Jigawa State's northwest senatorial area could be used to guarantee a higher level for this examination. Future exploration work should endeavour to utilize more examples drawn from the northwest senatorial locale of Jigawa State.
8. Studies should be conducted on instructors' or educators' attitudes toward impromptu showings of assets for compelling physics instruction.
9. This investigation focused on the use of ICT in teaching and learning physics, but other subjects, such as chemistry, English, mathematics, and biology, should also be investigated for an all-around improvement of education in Nigeria.
10. It is also necessary to assess the capabilities of physics educators. This is to survey the work force taking care of the education of physics and organize their skill building.
11. Additionally, it is suggested that fundamental ICT apparatuses for special participants (disabled) be applied in practice and address the challenges that may arise in implementing these recommendations.

Data availability
Completely, data produced or investigated during this work were involved in this submitted article.

Conflicts of interest
There is no conflict whatsoever to declare.

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