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Challenges and Solutions in Adopting Computerized Adaptive Assessment: Secondary School Teachers' Perspectives in Inclusive Classrooms

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ABSTRACT

This study explored secondary school teachers' perceptions of the adoption, challenges, and solutions to computerized adaptive assessment in inclusive classrooms in Imo State, using a survey research design. The sample consisted of 1,394 teachers (687 male and 707 female) selected through convenience sampling. Guided by three research questions and hypotheses tested at a 0.05 significance level, data were collected using a researcher-developed questionnaire with a reliability coefficient of 0.78 (Cronbach Alpha). Findings indicated that teachers were generally comfortable with adopting computerized adaptive assessments. However, challenges such as inadequate personal computers, unreliable power supply, poor internet accessibility, and insufficient government funding were identified. To address these issues, teachers suggested measures like increased computer literacy programs, improved technological infrastructure, and enhanced funding. The study recommends that governments establish well-equipped ICT laboratories and integrate digital skills into teacher education programs to facilitate effective adoption.

Keywords: Computerized Adaptive, Assessment Technology, Inclusive Classroom, Latent Traits

Introduction

The function of assessment in teaching and learning, guidance, certification, placement and determination of skills and competences of individuals call for care and diligence in the assessment of learners (Ihendinihu, 2022). Teaching and learning cannot be complete without assessment. Assessment is a fact-finding activity that describes conditions that exist at a particular time (Manichander, 2016). Assessment is the use of various methods and various sources to gather and estimate different types of information about a person, group or event in a comprehensive way (Nkwocha, 2019). Assessment involves collecting information to understand individual progress and provide feedback to support learning. According to Yessingeldinov *et al.* (2023), assessment is an essential component of teaching and learning as it allows teachers, policymakers and other stakeholders to be informed about students' achievements and to make decisions based on the results and evidence. They went further to assert that assessment helps to harmonize lesson plans and to model activities for students to meet their needs.

Some terms can be used interchangeably with assessment. These include evaluation, which deals with the ascribing of quality value or worth to traits or behaviours or attributes of an object or a person using standard guidelines (Nkwocha, 2019); measurement, which is a quantitative description of attributes of certain persons, objects or events (Okoye, 2015); and testing, which is a process of ascertaining learning progress and achievement. All are used to determine the existence of desired quality or characteristic in a person, object or event, despite the differences that do exist among them. In this paper, all are used interchangeably, without minding the little differences that exist among them.

Most assessments are designed for classes that show homogeneous performances or in which students do not differ significantly in their performances (Ebenbeck, 2023). Nevertheless, such assessments cannot be fair to the growing diverse nature of students in the path of progressive inclusion because they are concerned with the custom and expectations of performance based on the average standard. A test that does not adjust to the individual student's ability level has the potential to disempower both the student who is struggling and the student who is excelling (Kingsbury *et al.*, 2014). To better consider the diversity of students' performances within a class and to be able to provide appropriate assessments in these situations, preferably, the assessments should be as widely applicable as possible while still taking into account the individual situation of each student. Students' learning styles, the speed at which they can assimilate information, and their abilities to comprehend what is being taught are different and unique to everyone (Peng *et al.*, 2019). Based on the fact that students have peculiar needs and capabilities, differentiation in the classroom is a crucial aspect of the learning process, which is based on the principle that each student learns differently and requires tailored instruction to meet their individual needs. This method allows teachers to make an ideal learning atmosphere for every student in the class. Assessment is considered to be of good quality when

it influences students' motivation, valid, reliable, fair, ethical, uses multiple methods, incorporates technology as well as when it is visible and efficient (Amesi, 2016).

Adaptive assessments come in contrast to linear, non-adaptive assessments where all examinees respond to the same or equivalent forms of a test in a predetermined order. Adaptive assessment can be defined as any type of assessment that is tailored specifically to each examinee, based on their performances on previous items on the assessment. Most adaptive assessments are based on the theories and advances of Item Response Theory (IRT). More specifically, in IRT the examinee ability estimates, as well as item characteristics such as the item difficulty, are placed on the same continuum. This allows for the administration of items that are matched to the estimated ability level (y), of each examinee, at each point of the assessment. Therefore, adaptive assessments allow for the administration of items that are targeted to the ability level (or trait level) of each examinee, which enables the estimation of more accurate examinee ability estimates.

It is imperative to acknowledge that the scope of assessment should extend beyond conventional pencil-and-paper tests, and encompass the integration of technology to provide efficient and immediate access to student progress data, enabling prompt intervention (Yessingeldinov *et al.*, 2023). Technological advancements have continued to offer a wide range of potential benefits to the teaching and learning process and these benefits have also extended to the online assessment of learning (Ezeugo, 2021). The current reliance on computers to facilitate teaching and learning has led to increased interest in facilitating assessment through online means (Ramgovind & Pramjeeth, 2023). These changes have given rise to computerised adaptive assessment system. The use of computerised adaptive assessment for formative and summative purposes has become a major component of assessment reforms in many educational systems due to its potentials to provide important data for teacher-decision making to improve learning and inclusive classroom.

Computerised Adaptive learning systems are digitally designed to factor in the level of ability, skill attainment, and needs of students in a manner that considers automated procedures and instructor interventions (Troussas *et al.*, 2017). Computerised adaptive assessment is a form of computer-based test where the next item or the next set of items a test-taker sees depends on their performance on the previous items. According to Istiyono (2019), it is a class of delivery of algorithm from a test aimed at enabling test-takers to achieve higher measurement accuracy and efficient test delivery. Each test comes with individual set of items selected in sequence and adjusted to the current estimate or the respective test-taker's ability. It is an assessment technology that can greatly benefit many assessment programmes. Programmes that require efficient, accurate assessment could be better served by a computerised adaptive assessment approach as opposed to traditional fixed-form assessment – which deals with the administration of assessment across the entire (often heterogeneous) student distribution. As opposed to a linear test with fixed test items, computer-adaptive testing is a special approach to the assessment of latent traits, where the test is specifically matched to the needs of each examinee (Davey & Pitoniak, 2006). The test taker's individual trait level is iteratively estimated during the testing process. The test is assembled as the examinee works, and selection of test items is based on examinee response given on items presented previously (Colwell, 2013). In computerised adaptive assessment, Tamassia (2020), said that algorithms optimize the delivery of test items to match the characteristics of individuals, thereby allowing the test to provide more reliable information about skills in a relatively shorter period of time. Depending on the design, these algorithms could tailor both the difficulty and number of items to the characteristics of a respondent.

The efficacious computerised adaptive assessment programmes have been adopted in different countries in the world. However, the use of this mode of assessment has not been fully realised in Nigerian secondary schools, especially in Imo State. According to Mutisya (2020), Israel has implemented the Psychometric Entrance Test; Australia has administered the Multiple-Choice Examination (MCQ) to candidates hoping to attend medical school; and the Medical Council of Canada's Qualifying Examination Part 1 (MCCQE Part 1) which is administered in Canada. They went further to say that China has also developed an electronic assessment to establish the levels of proficiency in language and mathematics among her pupils in primary schools.

Globally, inclusive classroom is the order of the day in most of the educational systems. As a result, Rosen *et al.* (2017) submitted that there is an indisputable need for evidence-based instructional designs that create the optimal conditions for learners with different knowledge, skills and motivations to succeed. Petersen (2016) stressed that importance of technology in improving assessment using adaptive tests which adjust the difficulty of assessment items as students' progress through a testing session for more precise measurement. Computerised adaptive assessment maximizes precision of measurement across a larger range of ability and provides an opportunity to accumulate greater accuracy in making the decision. Empirical studies have proved a computerised adaptive testing; an adaptive form of assessment, advantageous over the linear forms, while giving credence to its capacity to improve absorption and retention of information leading to increased student engagement, motivation, and ultimately learning (Petersen, 2016).

The main idea of computerised adaptive assessment is that items are selected by the computer to individually match the ability level of each student. With computerised adaptive assessment, according to Way (2006), the computer begins by choosing an initial item, usually one at an intermediate level of difficulty, to administer to the student. If the student answers the item correctly, a more difficult item is selected next for administration. If the student gives an incorrect answer, an easier item is selected next for administration. This procedure of selection and evaluation is carried out by the computer throughout the test. By "adapting" the difficulty level of the items selected, the computer is able to accurately measure student's ability using far fewer items than a traditional paper assessment. In this article, authors examined the perceptions of secondary school teachers on the adoption, challenges and solutions to computerised adaptive assessment as a form of distinguished assessment in Imo State.

The hesitancy to seriously adopt computerized adaptive assessment at the secondary school level in the state, is an indication that educational stakeholders and secondary school teachers at large may have varied perceptions about computerized adaptive assessment especially as it relates to the challenges of its adoption. However, there is need to explore the differences in the perception of secondary school teachers on the challenges and solutions to computerised adaptive assessment, especially, based on their digital literacy. Different studies have investigated these challenges. Johnson *et al.* (2016) were of the opinion that insufficient equipment or connectivity which they termed "the access constraint" is a big factor. They went further to say that if a teacher's school does not possess adequate computers and fast internet connection, the implementation of computerized adaptive assessment will not be feasible. According to Ertmer *et al.* (2012), the most commonly cited reason for lack of technology implementation in the classroom is inadequate professional development and training. Research indicates teachers are afforded minimal learning opportunities to develop skills using data (Mandinach & Jimerson in Iwuoha-Njoku, 2022). More traditional educational beliefs have been related to less integration of computer-based technology in classrooms (Hermans *et al.*, 2008). Johnson *et al.* (2016) observed that many current teachers grew up without access to technologies like the personal computer and the internet, but students today are raised in an environment saturated by computer technology. These "digital natives" can intimidate teachers, especially teachers with little technological experience. If teachers feel they do not have the necessary competencies when using technology, they may feel less in control of the class, use less technology, and be unlikely to explore new possibilities that utilize technology when designing their classes (Hughes, 2005; Rakes & Casey, 2002). Dunn *et al.* (2013) asserted that assessment data contain measurement concepts that can be quite intimidating for teachers. Hence, students are at a disadvantage when teachers lack the confidence and competencies to transform the data from score reports into usable knowledge and make sound instructional decisions. Cuhadar (2018) infers that the technological competency level of teachers is intermediate or lower. These issues have contributed to an incomplete knowledge base on the part of the teacher, as well as the variability in teacher effectiveness (Hattie in Iwuoha-Njoku, 2022).

To successfully deal with the constraints of computerised adaptive assessments, teachers at the secondary school level who are the ones to administer the assessment stand a better chance to recommend viable ways that can be used to solve the constraints of computerized adaptive assessment. In their opinion, Johnson *et al.* (2016) suggested that building teachers' knowledge to a sufficient level, boosting confidence in the process, training and support from the educational administrators is necessary. For teachers to achieve effective use of computers, they must experience a paradigm shift from the teacher centered classroom to the student-centered classroom (Bitner & Bitner, 2002; Mandinach & Cline, 2000). Tamassia (2020) maintained that a team of psychometricians are needed to lead the complex data analysis and simulation efforts as well as appropriate analytical software. Iwuoha-Njoku (2022) insisted that the transition to computerised adaptive assessment calls for teachers to be literate in the language of assessment and to demonstrate assessment literacy skills such as interpreting and applying score report data. They went further to assert that supplementing teachers' existing knowledge and skill with well-designed professional opportunities is critical to strengthening educators' capacity in assessments.

Purpose of the Study

The study determined teachers' perceptions on the adoption, challenges and prospects of adoption of computerised adaptive assessment in inclusive classrooms in Imo State. Specifically, the study determined the:

- Secondary school teachers' comfortability of adopting computerised adaptive assessment in inclusive classrooms in Imo State.

- Perceptions of secondary school teachers on the challenges of computerised adaptive assessment in inclusive classrooms in Imo State.

- Perceptions of secondary school teachers on the solutions to the challenges of computerised adaptive assessment in inclusive classrooms in Imo State.

Research Questions

The following research questions were raised to guide the study.

- How comfortable are secondary school teachers on the adoption of the computerised adaptive assessment in inclusive classrooms in secondary schools in Imo State?

- What are the perceptions of secondary school teachers on the challenges of computerised adaptive assessment in inclusive classrooms in Imo State?

- What are the perceptions of secondary school teachers on the solutions to the challenges of computerised adaptive assessment in inclusive classrooms in Imo State?

- The comfortability of the secondary school teachers in Imo State on the adoption of computerised adaptive assessment is independent of their gender.

- The perceptions of the secondary school teachers in Imo State on the challenges of computerised adaptive assessment is independent of their gender.

The perceptions of secondary school teachers in Imo State on the solutions to the challenges of computerised adaptive assessment is **Hypotheses**

Methodology

- independent of their gender.

The design adopted for the study was a survey method. The appropriateness of the design stemmed from the postulation of Nworgu (2015), that survey research design is one in which a group of people or items is studied by collecting and analyzing data from only a few people or items considered to be a representative of the entire group. This design was considered appropriate because only a part of the population was studied and findings were used to generalize for the entire population. The area of this study was Imo State. The state has six education zones namely: Okigwe I, Okigwe II, Orlu I, Orlu II, Owerri I and Owerri II, with 308 public secondary schools. The population of the study consisted of 5, 576 secondary school teachers in Imo State (SEMB, 2024). The sample size for the study was 1394 teachers representing 25% of the population. The sample was obtained using convenience sampling method evenly distributed across the six education zones of Imo State.

The instrument for data collection was the researchers' developed structured questionnaire of the 4 – point scale Likert format of Strongly Agree (SA) = 4 points, Agree (A) = 3 points, Disagree (D) = 2 points and Strongly Disagree (SD) = 1 point, titled: Adoption, Challenges and Solutions to the of Computerised Adaptive Assessment in an inclusive Classroom (ACSCAAIC).

ACSCAAIC had four sections. Section A was designed to sought information on demographic variables from the teachers. Section B contained 15 items constructed to generate information on the teachers' comfortability on the adoption of computerised adaptive assessment in inclusive classrooms, Section C contained 15 items constructed to generate information on the challenges of computerised adaptive assessment in inclusive classrooms, while Section D was designed to generate information on the solutions to the challenges of computerised adaptive assessment in inclusive classrooms had 15 items.

The initial draft of the instrument, objectives, research questions and hypotheses were validated by two Lecturers in Measurement and Evaluation and one Lecturer from Computer Science Education, all from Alvan Ikoku Federal University of Education, Owerri. Their suggestions and corrections were effected in the final copy of the instrument. The reliability index was obtained using Cronbach Alpha. The instrument was administered once to 12 public secondary school teachers who were not involved in the study. The coefficient of reliability obtained was 0.78.

Data were analyzed using descriptive statistics (mean) and inferential statistics (Chi-Square test) at a 0.05 significance level.

Results

Research Question 1: What are the secondary school teachers' perceptions on the adoption of the computerised adaptive assessment process in inclusive classrooms in secondary schools in Imo State?

Table 1

Secondary School Teachers' Comfortability on the Adoption of the Computerised Adaptive Assessment

S/N	Item	S A	A	D	S D	Mean	Remarks
1	I can use a computer confidently	472	592	169	161	2.98	Agreed
2	You can upskill yourself to keep abreast of computerised adaptive assessment	501	561	202	130	3.02	Agreed
3	You can administer a test using a computer with confidence	446	514	311	123	2.92	Agreed
4	Many teachers do not have an internet enabled device	156	304	438	496	2.08	Disagreed
5	Computerized adaptive testing is an adequate tool for the assessment of learning	614	521	182	77	3.19	Agreed
6	The use of Computerised Adaptive Testing in assessment can offer a better testing experience than current Paper and Pencil Test	531	467	252	144	2.99	Agreed
7	Many teachers do not use computer away from school	401	399	352	242	2.68	Agreed
8	Your school provides adequate access to technological tools for learning	273	330	361	430	2.31	Disagreed
9	Many teachers do not support the use of gadgets like laptops during learning	130	332	481	451	2.10	Disagreed
10	CAA are not suitable for all subjects and cannot assess all skill types	316	386	337	355	2.47	Disagreed
11	Standardized question item pool in different areas or topics can be built.	610	525	187	72	3.20	Agreed
12	There is no difference between CAA and linear form of assessment	220	312	421	441	2.22	Disagreed
13	If the use CAA is optional, I would still prefer to use CAA as a supportive tool	401	461	302	230	2.74	Agreed
14	CAA can be used together with existing assessment methods	518	452	267	157	2.95	Agreed
15	Computerised adaptive assessment allows teachers to know areas students are having difficulties with the view of personalising their teaching and students' learning.	621	547	132	94	3.21	Agreed

Table 1 shows that all the items had mean score greater than 2.5 (except Items 4, 8, 9, 10 and 12) which is the mean value of the four-point scale. The implication is that teachers perceived the fact that Items 1, 2, 3, 5, 6, 7, 11, 13, 14 and 15 are feasible to make available for adoption of the computerised adaptive assessment. Furthermore, results in Table 1 show that Items 4, 8, 9, 10 and 12 had mean score less than 2.5. This implies that the teachers opined that these items were not true for the adoption of computerised adaptive assessment in the secondary schools in Imo State. These results show that teachers perceive all the factors

Research Question 2: What are the perceptions of secondary school teachers on the challenges of computerised adaptive assessment in inclusive classrooms in Imo State?

Table 2

Perceptions of Secondary School Teachers on the Challenges of Computerised Adaptive Assessment

S/N	Item	S A	A	D	S D	Mean	Remarks
1	There is low computer literacy on the part of the teachers	174	182	579	459	2.05	Disagree
2	Non availability of adequate personal computers is a big challenge for the adoption of computerised adaptive assessment	401	461	302	230	2.74	Agree
3	Unreliable and inadequate power supply	494	464	311	125	2.95	Agreed
4	Poor internet accessibility	546	488	204	156	3.02	Agreed
5	Lack of funding from the government	613	522	180	79	3.19	Agreed
6	Non availability of skilled manpower to drive the programme	367	352	344	331	2.54	Agreed
7	Schools in Imo State do not have the technological infrastructure to support computerised adaptive assessment	441	499	212	242	2.81	Agreed
8	Implementing CAA involves significant education of students, parents, and teachers.	430	391	302	271	2.70	Agreed
9	Lack of reliable educational support software is a limiting factor for CAA integration in schools in Imo State	455	481	323	135	2.90	Agreed
10	There will be difficulty in building adequate item bank	416	487	237	254	2.76	Agreed
11	There is possibility of impersonation in computerised adaptive assessment	486	412	259	237	3.33	Agreed
12	Given the population of the students taking the assessment, time management may become a huge problem	210	322	431	431	2.22	Disagreed
13	The cost implication of computerised adaptive assessment is much compared to traditional assessment	511	451	302	130	2.96	Agreed
14	There will be great difficulty in scoring and correcting questions with open responses that require explanation	418	452	317	207	2.77	Agreed
15	Some students who find it difficult with technological skills may be lost as a result of the adoption of computerised adaptive assessments.	522	444	234	194	2.92	Agreed

Results in Table 2 show that teachers perceived all the items indicated (except Items

1 and 12) as likely challenges of adopting computerised adaptive assessment for inclusive classrooms in secondary schools in Imo State. The mean responses of teachers on each of these items (except Items 1 and 12) were greater than 2.50. Hence, non-availability of adequate personal computers, unreliable and inadequate power supply, poor internet accessibility, lack of funding by the government, non-availability of skilled manpower to drive the programme, lack of technological infrastructure, significant education (of students, parents, and teachers), lack of reliable educational support software, difficulty in building adequate item bank, impersonation, the cost implication, difficulty in scoring and correcting questions with open responses and students finding it difficult with technological skills are all factors perceived by teachers as challenges of adopting computerised adaptive assessment. However, the teachers did not consider low computer literacy on the part of the teachers and time management based on the population of the students taking the assessment as challenges of adopting computerised adaptive assessment in secondary schools in Imo State. The mean responses of teachers on these items (2.05 and 2.22 respectively) are less than 2.50.

Research Question 3: What are the perceptions of secondary school teachers on the solutions to the challenges of computerised adaptive

Table 3

Perceptions of Secondary School Teachers on the Solutions to the Challenges of   Computerised Adaptive Assessment

S/N	Item	S A	A	D	S D	Mean	Remarks
1	Engagement of the teachers in the skill-up Imo programme of the Imo State Government will help to boost the computer						

	literacy of teachers	592	462	179	161	3.06	Agreed
2	There should be adequate supply of personal computers to schools	561	501	201	131	3.07	Agreed
3	There should be reliable and adequate power supply.	614	546	123	111	3.09	Agreed
4	Latest technologies that ensures good connectivity should be acquired and installed in secondary schools	696	538	104	56	3.34	Agreed
5	There should be adequate funding by the government for the smooth running of CAA	714	521	82	77	3.34	Agreed
6	There should be frequently professional computerised adaptive assessment workshop and development trainings for secondary school teachers.	731	567	52	44	3.42	Agreed
7	There should be technological infrastructure to support computerised adaptive assessment	701	599	52	42	3.40	Agreed
8	Implementing CAA involves significant education of students, parents, and teachers.	630	561	130	73	3.25	Agreed
9	Availability of reliable educational support software is necessary for CAA integration in schools	651	581	132	30	3.32	Agreed
10	Building of adequate item bank is a necessity	616	686	55	37	3.34	Agreed
11	Use of biometric login to prevent impersonation during computerised adaptive assessment is a way forward	661	530	173	30	3.30	Agreed
12	There should be skilled manpower to drive the programme	541	521	212	120	3.06	Agreed
13	Provisions should be made for the security of the item bank	401	461	302	230	2.74	Agreed
14	There should be in-built ways for scoring and correcting questions with open responses that require explanations	618	552	167	57	3.24	Agreed
15	Mock assessments should be prepared for students before the main assessment for them to be acclimatized with the computerised adaptive assessment techniques	627	491	134	142	3.14	Agreed

Table 3 shows that all the items have means that are above the cut-off mean (2.50). As a result, secondary school teachers in Imo State agreed to the following solutions to the challenges of computerised adaptive assessment: Engagement of the teachers in the skill-up Imo programme of the Imo State Government to boost the computer literacy of teachers, adequate supply of personal computers to schools, reliable and adequate power supply, installation of latest technologies that ensures good connectivity, adequate funding by the government for the smooth running of CAA, frequent professional computerised adaptive assessment workshop and development trainings for secondary school teachers, technological infrastructure to support computerised adaptive assessment, significant education (of students, parents and teachers) on the implementing CAA, availability of reliable educational support software in schools, building of adequate item, use of biometric login to prevent impersonation during computerised adaptive assessment, provision of skilled manpower to drive the programme, security of the item bank, in-built ways for scoring and correcting questions with open responses and mock assessments to be prepared for students before the main assessment for them to be acclimatized with the computerised adaptive assessment techniques.

Hypothesis One: The comfortability of the secondary school teachers in Imo State on the adoption of computerised adaptive assessment is independent of their gender.

Table 4

Analysis of the comfortability of the secondary school teachers in Imo State on the adoption of computerised adaptive assessment in inclusive classrooms according to gender.

	SA	A	D	SD	All	DF	Chi-square (Pearson)	p-value
Male	319 (310.5)	187 (201.6)	108 (107.4)	73 (67.5)	687	3		
							3.420	0.331
Female	311 (319.5)	222 (207.4)	110 (110.6)	64 (69.5)	707	3		
All	630	409	218	137	1394			

As observed in Table 4 above, there was no significant difference between male and female teachers' perceptions on the adoption of the computerised adaptive assessment process in inclusive classrooms in secondary schools in Imo State, since the p-value (0.331) is greater than the level of significance (0.05). Thus, the observed differences in the teachers' perceived responses were not significant. The values outside the brackets are observed frequencies whereas the values inside brackets are the expected frequencies.

Hypothesis Two: The perceptions of the secondary school teachers in Imo State on the challenges of computerised adaptive assessment is independent of their gender.

Table 5

Analysis of the perceptions of the secondary school teachers in Imo State on the challenges of computerised adaptive assessment in inclusive classrooms according to gender.

	SA	A	D	SD	All	DF	Chi-square (Pearson)	p-value
Male	317 (308.0)	190 (204.0)	106 (105.5)	74 (69.5)	687	3		
Female	308 (317.0)	224 (210.0)	108 (108.5)	67 (71.5)	707	3	3.002	0.391
All	625	414	214	141	1394			

As observed in Table 5 above, there was no significant difference between male and female teachers' perceptions on the challenges of computerised adaptive assessment in inclusive classrooms in the secondary schools in Imo State, since the p-value (0.391) is greater than the level of significance (0.05). Thus, the observed differences in the teachers' perceived responses were not significant.

Hypothesis Three: The perceptions of secondary school teachers in Imo State on the solutions to the challenges of computerised adaptive assessment is independent of their gender.

Table 6

Analysis of the perceptions of secondary school teachers in Imo State on the solutions to the challenges of computerised adaptive assessment in inclusive classrooms according to gender.

	SA	A	D	SD	All	DF	Chi-square (Pearson)	p-value
Male	301 (305.6)	208 (207.0)	109 (108.9)	69 (65.5)	687	3		
Female	319 (314.4)	212 (213.0)	112 (112.1)	64 (67.5)	707	3	0.503	0.918
All	620	420	221	133	1394			

As observed in Table 6 above, there was no significant difference between male and female teachers' perceptions on the solutions to computerised adaptive assessment in inclusive classrooms in the secondary schools in Imo State, since the p-value (0.918) is greater than the level of significance (0.05). Thus, the observed differences in the teachers' perceived responses were not significant.

Discussion of Findings

The study investigated the perceptions of secondary school teachers on the adoption, challenges and solutions to the adoption of computerised adaptive assessment in inclusive classrooms. The findings of this study revealed that teachers' level of comfortability on the adoption of computerised adaptive assessment in inclusive classrooms was general moderate based on items measured (having grand mean above 2.5). This result is not in consonance with the results of the research conducted by Nwachukwu *et al.* (2020) where they revealed that secondary school teachers' level of digital awareness was generally low. Regarding gender differences, the non-significant finding between male and female teachers' view suggests that both genders generally share similar views on their level of comfortability concerning computerised adaptive assessment in an inclusive classroom.

The study also revealed that non-availability of adequate personal computers, unreliable and inadequate power supply, poor internet accessibility, lack of funding by the government, non-availability of skilled manpower to drive the programme, lack of technological infrastructure, significant education (of students, parents, and teachers), lack of reliable educational support software, difficulty in building adequate item bank, impersonation, the cost implication, difficulty in scoring and correcting questions with open responses and students finding it difficult with technological skills were all factors perceived by teachers as challenges of adopting computerised adaptive assessment. This result happened to be in agreement with the submission of Johnson *et al.* (2016) who were of the opinion that insufficient equipment or connectivity which they termed "the access constraint" is a big obstacle to adopting computerised adaptive assessment. They went further to say that if a teacher's school does not possess adequate computers and fast internet connection, the implementation of computerized adaptive assessment will not be feasible. The resultant implication of this result is that the pace of development and utilization of digital tools for educational purposes including assessment of students' instructional achievement outcomes is still very

low in the State. Regarding gender differences, the non-significant finding between male and female teachers' views on the challenges of adopting computerised adaptive assessment suggest that both genders generally share similar views.

Secondary school teachers in Imo State agreed to the following solutions to the challenges of computerised adaptive assessment: Engagement of the teachers in the skill-up Imo programme of the Imo State Government to boost the computer literacy of teachers, adequate supply of personal computers to schools, reliable and adequate power supply, installation of latest technologies that ensures good connectivity, adequate funding by the government for the smooth running computerized adaptive assessment, frequent professional computerised adaptive assessment workshop and development trainings for secondary school teachers, technological infrastructure to support computerised adaptive assessment, significant education (of students, parents and teachers) on the implementing computerised adaptive assessment, availability of reliable educational support software in schools, building of adequate item, use of biometric login to prevent impersonation during computerised adaptive assessment, provision of skilled manpower to drive the programme, security of the item bank, in-built ways for scoring and correcting questions with open responses and mock assessments to be prepared for students before the main assessment for them to be acclimatized with the computerised adaptive assessment techniques. This result is in agreement with the assertion by Johnson *et al.* (2016), that building teachers' knowledge to a sufficient level, boosting confidence in the process, training and support from the educational administrators were necessary solution to the problems facing the adopting computerised adaptive assessment. Regarding gender differences, the non-significant finding between male and female teachers' views on the solutions to the challenges of adopting computerised adaptive assessment suggest that both genders generally share similar views.

Conclusion

Based on the findings of the current study, the pace of adoption of computerised adaptive assessment in educational assessment in Imo State is slow due to inadequate infrastructure such as non-availability of adequate personal computers, unreliable and inadequate power supply, poor internet accessibility, lack of funding by the government, non-availability of skilled manpower to drive the programme, lack of technological infrastructure, lack of reliable educational support software, difficulty in building adequate item bank, impersonation, the cost implication, difficulty in scoring and correcting questions with open responses and students finding it difficult with technological skills. All of which have been found to affect the pace at which computerised adaptive assessment can be adopted in educational assessment. The results did not indicate divergent perceptions between male and female teachers. Hence, gender should not be a factor on the adoption and utilization of computerised adaptive assessment. As a result of practical implications to this study, State Government and teachers must welcome new technologies, incorporate them into their undertakings and assessment methods, and cultivate the essential abilities and knowledge to use them well.

Recommendations

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

i.   Teachers should be motivated and encouraged to develop the desire to use digital technologies relevant to educational assessment in the 21st century

ii.   Government at all levels should establish functional information and communication technology laboratories equipped with modern digital technologies for teaching and learning in all the secondary schools in Nigeria.

iii. Digital competence should be a core skill for all educators and should be embedded in teacher education programmes.

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