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Impact of Mathematics Education on the implementation of Inclusive Education in Basic Education in Niger State: Challenges and Prospects

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Abstract: *The study focused on the impact of mathematics education on the implementation of inclusive education in basic education in Niger state: challenges and prospects. Cross-sectional descriptive survey research design was adopted. Three research questions guided the study. The population of the study constituted of all lower basic and middle basic (primary schools) schools' teachers and administrators from public schools from the three senatorial zones in Niger State. The multi-stage stratified random sampling procedure was employed to obtain three hundred and thirty teachers, and forty-two administrators which constitute the sample for the study. Among these figures, Zone A comprising of (Teachers=107 and Administrators=15); Zone B comprising of (Teachers=102 and Administrators=10), while Zone C comprising of (Teachers=121 and Administrators=17) respectively drawn from the three zones making a total of three hundred and sixty-three teachers. A questionnaire titled "Mathematics Education and Implementing Inclusive Basic Education Questionnaire MEDIMIBEQ" contains the question items to be answered using four Liket's scale for data collection. The instrument was validated by three experts in mathematics, science and education department respectively a reliability coefficient of 0.635 using Cronbach alpha-20 (α_{20}). Data collected was analyzed using percentages (%) and means statistics to answer the research questions. Results from the study indicated that learners are ready to learn mathematics; supportive are given to learners; learning environment is conducive; out-of-school children still exist and other challenges in inclusive basic education in Niger state. It was recommended that government should provide meals, uniforms; writing materials to learners to encourage their enrollment and attend schools regularly.*

Keywords: inclusive education, inclusive mathematics education, challenges of inclusive education and principles of inclusive

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INTRODUCTION

Education is the most powerful instrument for the provision of the requisite knowledge for the empowerment needed for full actualization of human potentials (Haruna, 2020). It can heal or kill, bind up or tear apart, lift or deprive. Education affects how well individuals, communities and nations fare. It also aims at elimination of ignorance, poverty, disease and the provision of the requisite knowledge for the empowerment needed for full actualization of human potentials (Haruna, 2020, FRN, 2013 and Nwangi, 2008).

Education is a powerful tool that treats women, minorities, people with disabilities, immigrants, less privilege groups to gain fundamental civil rights. This type of education is called inclusive education. Inclusive education is an educational system that describes how all students can be valued equally, treated with respect, and given equal learning opportunities. Inclusive education definitely works to identify all barriers to education and remove them and covers everything from curricula to pedagogy and teaching (Kırmızıgül, 2022 and Paolo et al, 2023).

Mizan (2022) sees inclusive as a quality of action that allows equal access to opportunities and resources for people who would otherwise be excluded or marginalized, such as those with physical or mental disabilities or members of other minority groups. United Nations International Children's Emergency Fund (UNICEF) cited in Mizan (2022) and Weduc (2022) maintained that inclusive education is the most effective way to give all children a fair chance to go to school, learn and develop the skills they need to thrive. Their inclusion involves been enrolled in schools through the proper channel of age, having guidance, transfer, and so on (Sibanda & Beckmann, 2021).

It is a reality that the standard of living of a nation is dependent on the level of science and technology of that nation. While science and technology are the bedrock of national development, mathematics is the gate and key to these subjects. Mathematics enable one to be creative, logical reasoning, accuracy, abstract or spatial thinking, critical thinking, problem solving ability and including effective communication skills (m.timesofindia.com>) and Bolaji et al, 2019). It has made inroads into every human pursuit and most important for all to learn. It is a compulsory subject, offered by all from nursery through basic education to secondary education in Nigeria.

Mathematics is offered to all learners including those with specific learning needs. Inclusive education policy encourages learners with or without ability to acquire literacy, numeracy, and manipulative skills, develop self-expression, self discipline, self-reliance, develop socialization and attitude, and so on (Nwangi, 2008; Duff, 2022). This is what makes mathematics education a part of an inclusive education.

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Inclusive mathematics education acknowledges human diversity and involves supporting the diverse learning needs of all students in general mathematics. Therefore, the mathematics curriculum and instruction need to be adaptable so that it is relevant to the specific students' needs in the class. This can take the form of using culturally responsive educational practices, welcoming students' uses of their preferred language, and engaging students in choosing topics to study using mathematics (creating more inclusive learning environments in mathematics (Gaille, 2019 and www.studentsexperiencenetwork.org>2020/07). Improving mathematics literacy across diverse populations can lead to better economic outcomes, more informed decision-making, and the development of talent in fields like science, technology, and engineering (Banerjee & Lahiri, 2019; Vasyliev, n.d). This can only happen when children are admitted into basic education schools. Basic education is the gateway to all other level of education charged with the responsibility of producing the manpower requirement for various sectors of the economy. The present education which is termed inclusive education in basic school is meant to be free and set to accommodate all learners of age range of six to fifteen years (FRN, 2013; Sadiq, 2020). It does not discriminate between learners for genders, culture, educational and economic status of parents, ages, height, able and disability, and so on. Learners can only benefit from this type of education through enrollment.

Enrollment in inclusive basic education classrooms is a process that ensures all children, regardless of their backgrounds, have access to education**.** While the standard age range for enrollment is typically between 6 and 15 years old, inclusive settings can accommodate children with disabilities or learning difficulties who may require more time to complete their education (FRN, 2013; Sibanda & Backmann, 2021). A wide range of programmes have been implemented to increase enrollment such as the abolition of school fees to guarantee universal access to education; and feeding programmes which has also improved the enrollment, drop out and completion rate. Provision of adequate security and providing adequate school amenities (toilets for girls separate from boys) will attract girls to school.

Learners are typically enrolled in inclusive education classrooms through a variety of methods**:** automatic admission based on age, referral from specialists, parental application, or community outreach programs. These methods ensure that all children have the opportunity to access inclusive education and benefit from a supportive and inclusive learning environment. (FRN, 2013; Weduc, 2022; Sibanda & Backmann, 2021).

Conducive Learning Environments for Mathematics Inclusive Basic Education: In inclusive basic education settings, the teaching and learning environment for mathematics can vary significantly depending on various factors. The ideal environment aims to be supportive, adaptable, and equitable, ensuring that all students can access the curriculum regardless of their abilities. Inclusive classrooms offer numerous benefits for all learners. However, the effectiveness of these environments depends significantly on several factors. Access to adequate equipment, effective use of technology, and fostering positive relationships among learners are crucial elements in

creating a supportive and adaptable learning space where all students can succeed in mathematics (Lambert & Tan, 2020; Hunt, 2020). Some of the factors that influence the conduciveness of the environment in inclusive basic education for the teaching and learning of mathematics are: *Assistive Tools***:** Braille readers, large print books, audio materials, adaptive writing tools, and communication devices for students with various disabilities.

*Mathematics Manipulative***:** Blocks, abacuses, number lines, and geometric shapes to help students, especially those with learning difficulties to understand abstract mathematical concepts. *Flexible Seating Arrangements***:** Adjustable chairs, desks with space for wheelchairs, and other ergonomic furniture in order to ensure that all students are comfortable and able to focus.(Sadiq, 2020;Das, 2021;www.studentsexperiencenetwork.org>2020/07). In order to make inclusion more successful, arrange learning environments by taking individual differences of students with special needs into consideration, guide parents, and create equal opportunities for all learners (Turgut & Gurlu, 2022).

Challenges in the teaching and learning of mathematics in inclusive basic education classrooms. Das (2021) and Duff (2022) stated that inclusive mathematics education creates new challenges for teachers, requiring additional knowledge and possibly changed classroom practices. The challenges faced by mathematics teachers that are making the teaching difficult in includes: Limited infrastructure, lack of specialize teaching materials such as Mathematics textbooks and teaching aids that are adapted for students with disabilities, such as large print or braille versions of textbooks, are scarce. Lack of p*olicy implementation and Support*, there is lack of adequate government funding to equip inclusive classrooms with the necessary tools and facilities (Mlolele et al, 2023; Muhmud et al, 2023; Kirmizigul, 2022, Holder, 2017). This includes insufficient budget allocations for specialized teaching materials, assistive technologies, and teacher training. *Lack of access to resource centers* that provide materials for students with special needs (Obunge & Taako, 2023). Special education services, such as speech therapists, occupational therapists, and psychologists, are rarely available in Nigerian schools. *Lack of Community and Parental Involvement***;** *Discipline Issues;* (Duff, 2022) and poor learning environment (Sadiq, 2020). Others are large class size, Increased integration of pupils with special needs within mainstream education and shortage of mathematics teachers, teaching assistance are not available, lack of technology in the classroom; limited knowledge about assessment may also contribute to teachers' inadequate preparedness for inclusion; In addition are: Lack of pedagogical content knowledge to teaching mathematics in inclusive classrooms; problem of subject teacher's attitudes and motivations; bullying problems between mainstream students and special needs students, and problems in ensuring effective communication in inclusive classes and the negative attitudes of parents to the fact that their healthy children should study with certain disabilities, and schools lack adequate equipment, inadequate building for various levels of schools from pre-nursery-basic-secondary schools (Micanovic, Novovic & Maslovaric, 2017; Muhmud et al, 2023) and adapting curriculum to their abilities, adapting physical environment to suit their stay, expansion of inclusive awareness in the society, and creating a legal foundation of inclusive education at all age levels.

Principles of Inclusive Education: The following are the main principles of inclusive education (Education minder, 2022; TopAdvantages, n.d and Vasyliev, n.d) as listed below: *Equal Opportunity, Uniqueness, Dignity Acceptance, Collaboration, Relevance, Empowerment, Social Balance, Law of Inclusiveness and Parents*: Involve parents in the education of their children including those with disabilities. They can help to ensure that their children's needs are met and that their children's quality of life remains as high as possible.

Despite the importance of every citizen to acquire at least numeracy and literacy that will lead to economic development of a nation at basic education levels and the benefits derived from it, it is of great concern to researchers that people are not aware of the existence of inclusive education in the Nigerian education system. Many researchers have highlighted the benefits inclusive education will bring into the security and social life of the nation. It is still observed that the policy implementation has not been adequately enforced in lower and middle basic schools (Primary schools) (Sadiq, 2020; Turgut & Gurlu, 2022). The environment where learning takes place is poor and teachers who execute the policy are not adequately trained and many other challenges facing the implementation of the policy. Sadiq (2020) attributes the problems hindering learners and teachers from maximum performance in Nigerian schools to their inability to proper teaching and learning of mathematics in a meaningful way due to government and stakeholders' stance to education. Based on this challenge, the study is to investigate the impact of mathematics education on the implementation of inclusive education in basic education in Niger State, Nigeria: Challenges and prospects.

***Research Questions*: T**he following research questions were formulated to guide the study:

1. How are learners being enrolled into inclusive basic education classrooms?
2. How conducive are the environment in inclusive basic education for the teaching and learning of mathematics?
3. What are the challenges faced in the teaching and learning of mathematics in inclusive education classrooms?

RESEARCH METHODOLOGY

The study adopted a Cross-sectional descriptive survey research method. The population of the study constituted of all lower basic and middle basic (primary schools) schools' teachers and administrators from the three senatorial zones in Niger State. The multi-stage stratified random sampling procedure was employed to obtain three hundred and thirty teachers, and forty-two administrators which constitute the sample for the study. Among these figures, Zone A comprising of (Teachers=107 and Administrators=15); Zone B comprising of (Teachers=102 and Administrators=10), while Zone C comprising of (Teachers=121 and Administrators=17) respectively drawn from the three zones making a total of three hundred and sixty-three teachers.

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A structured questionnaire titled "Mathematics Education and Implementing Inclusive Basic Education Questionnaire MEDIMIBEQ" was used for data collection. Part A was concerned with personal information of the respondents while part B consists of six parts with thirty-three (33) items to be responded to by the respondents. A four-point Likert's rating scale of strongly agree (SA=4), agree (A=3), disagree (D=2) and strongly disagree (SD=1) was used in measuring the response of the respondents. The questionnaire was validated by three experts in mathematics, science and education department respectively. A pilot test was conducted to determine the reliability of the instrument and a reliability coefficient of 0.635 was obtained using Cronbach alpha-20 (α_{20}). The questionnaires were collated and data obtained from the respondents were analyzed using percentages (%), means and standard deviation to answer the research questions and hypotheses were tested using t-test statistic.

Result Analysis

The data collected from the study was analyzed using percentages (%), descriptive statistics of means and standard deviation to answer the research questions and inferential statistics of t-test was used for hypotheses testing at 0.05 level of significance. The details of the analyses were as follow:

Research Question 1: How are learners being enrolled into inclusive basic education classrooms?

Table 1: Method of Enrollment into Inclusive Basic Education Classroom

Item	A (%)	D (%)	Mean	Std.Dev
Learners must be of school age of 6yrs or 6yrs+ with evidence of birth	305 **(92.4)**	25 **(7.5)**	3.8	0.7
By transfer from one school to another	267 **(80.9)**	63 **(19.1)**	3.5	1.0
Through oral interview before full admission is granted	262 **(79.4)**	68 **(20.6)**	3.5	1.1
The next-of-kin of learner to be admitted must be known	262 **(79.4)**	68 **(20.6)**	3.5	1.0
Through advertisement via mass media, traditional leaders, religious leaders, youth organizations and so on	253 **(76.7)**	77**(23.4)**	3.4	1.1
Average Mean			**3.6**	

Table 1 showed the results of responses of the respondents to method of enrollment of learners into inclusive basic education in the study area. Items 1, 2, 3, 4 and 5 agreed with the statements on the table that learners must be of school age of 6yrs or above with evidence of birth before they can enroll in basic school, by transfer, through oral interview, providing next of kin before admission is fully granted and that schools do advertise through mass media, traditional leaders, religious leaders, youth organizations and so on. Their responses has mean ranging from 3.8 to 3.4.

Research Question 2: How conducive are the environment in inclusive basic education for the teaching and learning of mathematics?

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Table 2: Conduciveness of Environment in Inclusive Basic Education for the Teaching and Learning of Mathematics

Item	A (%)	D (%)	Mean	Std.Dev
There are enough classrooms in the school to accommodate all learners	185 (56.1)	145 (43.9)	3.0	1.2
There are adequate infrastructural facilities in the classroom	194 (58.8)	136 (41.2)	3.1	1.1
Ventilations and brightness of classroom are good enough for learning mathematics	311 (94.2)	19 (5.7)	3.8	0.8
Spacing between desks and seats in the classroom are too close which affects learners learning	233 (70.6)	97 (29.4)	3.4	0.9
Seating position of learners in the classroom (ability, height, sight, hearing) affects their learning	254 (77.0)	76 (23.0)	3.5	0.9
Average Mean			**3.4**	

From the above table 2, responses to item 1, 2, 3, 4 and 5 showed that the respondents agreed with each statement on the table having percentages ranging from 94.2 to 56.1 with mean ranging from 3.80 to 3.01. It means that the learning and teaching environment in inclusive basic education is conducive.

Research Question 3: What are the challenges faced in the teaching and learning of Mathematics in inclusive basic education classrooms?

Table 3: Challenges Faced in Teaching and Learning of Mathematics in Inclusive Basic Education Classrooms

Item	A (%)	D (%)	Mean	Std.Dev
Supportive environment for all categories of learners	263 (79.7)	67(20.3)	3.6	0.9
Inability of learners to concentrate due to lack of reading or learning materials	265 (80.3)	65(19.7)	3.6	1.0
There is no special training of Mathematics teachers on how to handle special learners	266 (80.6)	64(19.4)	3.6	0.8
Loss of respect for teachers and aggression towards other learners	90 (27.3)	240(72.7)	1.5	1.7
Learners who are ill, feeling sleepy, anxiety or depressed cannot be catered for	264 (80.0)	66 (20.0)	3.6	0.8
Lack of facilities to cater for disable learners in the classroom	264(80.0)	66(20.0)	3.4	1.3
Average Mean				**3.2**

Table 3 shows the challenges faced in the teaching and learning of Mathematics in inclusive basic education classrooms. The results revealed that there is lack of supportive environment, inability of the learners to concentrates due to lack of learning resources, and lack of special training for mathematics teachers on how to handle special students; lack of facilities to cater for the disable learners and facilities to cater for disable learners were identified among the challenges as observed by the respondents (Mean of 3.6 to 3.4 with percentages of 80.6 to 79.7). In addition, the results revealed that 72.7% of the respondents disagreed that there was loss of respect for teachers and

aggression towards other learners as problem of teaching and learning mathematics in inclusive basic education classrooms (Mean=1.5).

DISCUSSION

The study was conducted to investigate the Impact of Mathematics of Education on the Implementation of Inclusive Basic Education in Niger State: Challenges and Prospects. Based on the analyses of findings, the results of the study showed that mathematics education has great impact at basic education level.

The finding shows that learners in inclusive Basic education classrooms are enrolled through various ways which includes by transfer from one school to another. This is in line with the Federal Republic of Nigeria (FRN, 2013), Hunt (2020) and Weduc (2022) who stated that all children, regardless of their backgrounds, gender, ethnicity, colour, nationality, cultural norms, languages, and so on must have access to education as soon as reach the age of six to fifteen years. According to Sibanda and Beckmann (2021) learners are typically enrolled in inclusive education classrooms through a variety of methods**:** automatic admission based on age, referral from specialists, parental application, or community outreach programs. These methods ensure that all children have the opportunity to access inclusive basic education and benefit from a supportive and inclusive learning environment.

Considering the importance of basic education and mathematics education to humanity, the study revealed that there are adequate infrastructural facilities in the classroom for teaching and learning of mathematics. Das (2021) and (www.studentsexperiencenetwork.org>2020/07) maintained that in inclusive basic education settings, the teaching and learning environment for mathematics can vary significantly depending on various factors as the ideal environment aims to be supportive, adaptable, and equitable, ensuring that all students can access the curriculum regardless of their abilities.

The results of the study revealed that there are many challenges faced in the teaching and learning of Mathematics in inclusive basic education classrooms such as fostering an inclusive and supportive environment for all learners. Muhmud et al, (2023); Kırmızıgül (2022) and Mlolele et al, (2023) supported that there is limited infrastructures like adjustable or specialized furniture that can accommodate students with disabilities, Lack of Assistive devices like braille machines, screen readers, or audio materials for visually impaired students, and hearing aids or speech-to-text tools for the hearing impaired, lack of specialize mathematics textbooks and teaching aids that are adapted for students with disabilities, teachers lack specialized training to teach mathematics in an

inclusive classroom; and lack of adequate government funding to equip inclusive classrooms with the necessary tools and facilities.

CONCLUSION

Every parent wants their children/wards to be educated which to some extent remains a dream yet to be accomplished. This can be achieved through inclusive education, a system of education that allow learners of all backgrounds who originally would have been excluded to have the same opportunities to grow and learn according to their own abilities, while also supporting their parents to engage in their education by enlisting them in schools with friendly environment and facilities, ultimately to the benefit of all. Teaching and learning of mathematics in an inclusive setting is primarily to ensure that students with special needs receive equal education with mainstream students. Teachers play a crucial role in igniting hope and transformation in the lives of their learners must employ innovative, creative and adaptable approaches and other specialized teaching techniques which will provide successful and productive teaching and learning processes. Inclusive mathematics education creates new challenges for teachers, requiring additional knowledge and possibly changes classroom practices. Inclusive education has the capacity to improve the quality of human life and leads to broad social benefits for individuals and society. It has the potential to raise people productivity, creativity, and improve income distribution. The implementation of inclusive education is very important for Niger State. This is one of the reasons why the state government setup committees as part of efforts to tackle menace of out-of-school children a means of transforming education in the state.

Recommendation

Inclusive education practiced in Nigeria presents a unique opportunity and strengths to all Nigerian children to be gainfully educated. Based on the study the following were recommended:-

- ✓ Teachers should employ creative and adaptable approaches and other specialized teaching techniques and instructional aids as they teach the learners, and provide students with the result of their assignment as at when due.
- ✓ Parents should be involved in the education of their children by helping with school activities and assignments when the need arises.
- ✓ Government should provide sufficient fund for the training of teachers on special education; provision of necessary infrastructure, building of more schools, provision of teaching and learning facilities, provision of equipment like ramps, elevator, wheelchairs, handrails along the walls, appropriate toilets, and school buses equipped lifts with special and so on.
- ✓ Government should provide meals, uniforms, writing materials to learners to encourage enrolling in schools.

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