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PERCEPTION OF MATHEMATICS TEACHERS TOWARDS ACHIEVING SUSTAINABLE DEVELOPMENT GOALS IN KANO STATE

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Abstract

One of the main cornerstones for achieving sustainable development is education. Particularly, the fourth and fifth goals of the Sustainable Development Goals (SDGs) stressed the importance of ensuring inclusive and quality education for all. This study investigated the perception of mathematics teachers on the role of quality education and gender-balanced mathematics education in achieving the SDGs. A descriptive survey design was used for the study. Out of the population of the study; one hundred and twenty (120) secondary school mathematics teachers within the metropolitan part of Kano State were randomly sampled. To guide the study, three research questions and one hypothesis were formulated. The instrument used for data collection was a researchers' designed questionnaire. The reliability of the instrument was determined using Cronbach Alpha Coefficient. Frequency and percentage, mean, standard deviation and Pearson Product Moment Correlation coefficient (at level of significance of 0.05) were adopted to provide answers to the research questions and hypothesis respectively. The analysis of data indicated that the level of teachers' awareness on the SDGs is moderate. In addition, the perceived role of mathematics teachers in realizing the SDGs through quality education and gender equality is inevitable. In conclusion, the work recommended that mathematics teachers should be motivated and challenged to prepare and present mathematics lessons to promote the multidisciplinary nature of mathematics which is capable of combatting the challenges facing humanity to attaining the Sustainable Development Goals.

Introduction

The Sustainable Development Goals (SDGs) officially referred to as "Transforming our World: The 2030 Agenda embraces the need for economic development that leaves no one behind and gives everyone a fair chance of leading a decent life. For effectiveness and efficiency, this research work only focuses on goals number four and five of the SDGs. Precisely; it explores the perception of mathematics teachers on the role of quality education and gender-balanced in achieving the SDGs.

All nooks and cranny of the world is battling with various challenges affecting sustainability of man. This has attracted the attention of educationists on the different perspectives of sustainability. For instance, various concepts for sustainable development have been discussed. Prominent among these concepts include economic viability, social justice and environment impacts (Leal et. al, 2020). In addition, Rieckmann (2012) and Ostrow (2019) in separate studies justified the need to transform knowledge in education into critical systemic thinking and action for sustainable development. This transformation cannot be achieved without the commitment of teacher (Bugallo & Vega, 2020). For students to acquire the necessary and sufficient skills required for sustainability, Seatter and Ceulemans (2017) argued for the need for a new style of teaching.

In lieu of this, various approaches have been developed by scholars to make mathematical materials more meaningful and useful to learners in meeting up with the required skills (such as critical thinking, creativity, collaborative, etc.) in the 21st century. One of such approaches is called Mathematics Education for Sustainable Development (Widiati & Juandi, 2019). This is probably why Rehmeyer (2011) emphasized that the problem of achieving sustainability are urgent and huge and will require complementary inputs of diverse disciplines. From the above positions, it is obvious that mathematics as a subject has what it takes to influence and address every component of these 2030 Agenda.

For Goal number 7 as an example, Levin, (2013) explained that mathematics has much to contribute when finding better and less polluting ways to explore for new energy, in increasing combustion efficiency, in the development of alternative energy, the management of energy g1rids and networks, and in minimizing the climate consequences of energy use. Hence, making energy to be essential for other targets; gender equity, quality education, etc.

Researches have shown from time immemorial that education is a key component of determining the standard of any country. To buttress this assertion, Adeyemi and Adaramola (2015) argued that in order to realize educational goals of any nation, there is need to attend to certain unavoidable variables such as teaching materials, methods of teaching, the curriculum, the students and the teachers. To Iji and Uka (2012), teacher remains the most important out of these identified variables. There is also growing evidence that teachers play a critical role in the development of high-quality education systems (OECD, 2011). Hence, to positively stimulate the development of the students, especially those with the wrong perception toward mathematics, it is necessary and sufficient for all teachers to realize their importance in all ramifications. No doubt, sustaining these goals is perceived by the researchers to be achievable through quality education and gender equality.

To begin with, mathematics as a discipline has a principle of identifying key area of contribution to scientific, economic and societal challenges. It plays a critical role in telecommunications, medicine, neuroscience, and much more. It is not an exaggeration that Abubakar (2010) opined that a constructive way of achieving sustainability in Nigeria is through a functional Mathematics Education. That is, mathematics education through well-trained mathematics teachers has a great deal to contribute to addressing these seventeen agenda of the Sustainable Development Goals.

According to Larson (2016), a mathematics teacher is someone who inspires his students to look beyond the pages of the textbook to become problem solvers and critical thinkers. As a mathematics teacher, one should ensure that students have the knowledge and skills that will help them not only to succeed in the classroom but also to be empowered by mathematics for becoming productive citizens in the society. Therefore, effective mathematics teachers should nurture and update their strengths in their subject matter and strategies through constant and deliberate effort. To achieve this, Schwartz, (2008) suggested the need to guard against creating the impression that mathematics is disconnected from the rest of what we study in school. In addition, mathematics teachers must be capable of defining concepts of mathematics, explaining why the concepts are worth knowing and understanding the relationship between theory and practice (Jorma & P*ä*ivi, 2019). To this effect, mathematics teachers need to play a role in promoting interest of both male and female students towards the subject and to make the connections between mathematics and other subjects visible and explicit in achieving quality education.

A good quality education is multicultural in nature. It enables its graduates to acquire the knowledge, skills and rational behaviors to earn a decent living and be able to live a productive, selfless, and peaceful life contributing to patriotic member of society (Allyson, 2014). Quality in mathematics teaching does not rely solely to students' achievement, to teaching approaches or too deeply held beliefs about the nature of mathematics and its teaching and learning, but to all of these. It is then expected that an ideal mathematics teacher education should raise all of these issues, as well as the aims, goals, and means of the teacher preparation process itself. Quality in mathematics teaching and teacher education depends on both theory and practice in systematic cooperation. Clearly, a quality mathematics class is capable of providing all students with chances of becoming economically and productive in contributing to a peaceful and democratic society like our great country, Nigeria.

The other area of goals of the SDGs this present study focuses on is the aspect of gender equality. Gender equality according to UNICEF (2017) is the equal valuing by society of the similarities and the differences of men and women and the roles they play. Though, few countries in the world have improved in this regard but majority (including Nigeria) are still found wanting. Gender inequalities in educational setting, politics and social values are as complex, dynamic and clear as it affects our interactions in all ramifications. To Doerr (2011), effects of gender issues are woven into educational outcomes, and at times contribute to complicated disparities, specifically in the field of mathematics education.

It is not an understatement that the existence of a gap between males and females in the areas of performance in mathematics is an issue among educationist almost everywhere around the continent. To mention but few, Forgasz et al. (2010) reported that most researchers agree that mathematics is still a male-dominated subject because females are still underrepresented in upper-level mathematics classes and careers as well as in the workforce. On the contrary, a study conducted by John and Benjamin (2015) revealed showed that male and female students are capable of competing and collaborating in mathematics. By and large, gender inequality should be condemned and eschewed by every rational mathematics teacher.

To break this barrier, one strategy for fighting such stereotypes is to provide role models for females in mathematics. Mathematics teachers should incorporate pedagogical practices that will make their lessons a base for educational placement and service provision that enhance all students' needs. To work effectively in a mathematics class, mathematics teachers should organize lesson units around big ideas and interdisciplinary themes to help establish connections between mathematics and the real world (*Dixon, 2006*).

Statement of the Problem

The place of mathematics in this century cannot be underestimated. It has been instrumental in recent development of science, engineering, medicine, agriculture, infrastructure development, technology and lots more. Mathematics provides solutions to challenges generated from daily dealings across all facets of life.

Despite the aforementioned benefits of this great discipline in the society, mathematics is not admirable, unchallenging, disconnecting to the real-world and ironically, not viewed as a tool for job creation. Worrisomely, mathematics is perceived as an isolated discipline which has no connection to real life experience. Competencies for incorporating mathematics skills for achieving the sustainable development is lacking among mathematics teachers. To curtail these imbalances, researches on the role of mathematics teachers in achieving the SDGs are crucial.

It is against this background this study is prompted to investigate the role every mathematics teachers should play to realizing the Sustainable Development Goals, teaching strategies they can use during teaching to stimulate learning environment that will appreciate transfer of knowledge into real life problems and promote academic excellence. Finally, to monitor how quality education and gender equality in mathematics achievement can bring about societies that will enhance and support the Sustainable Development Goals.

Objectives of the Study

The objectives of the research study are to establish the;

1. Mathematics teachers' levels of awareness on Sustainable Development Goals.
2. The perception of mathematics teachers on the role of quality education in achieving the SDGs.
3. The perception of mathematics teachers on the role of gender-balanced mathematics education in achieving the SDGs.

Research Questions

The research questions below are answered in the research study:

1. To what extent are mathematics teachers aware of the Sustainable Development Goals?
2. What are the perceptions of mathematics teachers on the role of quality education in achieving SDGs?
3. What are the perceptions of mathematics teachers on the role of gender-equality mathematics education in achieving SDGs?

Research Hypothesis

The null hypothesis below was postulated in guiding the research study;

Ho1: There is no significant relationship between the perceptions of the teachers on gender-balanced mathematics and quality education towards the achievement of SDGs.

Methodology

A survey design was employed in the research. The study population is mathematics teachers from the metropolitan part of Kano State, Nigeria. Out of which, a sample size of 120 participants was selected randomly from the Local Government Areas within the Kano City. Specifically, stratified random was used to select two (2) teachers from ten (10) secondary schools in each Local Governments. A researchers-designed questionnaire titled "*Role of Mathematics Teachers in Sustainable Development Goals Questionnaire* (RMTSDGQ)" with a 4-point Likert scale was adopted. Responses to each of the items were coded as Strongly Agree (SA) = 4, Agree (A) = 3, Disagree (D) = 2, and Strongly Disagree (SD) = 1. The instrument was validated by two experts (Senior Lecturers) in the Faculty of Education, Yusuf Maitama Sule University Kano, Nigeria. Thereafter, suggestions made by the experts were incorporated. In the same manner, the reliability was tested using the Cronbach Alpha coefficient and a global coefficient of 0.850 was obtained showing that the instrument is consistent based on the opinion of Cooper and Schindler (2008). The responses from those that are aware of the SDGs (81) were analysed using a descriptive statistics on bio data and the research questions. For an objective decision on all items generated for the research questions to be reached, a criterion mean (2.50) was obtained by finding the average of the 4-points coding scale. Items with mean values below the criterion mean shall be rejected while those above it shall be accepted. Finally, Pearson Product Moment Correlation (PPMC) was adopted in analyzing the research hypothesis.

Results

Research Question One: To what extent are mathematics teachers aware of the Sustainable Development Goals?

Table 1:

Mathematics Teachers' Awareness.

Variables	Frequency (N)	Percentage (%)
	Level of Awareness	
Aware	53	44.2
Partially aware	28	23.3
Unaware	39	32.5

From Table 1, it is clear that 53 teachers are fully aware of the SDGs, 28 teachers are partially aware of the SDGs while 39 teachers unaware of the SDGs. Thus, the analysis revealed that only 32.5% of the participating teachers are not aware of SDGs.

Research Question Two: The perception of mathematics teachers on the role of quality education in achieving the SDGs

Table 2:

Perception of Teachers on Quality of Education in achieving SDGs

No	Description	$\bar{X}$	S.D	Remark
1.	The current mathematics education is standard enough to achieve the SDGs	1.97	0.83	Rejected
2.	The incorporation of ICT in teaching mathematics has been introduced and successful in my school.	0.93	0.91	Rejected
3.	Quality education can be improved if every teacher actively and regularly attends conferences, seminars and workshop.	3.08	1.20	Accepted
4.	Rapid sustainable development will be experienced if mathematics teachers appropriately stimulate and design lessons that will foster enthusiasm in their students.	3.58	1.10	Accepted
5.	Quality mathematics education is capable of preparing learners towards skills and innovation required in competing in the present day workforce.	3.47	1.13	Accepted
	Average Mean/S.D			
		2.82	**1.04**	

From Table 2, quality education can be improved if every teacher actively and regularly attends conferences, seminars and workshop (item 3), rapid sustainable development will be experienced if mathematics teachers appropriately stimulate and design lessons that will foster enthusiasm in their students (item 4) and quality mathematics education is capable of preparing learners towards skills and innovation required in competing in the present day workforce (item 5) have mean values of 3.08, 3.58, and 3.47 respectively which are greater than 2.50 (criterion mean). This shows that the respondents perceived quality mathematics education as a parameter to achieving the Sustainable Development Goals. However, the mean rating obtained on item 1; the current mathematics education is standard enough to achieve the SDGs (1.97) and item 2; the incorporation of ICT in teaching mathematics has been introduced and successful in my school (2.03) are below the global mean (2.82). This indicates that the respondents disagreed that the current mathematics education is standard enough to achieve the SDGs. In addition, they revealed that the use of ICT in teaching mathematics has not been successful introduced to schools.

Research Question Three: The perception of mathematics teachers on the role of gender-balanced mathematics education in achieving the SDGs

Table 3:

Perception of Teachers on Gender Equality in achieving SDGs

No	Description	$\bar{X}$	S.D	Remark
1.	Gender equality in all ramifications will improve the possibilities of achieving the SDGs.	2.98	1.15	Accepted
2.	Mathematics exercises, task should be equally presented to all learners irrespective of their gender.	3.41	1.20	Accepted
3.	Government has established several workable interventions in sustaining gender equality both at state and federal level.	2.10	0.88	Rejected
4.	Low enrolment of girls in sciences & other mathematical related programs in higher institutions causes gender stereotyping by mathematics teachers.	2.99	1.13	Accepted
5.	Use of mathematical games/puzzles and other relevant materials during lesson may foaster interest of more females towards mathematics as their choice of career.	3.05	1.22	Accepted
	Average Mean/S.D	**2.91**	**1.12**	

Table 3 presents the analysis of responses related to gender-equality mathematics education. With the exemption of item 3 (with the least mean of 2.10 & standard deviation 0.88), the means obtained on other items 1 (gender equality in all ramifications will improve the possibilities of achieving the SDGs), 2 (mathematics exercises, task should be equally presented to all learners irrespective of their gender), 4 (low enrolment of girls in sciences & other mathematical related programs in higher institutions causes gender stereotyping by mathematics teachers) & 5 (use of mathematical games/puzzles and other relevant materials during lesson may foaster interest of more females towards mathematics as their choice of career) reveal that gender-balanced mathematics education will play vital role in achieving the SDGs. In particular, the respondents perceived equal presentation of mathematics exercises and task as well as the use of mathematics games and puzzles to be the major tools in maintaining gender-balanced mathematics education. Lastly, item 3 (government has established several workable interventions in sustaining gender equality both at state and federal level) shows the respondents disagreed that several workable interventions in sustaining gender equality has been established by both the state and federal government.

***Research Hypothesis*:** There is no significant relationship between the perceptions of the teachers on gender-equality mathematics and quality education towards achieving SDGs.

Table 4:

Correlation between Perceptions of Teachers on Quality Education & Gender-Balanced Education.

Variables	$\bar{X}$	S. D	*p* – value	*r* – value	Decision
Quality Education.	12.31	5.482	0.000	**0.471	Rejected
Quality Education.	11.95	2.204			

The Table 4 shows a correlation analysis of teachers' perceptions on quality education and gender balanced education. Evidently, there is a significant linear, moderate and positive correlation between the two variables (quality education and gender equality). In particular, the null hypothesis was rejected since the r-value obtained (0.471) is positive and it is less than the level of significance (0.05). Hence, the study revealed that there is statistically significant relationship between the relationship on the perceptions of mathematics teachers on the role of quality education and gender-balanced mathematics education in achieving the SDGs.

Discussion of Findings

Firstly, the finding of this study with respect to research question one revealed the level of awareness among mathematics teachers. In particular, the level of awareness of the teachers toward the SDGs is moderate. In support of this finding, Leire (2019) established the need to include education for sustainability in the educational curricula of the teaching staff at teachers' training colleges.

It is evident from the analysis (presented in Table 3) on research question two that the role of quality education in achieving the SDGs inevitable. Precisely, the result shows that mathematics teachers belief that they have role to play in ensuring their methodology of teaching and mode of assessment during mathematics classes agree with the rapid trend in Information Communication Technology (ICT) which may help to achieve the SDGs. In

addition, they opined that a quality mathematics education is capable of preparing learners towards skills and innovation required in competing in the present day workforce. This is in consonance with the findings of Chinedu, Wan Mohammad and Ajah (2018) as cited in Leire (2019) that teachers have a decisive role to play in reaching sustainable innovation since they are responsible for educating future generations.

For research question three, the study found that gender-balanced mathematics education will play a role in achieving the SDGs when equal presentation of mathematics exercises and other tasks as well as the use of mathematical games, puzzles and other related materials are maintained to all learners irrespective of their gender. This will foster the interest of more female learners towards choosing mathematics as a career. In the same manner, the findings of Okeke and Menkiti (2014) revealed that the use of innovative techniques and materials will improve and enhance students' achievement in mathematics irrespective of the gender.

Lastly, the data obtained on the above research hypothesis revealed that there is a statistically significant positive relationship between the perceptions of the teachers on gender-balanced mathematics and quality education towards achieving SDGs. This shows that quality education is acknowledged as a tool to nurture and support both males and females students in performing excellently in their academic carriers. The above finding is in line with that of UNFPA (2014) as cited by Katia and David (2015). Specifically, their findings revealed that education expands opportunities for girls and young women and raises their aspirations for work outside the home.

Conclusion

This paper investigated the level of awareness of the Sustainable Development Goals among mathematics teachers. Also, it studied the perception of mathematics teachers on the role of quality and gender-balanced mathematics education in achieving the SDGs. From the results, this study established that mathematics teachers' level of awareness is moderate. Also, the perception of mathematics teachers on the role of quality and gender-balanced mathematics education in achieving the SDGs was studied to be ubiquitous and essential. Precisely, the study has provided empirical evidence on how SDGs can be achieved through quality education and gender-balanced mathematics. To crown it all, the paper revealed the necessity to bridge the gap between mathematics taught in our schools and the mathematics needed for sustainability. This indeed will promote equality of rights for every mathematics students.

Recommendations

Based on the above findings, this study recommends the following measures need to be put in place.

1. Adequate and coordinated training, conferences, seminars and workshops organized by professional related bodies should be regularly sponsored by the state and federal government. This will keep mathematics teachers informed about the update of events and policies regarding events and policies which affect education.

2. Mathematics teachers should be motivated and challenged to prepare and present quality mathematics lessons in a manner that will promote multidisciplinary nature of mathematics. By so doing, students after their graduation will be capable of contributing immensely to various challenges facing humanity.
3. In addition, the state and federal governments should be more committed towards establishing vibrant and realistic policies that will improve gender equality education across all levels of education especially at higher institutions. Without any iota of doubt, more female students will be motivated towards studying the discipline as a future career choice.

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