



Roles of Mathematics Textbooks in Mathematics Education in Basic Education

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Abstract

The study discussed the roles of mathematics textbooks in basic education in Kontagora education zone, Niger State. A descriptive survey research method was adopted. Five research questions guided the research. Population of the research comprised of mathematics teachers and administrators in basic schools in the zone. Purposive sampling was adopted in selecting two hundred and fifty-six respondents {[Administrators (public=44 and private=20) and [Mathematics teachers (public=139 and private=53)]. A questionnaire "MATAQ" based on four point ranking scale with a reliability coefficient of 0.641 after. Data collected was analysed using mean response to answer the research questions. Results of the study indicated that textbooks played a central role in teachers' lesson preparations and in selection of practice exercises for the learners at this level of education. It was recommended that every learner should be made to have a copy of mathematics textbook at affordable cost because of its usefulness to their studies.

Keywords: Textbooks, Mathematics Textbook, Mathematics Education and Basic Education

Introduction

In Nigeria, basic education is the education meant for children within the ages of 6-15 years made up of three stages of lower basic, middle basic and upper basic called junior secondary school. Textbooks are essential to any education system in basic education. According to Martin et al (2017) and Pavesic and Cankar (2022), textbooks remain a critical component of many subjects or courses and academic programmes, with anecdotal evidence suggesting that there is a tendency to rely on traditional (Stein, et al, 2017). Martin et al (2017); Pavesic and Cankar (2022) added that the traditional print textbook has been regarded as the foundation for advancing learning, designed to provide an authoritative and pedagogical version of an area of knowledge, according to the societal beliefs about what is important for students to learn (Pavesic & Cankar, 2022; Stein et al, 2017, Martin et al, 2017; National University of Science and Technology, n.d). Svetlana et al (2024) stated that textbook is a written source of information, designed based on a syllabus or curriculum and geared towards meeting specific quality and learning requirements

(International Bureau of education, n.d; National University of Science and Technology, n.d).

Textbooks serve to guide instruction/discussion, frame issues, illustrate processes, identify critical questions and, thereby enrich the learning experience (Martin et al, 2017; Pavesic & Cankar, 2022). Textbook according to American Intercontinental University Online (n.d) and www.uduong.gov.ph provide organized units of work. A textbook according to Grand Canyon University (2015) gives one all the plans and lessons they need to cover a topic in some details to the extent that a textbook series provides one with a balanced chronological presentation of information (TeacherVision, 2022; American Intercontinental University Online, n.d). Studies have shown that in the school system all over the world, different subject have their textbooks containing the contents to be taught. Mathematics a compulsory subject in basic and secondary education has its own series of textbooks meant for each level.

Mathematics textbooks are important in the classroom. Roohi (2021); Mo and Zhou (2019); Kristanlo and Santoso (2020); and Kajande and Lovric (2009) sees



mathematics textbook as a fundamental resources that shaped the way we teach and learn mathematics. <https://scirp.org/journa> maintained that mathematics textbooks for primary and secondary schools plays an important role in elementary education and the realization of their functions and value depends on the scientific and effective use of teachers and students (Mo & Zhou, 2019; <https://scirp.org/journal>). The needs for mathematics textbook are as follow:

According to TeacherVision (2022) and allabouteducation4you.blogspot.com, a textbook is a standardized collection of subject-matter/knowledge, concepts and principles that has to be taught to the students of a selected topic or course. Nongsiej (2021) stated that textbooks facilitates the teaching of new concepts and skills, maintains the knowledge already acquired and helps in comparing theoretical knowledge with practical aspects of life (Vasu, 2018; Nongsiej, 2021).

Nongsiej (2021) opined that the uses of textbooks for mathematics teaching and learning give the teacher the outline of the course and help them to decide about the limits and depths of the content to be presented to the students while teaching (<https://julienongsiej.blogspot.com/2021>; <https://keerthisvbedcollege.files.wordpress.com>).

Mathematics textbook provides insight to the teacher in selecting the problems to be worked out, methods of teaching to be adopted and teaching aids to be used (Nakrani, 2025; Nongsiej, 2021; www.slideshare.net). Most Mathematics textbooks are accompanied by teacher's guide which provided them with supplemental teaching materials, ideas, and activities to be used throughout the academic year (TeacherVision, 2022; Grand canyon University, n.d). It provide organized unit of work and lessons that cover a topic in detail in chronological order, and direct the teacher on what to do and when to do it which give them more self-confidence while teaching (TeacherVision, 2022). Most of the classroom uses a standard mathematics textbook series. The usage of mathematics textbook depends on the expertise of the classroom teacher (Fredericks, 2005; TeacherVision, 2022). A good mathematics textbook is clear, appealing and organized in a predictive way (TeacherVision, 2022). It includes pictorial, illustrations, diagrams, exercises, homework, and so on to aid students in comprehension (Ham, 2018 & Petron, 2020). Keerthi (n.d) opined that the well-graded exercises provided after every topic in the textbook help the teacher in assigning suitable

homework and assignment to the students that suit their intellectual capacity (Nongsiej, 2021). Keerthi (n.d), Vasu (2018) and Nongsiej (2021) stated that Mathematics textbook saves a lot of time for the teacher as he need not to spend time to prepare problems and solutions as they are already available in the textbooks.

Mathematics textbooks help students relate what they are learning to life (Nongsiej, 2021; julienongsiej.blogspot.com). It helps foster the right study attitude among students as it present definite and concrete details in intensive manner which could arouse the student's interest and curiosity (Nongsiej, 2021; julienongsiej.blogspot.com). Further, added that textbooks provide the students with materials for drill and practice as such helps in fixing the mathematical principles and formulae in the learners (Nongsiej, 2021; julienongsiej.blogspot.com). julienongsiej.blogspot.com stated that it encourages self-study and independents work among the students thereby supplementing classroom learning, helps in clearing doubts and misunderstanding relating to mathematical concepts, formulae and principles, and help in correcting the mistakes that occur while copying the formulae and problems from the blackboard (Nongsiej, 2021; Vasu, 2018; julienongsiej.blogspot.com).

ASCD (2004) stated that teachers use them daily to plan and deliver the lessons considered essential in attaining the objectives of mathematics education; students work exercises in them and do homework. It strongly influence what students learn. ASCD (2004) added that authors and publishers base the content of mathematics textbooks on national curriculum standards. Mathematics textbooks have direct impact on what the schools teach and what students learn (Vasu, 2018; ASCD, 2004). Tulip and Cook (1993) and Thompson (2022) maintained that teachers of mathematics rely heavily on textbooks in their day-to-day teaching and decide what to teach, how to teach it and what sort of exercises to assign to their students largely on the basis of what is contained in the textbook authorized for their course (Thompson, 2022; Tulip & Cook, 1993; <https://link.spring.com>). Mathematics textbooks differ from other textbooks by providing problem solving techniques and approaches (Deira International School, n.d). The goal is to help students develop problem solving and critical thinking skills through examples, formulae and a variety of written and visual aids (Douglas college library, n.d; Deira International School, n.d; Nongsiej, 2021).



Donbell (2020) stated that textbooks must be written in simple and understandable language. It must be free from mistakes. It should be written within the grasp of the children; and provide sufficient materials to motivate the students to solve problems (Donbell, 2020).

Mathematics textbooks are updated or reviewed periodically because of factors such as the subject matter and formats of the textbooks as well as to offer students the freshest information available (the Classroom, 2022). Other reasons according to Vasu (2018) and Donbell (2020) include change in the syllables; new discoveries; removing outdated materials; including new fields; updating material (addition or removal) chapters or sections based on feedbacks; changing order of sections – more examples with solutions; error correction and so on to offer their users the freshest available information and knowledge (the Academia, 2019) leading to the production of quality textbooks to be used in schools.

Ekohotblog (2020) and educeleb.com are of the view that the state ministry of education ensures that publishers and authors align their textbooks publications with the national curriculum and unified scheme of work for primary and secondary schools. Educeleb.com stated that the exercise affords publishers and authors the avenues to provide rich contents that would facilitate qualitative teaching and learning processes which would engineer the inculcation of 21st century skills in the learners (Ekohotblog, 2020; educeleb.com). Educeleb.com believed that the major book review provides government an opportunity to access/censor books that would be circulated in schools across the state, thereby eliminating those that are substandard in content and unsuitable for students' consumption (Educeleb, 2020; Vasu, 2018; Stein, 2017; Ekohotblog, 2020). This culminates in the production of approved book lists from which schools in the state draw their respective booklists for their individual schools (Educeleb, 2020). The review is carried out by experienced teachers from public and private schools after they must have been orientated accordingly to the procedures, guidelines and in compliance with the national curriculum (Educeleb, 2020). This is one of those things that make subject textbooks special among other textbooks.

Textbooks have been part of the stock in trade of the educator for centuries (<https://core.ac.uk>; www.philippinesbasiceducation.us). There is something special about a book according to Fan (2013) some of which are: It has a very long life, far

than that of the individual reader. It is a low technology device. It is accessible to anyone who can read the language in which it has been written (<https://core.ac.uk>;

www.philippinesbasiceducation.us). In addition, during the hours of the day light it can be read (accessed) without any other supporting technology at all (<https://core.ac.uk>). It needs no maintenance except the occasional strip of adhesive tape, the way we teach and learn, it is accessible to anyone who can read the language it was written 24/7 a year (Olivier, n.d; www.philippinesbasiceducation.us), there is a positive connection between access to textbooks and learners' results, it encourages learners to learn; and ensures sameness of what takes place in different settings with different students and teachers (Das, 2018; Vasu, 2018; Donbell, 2020; the Conversation, 2015; <https://core.ac.uk>; Fan, 2013).

The rising cost of textbooks according to Martin et al (2017) is affecting students' ability to own textbooks and affect their study behaviours, purchase costly textbooks that were rarely used, and want another option for their studies (Stein et al, 2017). It is a practice now that every child must buy textbooks every new academic session with a particular author now unlike in the past where textbooks were passed from old child to the younger ones. The sale of textbooks in schools now is a big business venture whereby most times schools force parents to buy all books from their school bookshops (Atueyi, 2019). Atueyi (2019) stated that parents are seeking for the reuse of old ones; and want government and ministry of education to find a way of bringing harmony in the use of textbooks racketeering in the system. The periodic insertion of workbooks inside textbooks must be stopped. Pupils and students need to be encouraged to learn how to preserve their textbooks (Atueyi, 2019). Subsidized publication of books is to assist the publishers and authors to produce books of an acceptable standard at reasonable prices for students and teachers (Stein et al, 2017; Martin et al, 2017). UMassAmherst (2022) and Walrack (2022) believed that there is a need for adequate and relevant textbooks reserved in the library for users' access, loan out old textbooks by those who have it, sharing of textbooks with classmates and giving students the option to use different editions of the required textbooks.

Some textbooks may fail to arouse student interest. It is not unusual for students to reject textbooks simply because of what are compendiums of large masses of data for large masses of students.

(www.allabouteducation4you.blogspot.com/2010). Blogger.com (2010) opined that students may find it difficult to understand the relevance of so much data to their personal life; the quality of material used; coloring; ability to draw learners attention; originality; title dominance; binding quality or durability when using it; the number of pages; weight of the textbook; price of the textbook; gender illustration (TeacherVision, 2022; Patra & Sadasivan, 2021; EDB, 2016 and the Conversation, 2015).

However, Roohi (2019) stated that it is impossible for a book to cover everything that pupils need to know within a course of study. Therefore, it is important for teachers to take into consideration how books differ from one another when they decide on what material to use in the classroom (Course Hero, n.d). Teachers need to select suitable textbooks for use during its lesson. The more the teacher uses a textbook, the important it is to make sure that it has functions that suit the specific class (Course Hero, n.d). The study aimed to find the role mathematics textbook will have in mathematics education in basic education in Kontagora education Zone-Niger State

Research Questions

Below are research questions for the study:

- i. How importance is textbooks to teachers?
- ii. How useful is textbooks to students?
- iii. Why do authors update mathematics textbooks in schools?
- iv. How can the cost of textbooks be reduced to make it affordable to learners/users?

Presentation of Results

The results of the responses and means were presented and interpreted below:

Research Question 1: How importance is textbooks to teachers?

Table 1: Mean response on the importance of textbook to teachers?

N	Item	SA	A	D	SD	μ
1	It saves time and energy of teachers by giving direction to lessons and guide discussion	126	50	32	48	2.99
2	It makes teaching of mathematics systematic	115	70	32	39	3.03
3	It does not assist in managing a lesson	30	12	104	110	1.85
4	It provide teachers with confidence and security	90	56	61	49	2.73
5	It is not a reliable point of reference for teachers	28	48	110	70	2.13
6	It serves as guide to the syllabus and provide teachers with complete programme to execute	76	109	43	28	2.91
7	Good textbooks are not excellent teaching aids	29	50	111	66	2.16
8	The series is typically based on the latest research and teaching strategies	67	103	39	47	2.74

In table 1, the responses of item 1, 2, 4, 6 and 8 agree with their respective statement while mean responses to items 3, 5 and 7 were in disagreement with their respective statement.

- v. Why some textbooks may not arouse the interest of students?

Research Methodology

A descriptive survey research method was adopted. Area of study was Kontagora educational zone of Niger state, Nigeria. Population comprises of all mathematics teachers and administrators in all basic schools in the zone. Purposive sampling technique was adopted and used in selecting two hundred and fifty-six respondents made up of sixty-four administrators (public=44 and private=20); and one hundred and ninety-two mathematics teachers (public=139 and private=53). A structured questionnaire titled “Mathematics Textbook Assessment Questionnaire-MATAQ” was constructed on the bases of research questions on four point ranking scale of strongly agree (SA=4), agree (A=3), disagree (D=2) and strongly disagree (SD=1) used in measuring the response of the respondents, having two parts used for data collection. Part A considered personal information while part B consists of five sections of items responded to by the respondents. MATAQ have a reliability coefficient of 0.641 determined using Cronbach alpha ($\alpha=20$). The instrument was administered through research assistants. The researcher use frequency distribution table and mean response as statistical tool to answered the questions asked. Frequency distribution table was used to describe the data in order to understand the differences on the responses made by respondents. Responses with mean of ≥ 2.5 is accepted as agreed while mean of < 2.5 is taken as disagreed.

Research Question 2: How useful is textbooks to students?

Table 2: Mean response of usefulness of textbooks to students

N	Item	SA	A	D	SD	μ
1	It help students to learn the subject registry (language and terminologies)	103	63	51	39	2.90
2	It improves the students ability to think and find solution to problems	79	101	46	30	2.89
3	It enhance students creativity and their imagination	66	94	39	57	2.66
4	It boost students confidence and intelligent	87	81	43	45	2.82
5	It discouraged them from learning new terminologies of various topics in mathematics	44	39	68	105	2.09
6	It help them to organized their learning both inside and outside the classroom	119	96	28	13	3.25
7	It discouraged them from learning faster, better and easier	29	50	90	87	2.08
8	It does not provide students with several activities and questions related to the topics treated	08	34	98	116	1.74
9	They cannot use other reference books for more knowledge	12	32	118	94	1.85

The above table 2, shows the mean responses of the respondents agreeing with statements in items 1, 2, 3, 4 and 6 having respective value of greater 2.50. items 5, 7, 8 and 9 having mean responses of less than 2.50 each disagree with their respective statement.

Research Question 3: Why do authors update mathematics textbooks in schools?

Table 3: Mean response on reason why authors update mathematics textbooks in schools

N	Item	SA	A	D	SD	μ
1	Textbook may need repair from errors not caught in the proofing process	15	20	30	50	3.10
2	Mathematics textbooks offer adequate and sufficient instruction	6	46	26	86	2.09
3	Better coverage of topics and Inclusion of topics not covered earlier in response to the comments of teachers/students	93	58	56	49	2.76
4	Most publishers want to maximize profits	69	96	55	36	2.77
5	When new contents are introduced to have materials that were aligned with the curriculum	68	98	48	42	2.75
6	The curriculum the textbook was produce for remain same	35	48	13	34	2.33
7	To offer students the freshest available information	28	45	11	71	2.12

In table 3, the respondents agreed with statements in items 1, 3, 4 and 5 while they disagreed with statements in items 2, 6 and 7 respectively

Research Question 4: How can the cost of textbooks be reduced to make it affordable to users?

Table 4: Mean response on reduction of cost of textbooks to make it affordable to users

N	Item	SA	A	D	SD	μ
1	Government at all levels must take action that will favor all on sales of textbooks	47	109	48	52	2.59
2	Government must approve the reuse of old textbooks by learners all over the institutions in the nation and punish any institution that default	85	98	34	39	2.89
3	Subsidized publication of textbooks to enable the publishers produce acceptable textbooks at reasonable prices for users	76	100	41	39	2.83
4	Exclusion of workbooks inside the textbook will increase bulkiness and cost	12	38	128	78	1.94
5	Government need to provide learners with textbooks in the school libraries	98	58	56	44	2.82
6	Students must be answering questions from the textbooks into their workbooks	46	124	38	48	2.66
7	Sharing your textbooks with classmate will increase book cost	46	54	96	60	2.34
8	Allow government to produce these textbooks through its printing press	49	122	36	49	2.67
9	Sole publisher be allowed into textbooks publication business	46	32	96	82	2.16

Table 4 shows that the mean responses to items 1, 2, 3, 5, 6 and 8 by the respondents agreed with each statement while they disagreed with the statement in items 4, 7 and 9.

Research Question 5: Why some textbook may not arouse the interest of students?

Table 5: Mean response on why some textbooks may not arouse students interest

N	Item	SA	A	D	SD	μ
1	The quality of material used in the production of the textbook	81	111	35	29	2.95
2	Ability to draw learners attention	20	85	49	102	2.09
3	Colouring and title dominance of the textbook	68	96	46	46	2.73
4	Price of the textbook and durability when using it	59	116	34	47	2.73
5	Gender illustration	83	86	42	45	2.81
6	The number of pages and weight of the textbook	108	58	39	51	2.87
7	Textbooks do not take students background into consideration	46	33	95	82	2.17
8	Students having gone through the textbook may find it difficult to understand the relevance of bulky data in the textbook to their personal lives	32	49	59	116	1.99

Table 5 shows responses of respondents agreeing with statements in items 1, 3, 4,5 and 6 while they disagreed with statements in items 2, 7 and 8.

Discussion

The discussion of the results was to analyses the role of mathematics textbooks in mathematics education in Kontagora education zone, Niger State-Nigeria. Based on the analyses of findings, the results from the study showed that mathematics textbooks play a great role in mathematics education at basic education (Momozoku et al, 2025; Onyishi, 2023).

In their finding, Momozoku et al (2025) stated that state government through their respective ministry of education, curriculum planners, and experienced subject experts determine the types of textbooks to use by students in schools. This is in line with Vasu, 2018

and Stein et al, 2017 who said that the choice is made by teachers and curriculum experts.

Further, Momozoku et al (2025) supported that there are so many special things about a textbook apart from its utility such as shaping the way we teach and learn, increases intelligence and improve self-education. Das (2018) and TeacherVision (2022) supported that it encourages sameness of what take place in different settings with different students and teachers, and it encourages learners to learn.

Considering the uses of textbooks to teachers and students, the study revealed that textbooks are useful



to both teachers and students in these ways: provide teacher with confidence, security, managing lesson and excellent teaching aids while it help students learn subject registry, enhance their creativity and imagination; can be use both inside and outside the classroom. The conversation (2015), Tulip and Cook (1993), Vasu (2018), Magnusson (2021) and TeacherVision (2022) affirmed that textbooks are useful to both teachers and students in many different ways through its functions and their advantages to both of them.

In their contribution, Stain et al (2017) and Martin et al (2017) studies revealed that the cost of textbooks can be reduced to make it available to users by government involvement in the production of these textbooks, subsidize cost of production to publishers and allowing users to use old textbooks. The finding is supported by Stein et al (2017), Martin et al (2017), Esposit (2017), UMassAmherst (2022) and Walrack (2022) that there is need to have adequate and relevant textbooks reserve in the library for users access, loan out old textbooks by those who have it, sharing of textbooks with classmate and giving students option to use different editions of the required textbook

The finding shows that the quality of material used, gender illustration, the language and price of the textbook and durability when using it discourage users from having interest in textbook. The study is in harmony with previous works of Das (2015), EDB (2016), the Conversation (2015), Patra and Sadasivan (2021); and TeacherVision (2022) which showed that the language, the difficulty level of the content, bias in stereotyping, colouring and illustrations were responsible for lack of interest observed among the users of those textbooks.

Conclusion

This paper has established that mathematics textbooks are the backbone of mathematics education. Mathematics textbooks gives the users the opportunities for developing computational, manipulative and problem solving skills that will enable them function effectively in the society within the limits of their capability. Mathematics textbook are essential tools for arousing interest and motivation in the learning of mathematics. The spirit of possession of mathematics textbook by learners/users brings about interest, motivation, persistence and the ability that will enable learners/users to achieve success of learning mathematics. The inability of learners/users to possess one mathematics textbook impact

negatively on the nation. Therefore, it is necessary that avenue be created for its possession by all categories of learners/users to put the learning of mathematics on the right track. Finally, provision of relevant mathematics textbooks to learners/users will go a long way in motivating, and raising their morale and interest in the subject.

Recommendations: From the results of the finding, it is recommended that:

- Mathematics textbooks should be accessible to both mathematics learners as there is positive connection between access to mathematics textbooks and learners achievement
- Mathematics textbook should be able to draw learners attention, take learners background and gender into consideration
- Every learner should be made to have a copy of mathematics textbook at affordable cost because of its usefulness to their studies
- Teachers should be made to possess more than one mathematics textbooks as no single mathematics textbook offer adequate content coverage of the curriculum
- Government should regulate the sales of mathematics textbooks, subsidize publication of mathematics textbooks by publishers or produce these mathematics textbooks through its printing press; and supply adequate relevant sets of mathematics textbooks to learners in basic schools to enhance uniformity

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