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Enforcement of the National Minimum Standards Specifications for Implementation of the 3-Year Upper Basic Science and Technology Curriculum in North Central Nigeria

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Abstract

This study assessed the extent to which the National Minimum Standards Specifications are enforced for effective implementation of the 3-year Upper Basic Science and Technology curriculum in North Central Nigeria. A cross-sectional survey research design was used for the study. The population comprised all 10,688 Basic Science and Technology teachers. The sample consisted of 288 teachers randomly selected from 72 government and private secondary schools in the study area. Basic Science and Technology Facilities Checklist (BSTFC), Basic Science and Technology Teachers Minimum Qualification Questionnaire (BSTTMQQ) and Basic Science and Technology Teachers In-service Training Inventory (BSTTITI) were used for data collection. The

instruments were validated by three experts, two in Science Education and one in Test and Measurement. The reliability coefficient of the instruments was determined using Cronbach alpha and the internal consistencies of instruments were obtained as 0.92, 0.78 and 0.79 respectively. The three research questions which guided the study were answered using mean and standard deviation (SD), while the three null hypotheses were tested at 0.05 level of significance using independent t-test. The result revealed that the National Minimum Standards are enforced to a less extent as the basic facilities for the implementation of the 3-year Upper Basic Science and Technology curriculum are available moderately only in Government Secondary Schools (GSS). The minimum teaching qualification of Nigerian Certificate in Education (NCE) is less enforced especially in Private Secondary Schools (PSS). Teachers in Private Secondary Schools attend workshops and seminars for effective implementation of the curriculum moderately while the Government Secondary School teachers attend workshops and seminars to a less extent. It was recommended that Government through the Ministry of Education (MOE) and private schools owners should ensure full enforcement of the National Minimum Standards specifications for the implementation of the curriculum in both government and private secondary schools in the country. This can be achieved through the provision of basic facilities such as classrooms, furniture, laboratories, workshops, sport/games, ICT/ computer multimedia, electricity, water, stores, library, offices and toilets. It was also recommended that authorities ensure the minimum teaching qualification, that is NCE, is enforced to a great extent in both government and private secondary schools. Educational authorities should also harmonize the in-service training for both government and private secondary school teachers by organizing regular workshops and seminars as well as strict monitoring of all schools to ensure that the National Minimum Standards Specifications for effective implementation of the 3-year upper science and technology curriculum are enforced.

Keywords: Science and Technology Curriculum, National Minimum Standards, Enforcement, Specification, Implementation

Introduction

Basic Science and Technology Education is an organized process where learners at the Basic Education level try to learn and understand their environment through observation and exploration of the things around them. Science learning and the application of technology enhances the production of citizens who can effectively participate in the global affairs and contribute to the attainment of the Sustainable Development Goals (SDGs). According to Angura and Fatoki (2020) part of the mental abilities and skills learners cultivate early in life with sound attitudes towards problem solving, through manipulative and creative thinking enable them begin to venture in real life situation technologically, thereby laying solid foundation for useful experiences that facilitates mental development. Akpan (2015) opines that no nation or society can strive to function effectively in the absence of science and technology. He further asserts that only science and technology have the key to produce skills, knowledge, competencies, as well enhance the development of human potentials for social economic advancement.

Grover (2018) states that there is a great relationship between science and technology which is knowledge construction and application that lead to skill acquisition, competence and development in the society. The author explains further that science and technology collaborate to bring about teaching and learning that can promote higher levels of creativity. According to Lazar (2015) Science and Technology education is of immense importance to present day society, especially to enhance the area of skills acquisitions and knowledge needed for self – reliance in a

bid to check the excesses of unemployment and youth restiveness. The need to provide science and technology education in Nigeria as a way of caching them young at the Upper Basic Education level is good foundation for secondary school curriculum implementation (Aina, 2013). The author is of the opinion that teachers need to acquire the minimum teaching qualification to enable them use the required and specified facilities for effective curriculum implementation now that science and technology education is being considered as the basic tool for the attainment of Sustainable Development Goals.

According to the Universal Basic Education Commission (UBEC, 2010) as contained in the National Minimum Standards Specifications for Basic and free education. Number 115, section 9, sub-section (c) of The Compulsory, Free, Universal Basic Education and Other Related Matters Act, 2004. Otherwise known as the UBE Act of 2004 provided that, the UBE Commission is to "prescribe the minimum standards for basic education throughout Nigeria in line with the National Policy on Education and the directive of the National Council on Education and ensure the effective monitoring of the standards". According to Nigerian Research and Development Council (NERDC 2012), a standard is an established norm or requirement that all systems work towards achieving. Standards are of three types, namely resource standards, process standards and performance standards. These three are operational in the implementation of the UBE Programme in Nigeria. However due to limited scope, this study is focused on the resource standards which are concern with the minimum teaching qualification, teachers in-service training and the basic facilities needed in each school for effective implementation of the curriculum. Ityav (2014) opines that, there are schools with varied levels of facilities and teaching standards. These schools are majorly classified into government and private schools, the standards for most schools, however, are dismal, and do not lend itself to the overall growth and development of children. To provide them the skills required to survive with dignity in this ever changing global society that is entrepreneurial oriented. However, by the provision of the UBE Act, 2004, all primary and secondary schools operating in Nigeria irrespective of status are compelled to cue in the National Minimum Standards Specifications for the implementation of the UBE curriculum in Nigeria. Now that Basic Education institution is seen as lucrative and has become an all-comers' affair, there is every need to ascertain the extent of enforcement of the National Minimum Standards for the implementation of the 3-year Upper Basic Science and Technology curriculum which is a vital component of the 9-year Universal Basic Education loaded with strong indicators for the attainment of the Sustainable Development Goals (SDGs).

According to Paige (2009) adopting a 21st century curriculum should blend knowledge, thinking, innovative skills, media, Information and Communication Technology (ICT) literacy, and real life experience in the context of core academic subjects. In order to achieve critical thinking that could lead to problem solving, the curriculum should expose learners to model facilities to enhance rapid knowledge construction. In this way, learners will be prepared with the necessary knowledge and life skills that will help them be successful in their future careers (Lombardi, 2007). The author points out that, curriculum in the 21st century should focus on the construction of knowledge and encourage students to produce the information that has value or meaning to them in order to develop new skills. Robin (2008) states that adopting digital slides in the classroom to aid instruction can support student participation, their motivation and understanding for the academic subjects, as well as real life global affairs. Itav (2014) asserts that standards are designed

to be robust and relevant to the real world, reflecting the knowledge and skills that our young people will need for success in science and technology education and be positioned to compete successfully in the global economy.

According to UBEC (2012), teachers minimum teaching qualification is Nigerian Certificate in Education (NCE), this entails that teachers in both government and private secondary schools handling the four areas of Basic Science and Technology should have at least the Nigerian Certificate in Education (NCE) in Basic Science, Basic Technology, Physical and Health Education as well as Computer Science/Information Communication for effective implementation the curriculum. Adegoke (2012) observes that the classroom teacher forms the cornerstone in curriculum implementation. He/she is the main force and the last person to ensure that all the segments of the curriculum are implemented according to specifications. On the other hand the instructional facilities are the physical material/structures used to facilitate teaching and learning in Basic Science and Technology. These facilities include; classrooms, furniture, laboratories, workshops, sport/games, ICT/computer multimedia, electricity, water, stores, library, offices, toilets, and machines which are utilized by teachers and students in the teaching and learning process in both government and private owned secondary schools (Sambo, 2012). Osita (2014) states that the effectiveness of curriculum implementation is depended on the quality of the teachers and the extent the required facilities are available and utilized during instruction.

According to Keating (2011), curriculum, if naturally and positively interpreted, could achieve the objective of motivating learning, enhancing knowledge and abilities and developing positive values or even attitudes especially when its implementation is based on the specific curriculum objectives and the required minimum standards specifications or bench marks. The major aims and objectives of the merged 3-year Upper Basic Science and Technology as stated by NERDC (2012) are to help learners:

i. Develop interest in the study of Science and Technology;
ii. Acquire scientific and technological knowledge and skills;
iii. Apply the scientific and technological knowledge and skills for sustainable community development;
iv. Take advantage of numerous career opportunities offered by science and technology; and,
v. Become prepared for further studies in science and technology.

In order to achieve these objectives, the Universal Basic Education Commission (UBEC) according to UBE Act of 2004 number 115 as amended has put in place the following Minimum Standards Specifications or bench marks for the implementation of the Basic Science and Technology Curriculum (BSTC): that all primary and secondary schools operating in Nigeria must keep and maintain;

i. Adequate facilities such as classrooms, offices, toilets, laboratories/workshops, ICT, playing grounds and equipment, and power source.
ii. Teachers' minimum teaching qualification at the lower and upper Basic Education level, which is the Nigerian Certificate in Education (NCE).

iii. In-service training (workshops and seminar) for Basic Science and Technology Teachers.
iv. Use of specific instructional resources in each of the four areas of Basic Science and Technology.
v. Specific instructional methods for Basic Science and Technology instruction.
vi. Use of specific assessment criteria and techniques for Basic Science and Technology.
vii. Specific practical activities during Basic Science and Technology instruction for skill acquisition and application among others.

Atomatofa, Avbenagha and Ewesor (2013) maintains that both public and private primary schools are lagging behind in the strict enforcement of specified minimum standards for Basic Education in Nigeria. In a similar development, Doggoh (2011) stressed that there is a significant effort among states in the implementation of the UBE Act (2004). This implies that the Minimum Standards were moderately enforced among the states surveyed; however with low compliance with the minimum teaching qualification as secondary school leavers still parade both the lower and upper basic education levels as teachers especially in private schools. Ogungbesan (2012) points that 66.5% of the Basic Science teachers surveyed were not professionally qualified to teach the subject, 78% of the schools covered lack essential schools facilities like classrooms, offices, playing fields and instructional aids and 70% of the teachers surveyed were using lecture and discussion methods for Basic Science instruction. Nakpodia (2011) states that urban teachers' implementation of the UBE programme was significantly different from to those in the rural areas. Also, the experienced teachers' implementation of the programme did not differ from the less experienced teachers. He adds that teachers in the area generally lack in-service training (seminar and workshops) to effectively implement the UBE curriculum. Nwafor and Eze (2014) observe that only two dimensional instructional materials are available in schools. Other instructional materials such as audio materials and audio-visual materials are lacking in most schools including major school facilities like classrooms, laboratories and workshops.

The quality of teachers and the extent facilities are available in schools for effective teaching and learning cannot be overemphasis. This is because, it is only when the most qualified teachers are employed and the required or specified facilities are provided that meaningful teaching/learning could take place. In line with international best practice, the National Minimum Standards Specifications as stated by UBEC (2012) has provisions for government and other stakeholders in education in Nigeria for effective implementation of the UBE programme. Basic Science and technology is one of the key subjects at the Upper Basic Education level targeted to prepare students for further studies in science/technology and for the attainment of the Sustainable Development Goals (SDGs). However, prior to the merger of Basic Science, Basic Technology, Physical and Health Education and Computer Science as Basic Science and Technology. Studies by Doggoh (2011), Nakpodia (2011) and Ogungbesan (2012) reported that both government and private secondary schools were not adhering strictly to the enforcement of specified minimum standards for Basic Education in Nigeria. This obviously calls for an empirical survey to find out what the situation is, now that these individual subject areas are merged as one.

Statement of the Problem

The National Minimum Standards have specifications on the minimum teaching qualification, the training need for teachers at the lower and upper basic education in Nigeria, as well as the required facilities for effective implementation of the curriculum. The question is that are these minimum standards enforced in the government and private secondary schools in Nigeria? Doggoh (2011), Nakpodia (2011), Ogungbesan (2012), Atomatofa, Avbenagha and Ewesor (2013) reported low level of adherence to the minimum standards for the implementation of UBE curriculum in the single subject areas of Basic Science and Technology in Nigeria. Therefore now that these subject areas are merged as one. To what extent are National Minimum Standards Specifications for the implementation of the 3-year Upper Basic Science and Technology curriculum enforced in both government and private secondary schools in Nigeria?

Purpose of Study

The purpose of this study was to assess the extent to which the National Minimum Standards Specifications for the implementation of the 3-year Upper Basic Science and Technology Curriculum are enforced for effective implementation of the curriculum in Government Secondary Schools (GSS) and Private Secondary Schools (PSS), in the North-central geopolitical Zone of Nigeria. Specifically, the objectives of the study were to;

i. To determine the extent facilities are available in government and private secondary schools for effective implementation of Basic Science and technology curriculum.
ii. To determine the extent to which the minimum teaching qualification (NCE) is enforced by government and private secondary schools in the four areas of Basic Science and Technology (BST).
iii. To find out the extent to which teachers handling the four areas of Basic Science and Technology (BST) attend seminars and workshops for effective implementation of the curriculum.

Questions

i. To what extent are facilities available in government and private secondary schools for effective implementation of BST curriculum?
ii. To what extent is the minimum teaching qualification of NCE been enforced by government and private secondary schools in the four areas of BST?
iii. To what extent do teachers handling the four areas of BST attend seminars and workshops for effective implementation of the curriculum?

Hypothesis

i. There is no significant difference in the mean rating scores of teachers on the extent to which facilities are available in government and private secondary schools.
ii. There is no significant difference in the mean rating scores of teachers on the extent to which the minimum teaching qualification of NCE is enforced in government and private secondary schools in the four areas of BST.
iii. There is no significant difference in the mean rating scores of teachers in government and private schools on the extent to which teachers handling the four areas of BST attend seminars and workshops.

Methods

The study is a cross sectional survey design was used for the study. The population comprised all 10,688 Basic Science and Technology teachers in North Central Nigeria. The sample consists of 288 teachers randomly selected in both government and private secondary schools in the study area. Three research questions guided the study, while three hypotheses were tested at 0.05 level of significance. Basic Science and Technology Facilities Checklist (BSTFC), Basic Science and Technology Teachers Minimum Qualification Questionnaire (BSTTMQQ) and Basic Science and Technology Teachers In-service Training Inventory (BSTTITI) were used for data collection. The instruments were validated by three experts, two in Science Education and one in Test and Measurement. The reliability coefficients of the instruments were determined using Cronbach alpha and internal consistencies of instruments were obtained as 0.92, 0.78 and 0.79 respectively. The instruments were developed on a modified Likert-type four point rating scale of 4, 3, 2, and 1 as follows: each item in instrument A, B and C has; Great Extent (GE) = 4 points = 3.50 – 4.00, Moderate Extent (ME) = 3 points = 2.50 – 3.49, Less Extent (LE) = 2 points = 1.50 – 2.49, No Extent (NE) = 1 point = 0.50 – 1.49. Any item with the mean of 2.50 and above was accepted while items with the mean of 2.49 and below were considered less extent. The instruments were administered to the respondents by the researcher alongside with one trained research assistant. The data collected was analyzed using mean and Standard Deviation (SD), while the three hypotheses were tested using independent t-test.

Results

Question One

To what extent are facilities available in government and private secondary schools for effective implementation of BST curriculum?

Table 1: The extent to which facilities are available in government and private secondary schools for effective implementation of BST curriculum

S/N	Facilities Available	GSS			PSS		
		Mean	SD	DEC	Mean	SD	DEC
1	Offices/Classrooms/toilets	3.70	1.16	GE	4.00	1.20	GE
2	Furniture	2.50	1.21	ME	3.00	1.15	GE
3	Laboratories	2.30	1.25	LE	2.50	1.21	ME
4	Workshops	1.28	1.12	LE	1.38	1.19	LE
5	Sport/Games facilities	2.80	1.21	ME	1.35	1.35	LE
6	ICT/Comp. facilities	2.55	1.20	ME	2.80	1.31	ME
7	Electricity	2.50	1.18	ME	2.65	1.17	ME
8	Water	2.80	1.15	ME	3.40	1.18	GE
9	Stores	2.64	1.25	ME	2.00	1.22	LE
10	Library	2.34	1.19	LE	3.85	1.18	GE
Cluster mean		**2.54**			**2.69**		

Key: BST = Basic Science and Technology
GSS = Government Secondary Schools
PSS = Private Secondary Schools

GE = Great Extent, ME = Moderate Extent, LE = Less Extent, & NE = No Extent

The result in Table 1 of research question 1 shows that facilities are available in government secondary schools (GSS) and private secondary schools (PSS) for the implementation of the 3-year Upper Basic Science and Technology curriculum moderately. However, the PSS have slightly more facilities available than the GSS with the composite means of 2.54 and 2.69 respectively.

Question Two

To what extent is the minimum teaching qualification of NCE been enforced by government and private secondary schools in the four areas of BST?

Table 2: The extent to which the minimum teaching qualification of NCE is been enforced by government and private secondary schools in the four areas of BST

S/N	Four Areas of BST	Mean Rating of Teachers with the Minimum Teaching Qualification NCE					
		GSS			PSS		
		Mean	SD	Dec	Mean	SD	Dec
1	Basic Science	2.50	1.10	ME	2.20	1.18	LE
2	Basic Technology	2.30	1.20	LE	2.56	1.27	ME
3	Physical & Health Edu	2.15	1.18	LE	2.66	1.19	ME
4	Computer Science	2.58	1.35	ME	2.45	1.29	LE
Cluster Mean		**2.38**			**2.47**		

Key: BST = Basic Science and Technology
GSS = Government Secondary Schools
PSS = Private Secondary Schools
FE = Fully Enforced, ME = Moderately Enforced, LE = Less Enforced & NE = Not Enforced

The result in Table 2 of research question 2 reveals that, the minimum teaching qualification of Nigerian Certificate in Education (NCE) is enforced to a less extent. In government secondary schools (GSS) and private secondary schools (PSS), with the composite mean of 2.38 and 2.47 respectively.

Question Three

To what extent do teachers handling the four areas of BST attend seminars and workshops for effective implementation of the curriculum?

Table 3: The extent to which teachers handling the four areas of BST attend seminars and workshops for effective implementation of the curriculum

S/N	Four Areas of BST	Mean Rating on the Extent to which BST Teachers Attend Workshops and Seminars.					
		GSS			PSS		
		Mean	SD	Dec	Mean	SD	Dec
1	Basic Science	2.60	1.30	ME	2.80	1.25	ME
2	Basic Technology	2.15	1.45	LE	2.45	1.38	LE
3	Physical & Health Edu	2.49	1.15	LE	2.60	1.21	ME
4	Computer Science	2.51	1.18	ME	2.58	1.18	ME
Cluster Mean		**2.44**			**2.60**		

Key: BST = Basic Science and Technology
GSS = Government Secondary Schools
PSS = Private Secondary Schools
GE = Great Extent, ME = Moderate Extent, LE = Less Extent & NE = No Extent

The result in Table 3 of research question 3 indicates that, the Private Secondary School teachers attend workshops and seminars for effective implementation of the 3-year Upper Basic Science and Technology curriculum moderately with the cluster mean of 2.60. While the Government Secondary School teachers attend workshops and seminars to a less extent with the cluster mean of 2.44.

Hypothesis One (HO1)

There is no significant difference in the mean rating scores of teachers on the extent to which facilities are available in government and private secondary schools.

Table 4: t-test of independent sample of the difference between mean rating scores of teachers on the extent to which facilities are available in government and private secondary schools

Variables	N	Mean	SD	T	df	p	Level of Sig	Dec
Teachers in GSS	288	2.5410	0.5001					
				0.057	75	0.033	0.05	R
Teachers in PSS	288	2.6930	0.5233					

The t-test of independent sample on the extent to which facilities are available in government and private secondary schools for effective implementation of the 3-year Upper Basic Science and Technology curriculum recorded t-test value of 0.057 with a p-value of 0.033 which is less than 0.05 level of significance ($p = 0.033 < 0.05$). That means the null hypothesis is rejected. This implies that, there is significant difference on the extent to which facilities are available in government and private secondary schools for effective implementation of the curriculum.

Hypothesis Two (HO2)

There is no significant difference in the mean rating scores of teachers on the extent to which the minimum teaching qualification of NCE is enforced in government and private secondary schools in the four areas of BST.

Table 5: t-test of independent sample of the difference between mean rating scores of teachers on the extent to which the minimum teaching qualification of NCE is enforced in government and private secondary schools in the four areas of BST

Variables	N	Mean	SD	t	df	p	Level of Sig.	Dec
Teachers in GSS	288	2.3825	0.3220					
				0.051	75	0.041	0.05	R
Teachers in PSS	288	2.4675	0.3300					

The t-test of independent sample on the extent to which the minimum teaching qualification of NCE is enforced in government and private secondary schools in the four areas of BST recorded t-test value of 0.051 with a p-value of 0.041 which is less than 0.05 level of significance ($p = 0.041 < 0.05$). That means the null hypothesis is rejected. This implies that, there is significance difference on the extent to which the minimum teaching qualification of NCE is enforced in government and private secondary schools in the four areas of BST for effective implementation of the curriculum.

Hypothesis Three (HO3)

There is no significance difference in the mean rating scores of teachers in government and private schools on the extent to which teachers handling the four areas of BST attend seminars and workshops.

Table 6: t-test of independent sample of the difference between mean rating scores of teachers on the extent to which teachers handling the four areas of BST attend seminars and workshops.

Variables	N	Mean	SD	t	df	p	Level of Sig.	Dec
Teachers GSS	288	2.4375	0.5112	0.058	75	0.037	0.05	R
PSS	288	2.6075	0.5700					

The t-test of independent sample on the extent to which teachers handling the four areas of BST attend seminars and workshops recorded t-test value of 0.058 with a p-value of 0.037 which is less than 0.05 level of significance ($p = 0.037 < 0.05$). That means the null hypothesis is rejected. This implies that, there is significant difference on the extent to which the teachers handling the four areas of BST attend seminars and workshops for effective implementation of the curriculum in government and private secondary schools.

Discussion

The result reveals the extent to which facilities are available in government and private secondary schools for effective implementation of the 3-year Upper Basic Science and Technology curriculum with t-test value of 0.057 with a p-value of 0.033 which is less than 0.05 level of significance ($p=0.033<0.05$). That means the null hypothesis is rejected. This implies that, there is significant difference on the extent to which facilities are available in government and private secondary schools for effective implementation of the curriculum. That is major specified facilities for the implementation of the 3-year Upper Basic Science and Technology curriculum are available to a less extent especially in GSS. The result is in consonance with Doggoh (2011) who points out that the basic facilities for the implementation of the curriculum are lacking especially in government owned schools. The result at the same time shows the extent to which the minimum teaching qualification of NCE is enforced in government and private secondary schools in the four areas of BST with t-test value of 0.051 with a p-value of 0.041 which is less than 0.05 level of significance ($p=0.041<0.05$). That means the null hypothesis is rejected.

This implies that, there is significant difference on the extent to which the minimum teaching qualification of NCE is enforced in government and private secondary schools in the four areas of BST for effective implementation of the curriculum. This indicates that the minimum teaching qualification of Nigerian Certificate in Education (NCE) is less enforced especially in PSS. The result is in agreement with Atomatofa, Avbenagha and Ewesor (2013) who maintains that both public and private primary schools are lagging behind in the strict enforcement of specified minimum standards for Basic Education in Nigeria. Also the result is consonance with Ogungbesan (2012) who states that 66.5% of the Basic Science teachers surveyed were not professionally qualified to teach the subject. Also, the result reveals the extent to which teachers handling the four areas of BST attend seminars and workshops with t-test value of 0.058 with a p-value of 0.037 which is less than 0.05 level of significance ($p=0.037<0.05$). That means the null hypothesis is rejected. This implies that, there is significant difference on the extent to which the teachers handling the four areas of BST attend seminars and workshops for effective implementation of the curriculum in government and private secondary schools. The result confirms Nakpodia (2011) who notes that teachers in the area surveyed generally lack in-service training (seminar and workshops) to effectively implement the UBE curriculum.

Conclusion

Going by the findings, it is concluded that major facilities for the implementation of the 3-year Upper Basic Science and Technology curriculum are available moderately especially in GSS. The minimum teaching qualification of Nigerian Certificate in Education (NCE) is less enforced especially in PSS. The teachers in Private Secondary Schools attend workshops and seminars for effective implementation curriculum moderately while the Government Secondary School teachers attend workshops and seminars to less extent.

Recommendations

It was recommended based on the findings that; the government through the Ministry of Education (MOE), State Universal Basic Education Boards (SUBEB) and Private School Owners should ensure that the National Minimum Standards Specifications are enforced to a great extent through;

i. Provision of more specified major facilities for effective implementation of the curriculum in government and private secondary schools.

ii. Enforcement of the minimum teaching qualification that is; Nigerian Certificate in Education (NCE) to a great extent in both government and private secondary schools.
iii. Harmonization of the in-service training for both government and private secondary school teachers through regular workshops and seminars as well as strict monitoring of all schools to ensure that the National Minimum Standards Specifications for implementation of the curriculum are enforced to a great extent.

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