A NEW HORIZON ON MATHEMATICS EDUCATION: THE REFORM EFFECT

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Abstract
Mathematics education is the bedrock of scientific and technological development of any society. Introducing it early in its simplest form to the Nigeria child is a way of overcoming the mathematical challenges facing the society and empowering Nigerians for qualitative growth and changes that could make the country one of the top twenty economies in the world. The teaching and learning of all the instructions that constitute mathematics in the primary, secondary and tertiary levels of education is mathematics education. The New Horizon is a broad-based national reform on mathematics education initiated by the state and gradually implemented in primary and secondary levels of education. This paper thus, centre on the main elements of the reform as; small-group instruction time, an increase in teachers’ salaries, higher requirements and incentives for professional development and increase in the time teachers’ spent in schools.

Keywords: New Horizon, Mathematics, Reform.

Nigeria has gone through and is currently still going through various forms of reforms in every sector of her national life, be it political, economic, social or educational sectors. This paper looks at reforms in the educational sector narrowed down to mathematics education. What forms of reforms are most effective, and how effective are these reforms? These are pertinent questions that are difficult to answer since changes in educational resources both at school and state levels are seldom applied randomly leading to a correlation between school attribute and the reform agenda.
Many studies have been conducted on educational reforms such as; class size (Leuven, 2008) in (Reingewert and Shany, 2016), teacher quality (Rivkin et al, 2005) in (Reingewetz and shany, 2016), teacher training (Augrist and Lavy, 2001) in (Reingewetz and Shany, 2016), teaching expenditure (De Ress et al, 2015) in (Reingewetz and Shany, 2016), financial incentive programmes for teachers (Lavy, 2009) in (Reingewetz and Shany, 2016) among others. Though educational reforms often tend to affect the allocation of several other educational resources at the same time as we see in the 9-3-4 system of education reform in Nigeria.

This reform is aimed at improving the academic achievements, produce self-employable graduates and reduce gaps by strengthening teacher’s status, raising teachers’ salaries and setting higher incentives and requirements for professional development. Many literatures exists on the effects of educational resources on students’ educational outcomes, though the challenge is in identifying the causal effect of educational inputs on students’ achievements which has brought to-bear a vast body of literature that uses various methods to isolate the causal effect of a change in educational inputs on students’ out comes. Augrist and Lavy (1999) in Reingewetz and Shany, (2016), use exogenous variation in class size to show that reducing class size yields a significant and substantial increase in students’ academic achievements, Leuven etal (2008) in Reingewetz and Shany, (2016) in contrast found no such effect.

Rivkin etal (2005) in Reingewetz and Shany, (2016) argued that teacher quality has powerful effects on reading and mathematics achievements. In this paper therefore, we evaluated the effect of the New Horizon reform on mathematics education.

Mathematics Education

Mathematics education is the teaching and learning of all the instructions that constitute mathematics in the primary, secondary and tertiary levels of education. A vast knowledge of mathematics imparted to children of school age marks the beginning of technological spread that could give rise to national development if well implemented. According to (Anigala 2011) in (Agbajor 2013), mathematics has gained an indisputable importance because; it is a recurrent denominator in all scientific researches. Its relevance is also attested to in considering mathematics as occupying a central position in the scientific attempt at globalization through information and communication management. As significant as this phenomenon is, in enhancing economics, socio-political and other pre-requisites of national development, its pride of place have not been given full recognition hence the government has found it very difficult in satisfying her citizenry as a result, social vices have taken its toll on the people. The main component of a comprehensive framework as stated by (Aniefiok and Imeh 2013) in (Agbajor 2013) includes the learner, teacher, instructional method, materials, media activities and organisation for instructions. They opined that the indices highlighted above have been sparingly attended to and as a result, material development assumes the mode of slow development. They opined that, one of the aims of establishing the universities, polytechnics and college of education in Nigeria is to equip students with the necessary skills and knowledge required for accelerated growth. According to
tertiary education is designed to equip the citizens with high level skills required for
national development.

The New Horizon Reform

New Horizon is a reform introduced by the government and stakeholders in the
education sector on education and, on mathematics education in particular which is the
focus of this paper. The reform like every other reform is aimed at boosting the status of
teachers and raising their salaries, to provide equal opportunities for every student and
raise students’ achievements, and to improve the school climate and environment
(Reingewetz and Shany, 2016). Reforms like strengthening mathematics and science
education (SMASE) and others aimed at strengthening teacher quality and reducing
class size for better students’ achievements. This reform has introduced new criteria
governing teachers’ professional development and promotions as well as instituting a
standard system for evaluating educational staff in the primary and secondary levels of
education. This reform centres on the formation of small-group of learning – five to ten
pupils/students who are instructed by the teacher given the large class size of our public
schools. This is to reduce the existing gaps in students’ achievements and strengthen the
student – teacher relationship.

Channels for the Effect of the Reform

New Horizon encompasses the changes in several educational inputs and learning
environment. Here, the potential elements of the reform are discuss in three perspective:
the direct and immediate effect on students through, small-group learning activities, and
the indirect effect on students as a result of the effect of the reform on teachers through
the change in teachers’ composition and working conditions within the environment
they find themselves.

Small-Group Learning

Reingewetz and Shany, (2016), opined that in small-group learning, 59 percent of the
students in schools that operated under the reform rules attended small-group learning
classes; in the 2010 school year, the rate increased to 68 percent. Teachers reported that
they devoted 42 percent of the small-group learning hours to students with learning
difficulties, 34 percent to students with average achievements, and only 10 percent to
outstanding students and that students participation in the groups lasted five months (23
weeks) on average. They opined that, student attendance in small-group learning ended
by teacher decision (usually when the student improved his or her achievements to the
teacher’s satisfaction). Teachers also in (Reingewetz and Shany, 2016) reported that 56
percent of the hours were allocated to reinforcement of core subjects, especially reading,
writing in the mother tongue and mathematics, 28 percent to expanding and enriching
knowledge of specific subjects and 16 percent to personal dialogue with students. The
report of the survey concluded that the small-group learning format is widely perceived
as an outstanding feature that strengthens teacher-student relations and allow teachers to
direct their instructions to students’ needs.

Owing to the fact that the small-group learning activities are aimed largely at
students with previous low and average achievements, it became necessary to examining
whether such students actually benefited more from the reform than others. Reingewetz
and Shany, (2016) being unable to observe students, previous achievements adopted a
heterogeneous treatment effects by using family education as a proxy for students’
ability and constructed a variable that is the sum of the student parents’ years of
schooling (hence forth parents schooling sum and calculated the first, second and three
quartile values of parents schooling sum for each classes. They classify each student by
this variable into three groups:

Low educated parents (parents schooling sum below the first quartile value),
average educated parents (parents schooling sum between the second and third quartile
values) and high educated parents (parents schooling sum above the third quartile
value). They obtained a positive and significant effect on mathematics test scores of
students whose parent are poorly educated and on English test scores of students with
high and average, educated parents.

The Effect of the Reform on Teachers’ Characteristics

Reingewetz and Shany, (2016) in their study using a difference-in-differences
(DID) model with the outcome variables of average teacher seniority, percentage of new
teachers (fewer than five years of experience), percentage of veteran teachers (more than
thirty years of experience), number of teachers, the average age of the teachers,
percentage of academic teachers (Bachelor’s degree or above) and teachers’ average
weekly working hours.

Their results showed; that in the period leading to the reform, the teachers’
characteristics were not significantly different from those immediately before the reform
i.e there were no pre existing trends; an increase of almost a year in average teacher
seniority three years after the school reformed with an insignificant change, a small and
insignificant decrease of less than 1 in the number of teachers working in the school
immediately after the reform was introduced; effect on the percentages of new and
veteran teachers respectively; that there were no significant difference in teachers’
average age; a positive effect in the percentage of academic teachers in the period
following the introduction of the reform but it becomes statistically significant only after
more than two years after the school adopted the reform; a positive and significant effect
as expected on teachers’ average weekly working hours.

Reingewetz and Shany, (2016) therefore opined that the aforementioned results
thus, suggest that the reform does not affect the characteristics and composition of
teachers within a school in the short run and that the teachers’ work week becomes
longer.
Effect of the Reform on Teachers’ Working Conditions

One of the key aspects of New Horizon in mathematics education is the change it offers in teachers’ working conditions such as increase in monthly wage, working hours, and time spent in school and other incentives and training. The New Horizon reform does not, however, reward teachers for students’ short-term success, rather, it creates a system that induces and motivates the teachers to invest more time and effort in carrying out instructional activities that can attract and retain more able teachers.

These types of effects are expected to change and improve the quality of teachers who remain in and enter the state education system in the medium and long term. These changes however may also have immediate effects on teaching quality among teachers already in the system (Reingewetz and Shany, 2016).

Conclusion

Since mathematics education is the teaching and learning of all the instructions that constitute mathematics at the primary secondary and tertiary levels of education, the New Horizon reforms improves student-teacher relations, increases teachers’ expectations of students’ success and raises teachers’ effort to help students.

The evidence here therefore suggests that, the positive effect of the new horizon reform on the achievements of students is traced mainly to small-group learning and the improvement in the working conditions of the subject teacher. The significance of this paper is its relevance to policy makers and stakeholders in the education sector and investigating the effectiveness of the new horizon reforms may yield a better understanding of the effectiveness of educational reforms in Nigeria.

References


