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Improving Secondary School Teachers' Performance to Re-Brand Students to Think Mathematically

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Abstract
The paper examines ways of improving secondary schools teachers' performance in a bid to rebrand students to think mathematically. It discusses the beliefs about the nature of Mathematics, teachers' content knowledge of Mathematics and use of instructional strategies. The paper recommends that teachers content knowledge to be enhanced through workshops, seminars, conferences and In-service training. Mathematics teachers should teach with enthusiasm so that students should learn enthusiastically among others.
Key words: Improving Performance, Re-branding, Mathematics Beliefs, Content Knowledge

1. Introduction

One of the qualities of a good mathematics teacher is to give clear, obvious and definite instructions to his students. But invariably the opposite is the case in most mathematics classrooms despite the various calls made by researchers, educationists and mathematicians for explicit and concrete teachings so as to achieve noble objectives. Scott (2002) opines that explicit instruction is most useful in teaching Mathematical concepts and procedures. However many factors have been identified by researchers for variation or differences in performance and achievement among students. Lamb and Fullarton (2000) argue that the differences in teachers' qualities and effectiveness account for much of the classrooms variation and differences in mathematics achievement. Other scholars believed that teacher effects on students' achievement are driven by teachers' ability to understand, use subject matter knowledge and select appropriate instructional materials in carrying out their tasks of teaching (Shulman, 1986; Wilson, Shulman, & Richert, 1987; & Ball, 1990).

It is quite true when it comes to improving academic excellence in schools, teachers play important and critical roles in the process of teaching and learning (Wiseman et al, 1999). And part of the teacher's quality is effectiveness in delivery of a lesson which also depends on the beliefs and pedagogical content knowledge of the teacher. Tickle (2000) adds that this includes mastery of content knowledge about students' teaching and learning styles as well as effective use of learning strategies couple with Knowledge about how to simplify teaching and utilization of appropriate teaching materials and methodologies.

However, according to the Wikipedia the free encyclopedia "rebranding is the creation of a new name, term, symbol, design, or a combination of them for an established brand with the intension of developing a differentiated (new) position in the mind of stakeholders and competitors".

It is against this backdrop. This paper seeks to examine mathematic beliefs of both teachers and students; teachers' mastery of content knowledge, teaching and learning strategies and appropriate utilization of instructional materials as a bid to rebranding students in secondary schools to think Mathematically. In attempt to change both teachers' and students' attitudes from negative to positive to achieve performances in Mathematics. The researcher sees rebranding in the context of total transformation of students to think mathematically.

2. Beliefs About the Nature of Mathematics

To improve mathematics academic excellence in schools teachers need to critically examine their Mathematics beliefs. According to Raymond (1997), Mathematics beliefs refer to the beliefs of Mathematics as a discipline which include how it is learn and teach. Supporting Raymond (Pehkonen, 1997) categorizes beliefs into several parts; as Mathematics discipline, as Mathematics teaching and as Mathematics learning. However, Earnest (1994) sees beliefs philosophically and states three (3) philosophical views about the nature of mathematics, these are;

First, there as a view that says Mathematics is a collection of facts, rules and skills. This is known as instrumentalist's view. Second, Platonist views that see Mathematics as statics and unification of some other knowledge. They believe that Mathematics is discovered not created. Third, there are views that regard Mathematics as being dynamic i.e. continuous and changeable in terms of development and knowing.

Similarly, giving his contribution on Mathematics beliefs Mcleod (1992) proposes four (4) categories of

students' Mathematical beliefs, suffice here is his breakdown;

1. The beliefs that Mathematics is always difficult or bound to many rules.
2. Beliefs in self, including self confidence in learning Mathematics and the ability to be successful or failure in Mathematics. This is also selected and assigned to individual's determination.
3. Beliefs about teaching, this include what teachers should do to help students learn and achieve in Mathematics.
4. Beliefs in social context, that Mathematics learning is not far from being competitive always.

However, in spite of the knowledge of beliefs about Mathematics and the various strategies advocated by researchers and Mathematicians on how best to improve Mathematic teaching and learning in Nigerian Secondary Schools. The change has become difficult. It is quite obvious over the past years Nigeria and Nigerians have seen several waves of Mathematical reforms, each entail serious efforts to improve Mathematics learning. Each wave has attempted to upgrade what counts as "Mathematics" in schools to alter students' Mathematical experiences and to improve their grasp of fundamental ideas and skills. Yet both the internal and external examinations recorded huge failures in terms of students performance-confirming no change. Students still practice pages of sums, products, quotient and differences. They are still told to "Invert and multiply" to divide fractions and to use "My Dear Aunt Salamatu (MDAS)"; to remember to multiply and divide before adding, and subtracting in an expressions such as $15+16\times5\div4-27$.

There is no single cause that can account for the failure of past reform efforts to change the face of Mathematics teaching and learning in Nigerian schools and classrooms. But dominant explanations for the failure of past reform efforts suggest factors that impede progress and success. Among the most frequent explanations on why students failed are the lack of pedagogical content knowledge, explicit and concrete teaching styles, and effective use of instructional materials and selection of appropriate strategies that could improve learning at every level. That is the main reason why the writer of this paper is calling with a laud voice for the improvement of the Nigerian Secondary School Mathematics teachers' performance so as to rebrand the students to think mathematically. This will in turn improve students' performance.

To re-brand students to think mathematically teachers' Mathematics content knowledge must be enhanced to meet the challenges posed by the changing world. It is the writer's view that there is interplay between content knowledge and effective mathematics teaching.

3. Teachers' Mathematics Content Knowledge

The argument on what types of teachers knowledge are fundamental and essential for teaching Mathematics in the Secondary Schools has been the subject of concern and discussion among curriculum developers, educational heads, teachers, parents and students (Yusha'u, 2010). However, this paper upholds Dewey's claim that knowledge for teaching is different from knowledge for "doing" in a discipline. Because "Knowing" Mathematics does not entails that one can teach well in such ways that students will develop the mathematical power and deep conceptual understanding as envisioned in current reform documents (National Council of Teachers of Mathematics, 2000).

Many studies confirmed significant relationships between teachers' content knowledge and students' performance in Mathematics. It has been reported that the 1960s, 1970s, and 1980s. Saw a flurry of descriptive studies that attempted to characterize the strengths and weaknesses in teachers' knowledge of particular content areas such as fractions, geometry, trigonometry and word problems (Simon, 1993; Blume, 1994; Galadima, 2001). And in spite of the fact that quite a number of Mathematics teachers possessed some level of desirable Mathematics content knowledge, quite a number also lacked adequate knowledge of Mathematics as a discipline that will enable them to give effective delivery in terms of classroom instruction. Hence, the need for teachers improvement to rebrand the Mathematics students to think mathematically.

4. Effective Use of Mathematics Instructional Strategies

The effective use and the role of instructional strategy in Mathematics teaching and learning have been the focused of attention in recent years. To improve Mathematics teachers' performance to rebrand the students to think Mathematically, Mathematics teachers must be trained and guided on how best to use instructional strategies (discovery, problem solving, cooperative learning, games and simulation etc.) effectively. One major attitude of Mathematics teachers is neglect of instructional strategies during delivery.

To achieve effective delivery in Mathematics classrooms, teachers used one or a combination of Mathematics teaching strategy to achieve objectives and to rebrand students to think Mathematically, teachers should employ the use of these and many other strategies;

i. **Problem solving instruction (PSI)**: This is a strategy that calls for explicit instruction in the steps to solving Mathematical problems including understanding the questions, identifying relevant and irrelevant information, choosing a plan to solve the problem and checking the answer.

ii. Reciprocal peer tutoring (RPT): To improve Mathematics achievement: having students pair,

choose a team goal to work toward, tutor each other on Mathematics problems, and then individually solve problems. Students should be rewarded appropriately and work toward objectively.

iii. **Reinforcing Mathematics skills through games (RMSG)**: Using games to follow-up a lesson in order to reinforce learned skills and use the skills in another context. (National Center on Educational Outcomes, 2005).

Iv. Cooperative Learning Instructional Strategies (CLIS):

Cooperative learning is being considered and regarded as one of the powerful educational approach for helping all types of students to attain content standards and develop the interpersonal skills needed for succeeding in a learning, it is an approach that involves small, heterogeneous teams, usually of three, four, five, six……. members, working together towards a given group task in which each member of the group is individually assign and accountable for part of that task (Cohen, 1994 & Williams, 2007). cooperative learning is also being endorsed and regarded as a pedagogical practice that always promotes learning and socialization among students, despite the fact that teachers are still struggling with how to introduce it into their classrooms (Gillies, 2007).

V. Questioning Techniques Strategies (QTS) : Questioning techniques stimulate thinking in Mathematics class room . Dianes (1986) observes that good questioning technique serve as a fundamental tool for effective teaching. Develop teachers' self-awareness, techniques and thinking skills. It enhances planning and helps in identifying relevant skills. Questions play an indispensable part in ''Learning'' 'Teaching' and 'testing'. If used appropriately questions lead to new realms of information and understanding that could stimulate new ideas. Questioning techniques could also serve as a tool for managing classes. It changes the attitude of students from being passive to active learners. Badham (1994;1996) grouped questions into four main categories. These are:

(1) Starter Questions; In a mathematics classroom teachers could use starter questions to stimulate students interest, such as (i) How many angles are there in a triangle ? (ii) Which is greater between -27 and -37 (iii) How many methods are there to solve Simultaneous linear equation?

(2) Questions to Stimulate Mathematical Thinking. Examples; (i) What is the difference between union and intersection of a Set ? (ii) Can you group these numbers into like and unlike terms 20+20x 30y=10 15y 10x 6? (iii) Differentiate between a scalar and a vector quantities.

3. Assessment Questions; (i) What is the result of 13×3+50-16?

(ii)Solve $x^2+6x+10=0$ (iii)Prove that A□(B n C) = (A□ B) n (A□ C)

4. Discussion Questions ; This encourages learners to evaluate their work at the end of a given task. Teachers use question at the end of a given task. Teachers use questions like ; (i) Are everybody's result the same?

(ii) Who has difficulty in solving equation of the form $2x^2+5x+10=0$

(iii) Have we found all the possibilities in solving the given equation ? And many other similar questions could be used by teachers as strategy to stimulate discussion in mathematics classroom. Hence, the need for improving Mathematics teachers' performance to rebrand students to think mathematically.

5. Conclusion

This paper discusses the teachers and students belief about the nature of Mathematics, the role of Mathematics content knowledge of the teacher play as well as the effective use of instructional strategies. The effectiveness of teaching has not only depends on skills but attitudes, the writers are of the view that if these beliefs, knowledge and strategy could be used to improve the Mathematics teachers' performance in Secondary Schools, the students will definitely be re-branded to think Mathematically.

6. Recommendations

The paper recommends the following:

i. Teachers content knowledge should be enhanced through workshops, conferences and in-service training, Mathematics teachers should be given appropriate training regularly.
ii. Mathematics teachers should use instructional strategies interchangeably, taking into consideration students' learning styles and desired objectives.
iii. Negative beliefs about the nature of Mathematics should be changed to positive beliefs through explicit and concrete lesson delivery. By so doing students should be made to think Mathematically.
iv. Teachers' should teach Mathematics with enthusiasm so that students will learn enthusiastically.

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