Journal of Education and Practice
ISSN 2222-1735 (Paper) ISSN 2222-288X (Online)
Vol.5, No.12, 2014

A Study Of Teachers' Use Of Language On Junior High School Students' Conceptual Understanding Of Some Mathematics Concepts.

Emma Sarah Eshun[1] and Ahmed Kobina Amihere[2]
University of Education, Winneba, Department of Basic Education P. O. Box 25, Winneba, Ghana.
*eseshun@yahoo.com

Abstract
The purpose of the study was to explore the influence of language use on Junior High School students' understanding of the conceptual understanding of some mathematical concepts used by teachers in and out of Mathematics context. It is believed that acquisition of mathematical ability is a subtle process, but dialogue between the learner and teacher is imperative and this depends on effective communication. The study was a descriptive survey that used the mixed methods approach. Direct classroom observation, focus group interview, as well as content analyses of the participants' verbatim classroom talk, and questionnaires were used for data collection. The findings have revealed that instructional language in Mathematics classroom at the JHS can be a major influence on the level of students' understanding and retention of Mathematics concepts. Evidence was seen in Mathematics teachers' lack of explicit awareness of functional values of some Mathematics concept; Minus verses Negative', 'Simplify verses Reduce', 'Average verses Mean', 'Breadth verses Breathe', 'Whole verses Hole', 'Similarity verses Congruence', etc which lead to misunderstanding and misinterpretation of mathematical tasks. It was recommended that rigorous in-service training on appropriate use of mathematical language should be organized for basic school teachers to equip them for effective teaching and learning of Mathematics in Junior High schools in Ghana. Mathematics experts with education background should also be employed by the government to write Mathematics textbook with appropriate vocabulary of language.
Keywords: language use, conceptual understanding, mathematics concepts, instructional approach.

1. Introduction

Today's world demands that young people should be able to use numbers competently, read and interpret numerical data, reason logically, solve problems involving calculations and mathematical reasoning, as well as communicate effectively with other people using accurate mathematical data and interpretations. This is because Mathematics is one of the essential areas of learning which provides students with logical, reliable and growing body of concept that makes use of specific language and skills to model, analyze and interpret the world, Ministry of Education - MOE (2012). The MOE (2012) continues to explain that acquisition of these skills will help pupils in their careers later in life and in the process benefit the society and the nation. Achieving this requires a sound Mathematics curriculum, competent and knowledgeable teachers who can integrate instruction with assessment, classrooms with ready access to technology, and a commitment to both equity and excellence.

According to Bishop (1988), Mathematics is a must study subject for higher education, but few students feel comfortable with it. He explains further that it is even socially acceptable in many countries to confess ignorance about the study of Mathematics, to brag about one's incompetence, and even to claim to be math-phobic. This sometimes leads to students having a negative feeling about Mathematics learning. Many high school students in Ghana are not able to continue to do post-secondary programmes because of their inability to pass Mathematics with a minimum of grade C. This has been a major contributing factor to creating a backlog of students hoping to enter into the various tertiary institutions for diploma and degree programmes. In effect a relatively small number of students that gain admission into our Senior High Schools (SHS) get into post-secondary programmes. To this end, it has been recognized that one of the most critical aspects of Mathematics is that, which is viewed as a filter that limits students' career aspirations (Sells, 1978; Oakes, 1990).

Resnick (1988) also observes that Mathematics is also regarded as a field in which statements have unambiguous meanings. This could lead teachers to treat Mathematics as a field with no open questions and no arguments, at least none that students or those not particularly talented in Mathematics can appreciate. He maintains that, even when Mathematics teachers teach problem solving, they often present stereotyped problems and look for rules that students can use to decide the right interpretation of the problem so they can find the single appropriate answer. With this, Schifter & Fosnot (1993) note that the kind of teaching that is now proposed should necessitate a greater investment in the instructional responsibility of the teacher, which will entail a greater need for collegial cooperation. In view of this, the rationale for teaching Mathematics states, strong Mathematical competencies developed at the J.H.S level are necessary requirements for effective study in Mathematics,

science, commerce, industry and a variety of other professions and vocations for pupils terminating their education at the J.H.S level as well as for those continuing into tertiary education and beyond MOE (2012).

2. Mathematics Instruction

Over the past two decades, Mathematics education reformers have been increasingly concerned with what goes on in Mathematics teaching/learning situations, especially in the classroom. However, the role of instructional language in learning Mathematics has remained out of focus in Mathematics education research. The manner of use of instructional language during the teaching by Mathematics teachers as a factor in quality of learning of Mathematics needs to be examined.

Language is vital to the processing of any concept whether mathematical or not. The significance of language as a tool in the classroom is considered important in all activities associated with effective teaching and learning of school subjects of which Mathematics is a part. This shows that the use of appropriate language both written and oral (as in the form of teacher and student talk) cannot be avoided in effective teaching and learning of Mathematics.

In Ríordáin's (2009) view, the capability to talk about Mathematics is of importance for all teachers and learners of the subject. Language and communication are essential elements of teaching and learning Mathematics as it facilitates the transmission of mathematical knowledge and allows for teacher-student interactions. She explains further that language permits Mathematics learners to work out meanings, to convey their understanding, help develop their thinking further and to express their answers with others. This is because mathematical learners' language is in two-fold in that; they are required to have competence in the language of instruction and in the language of Mathematics.

To emphasize this issue, Pimm, (1987) and Ríordáin (2009) opine that some borrowed words and ambiguous terms from everyday English are a key issue that causes significant problems for learners in Mathematics. They give details that these words tend to be ambiguous due to multiple meanings they might have in the Mathematics register, vis a vis its everyday use. The non-mathematical meanings of these terms can influence mathematical understanding, as well as being a source of confusion. Examples include:

above, angle, as great as, average, base, below, between, circular, collection, common, complete, coordinates, degree, difference, different, differentiation, divide, down, element, even, expand, face, figure, form, grid, high, improper, integration, leaves, left, little, low, make, mean, model, natural, odd, one, operation, parallel, path, place, point, power, product, proper, property, radical, real, record, reflection, relation, remainder, right, root, row, same, sign, similar, square, table, tangent, times, top, union, up, value, volume etc.

It is clear from the above that if students are not given the competence in using mathematical vocabulary to explain mathematical task to others, to ask or answer questions, and when working in groups, it is going to create linguistic difficulty in the study of the subject. In that, when teachers do not use mathematical language effortlessly, their students are unable to describe mathematical ideas and concepts using appropriate language.

According to Högström, Ottander and Benckert (2010), teachers' interactions with students could result in consensus and common understandings of issues brought about during practical work. Everywhere in education, there is an urgent need to ensure that the language of instruction issues receive adequate attention. In Vygotsky's (1978) view, teachers' use of instructional language during teaching is based on the recognized role of language in concept formation and development. It also shows its' vital importance to students' learning of mathematical concepts.

The U.S. National Center for Educational Statistics – NCTM (1981) also comments that an increase in the number of students' ages 5 to 14 years from the level of 2.4 million to 3.4 million by the year 2000 raised major concern on Mathematics learning of these ages. An inadequate grasp of the language of instruction is a major source of underachievement in schools.

Ohta (2001) found that teacher–learner communication encourages learners to increase their knowledge in classroom and in support of this, Hall and Verplaetse (2000) indicate that when teachers and students work together to create the intellectual and practical activities, it shapes both the form and the content of the target language as well as the processes and outcomes of individual development.

Shellard & Moyer (2002) also opine that there are three critical components to effective Mathematics instruction; teaching for conceptual understanding; developing children's procedural fluency and promoting strategic competence through meaningful problem-solving investigations. Thus, teachers' instructions at the JHS should

build on students' emerging capabilities for increasingly abstract reasoning, including: thinking hypothetically, comprehending cause and effect and reasoning in both concrete and abstract terms (Protheroe, 2007).

In Ghana, the language policy of education makes clear the use of English language as a medium of instruction at the Junior High School (JHS) level. The pupils are expected to be able to read and use numbers correctly, reason logically, solve problems and communicate mathematical ideas effectively using English. The pupils' mathematical knowledge, skills and competency at this stage enable them to make more meaning of the world around them and also develop interest in Mathematics. However, teachers' use of instructional language in Mathematics at the JHS level has been a catalyst in the creation of great linguistic problems in terms of comprehension.

As Mayer (1993) states, the problem solving difficulty appears to be related to linguistic complexity in the study of Mathematics. It is, therefore, desirable to study the linguistic competence of mathematical concept at the JHS level in order to help teachers use the language of instruction effectively in the teaching and learning of Mathematics which in turn could lead to students' own Mathematics discoveries.

This article reports and discusses findings in an investigation of Mathematics teachers' use of instructional language in the classroom. It also explores the effect of teachers' appropriate language use on Junior High School students' understanding of some mathematical concepts. Two questions were addressed to help in the investigation: how do teachers' use of language influence pupils' understanding of Mathematics concepts? How can appropriate use of Mathematics language influence pupils' understanding of Mathematics concepts?

3. Methodology

The study adopted the descriptive survey design because according to Bell (2007) this method allows researchers to easily describe and provide an understanding of a phenomenon using simple descriptive statistics. The design was found appropriate for the study because it allowed the investigators to inductively observe real classroom setting, and carefully studied the existing instructional approach used by teachers in Mathematics classroom and attempt to describe the situation. The research strategy followed was the mixed method. A questionnaire, observation and focus group interviews were the instruments used in collecting data from Junior High School teachers in the Effutu Municipality.

An eleven self-designed item questionnaire was used to collect data from 10 Junior High schools. The 11 item questionnaire instrument consisted of 5 closed-ended and 6 open – ended questions. The open-ended questions gave the respondents the opportunity to express their opinions on the questions concerned. The survey items were Mathematics concepts selected from the Junior High Schools syllabus and were validated by colleagues and expert Mathematics lecturers to determine content and face validity. Cronbach Alpha test was applied to establish the internal consistency of the survey items at 0.78. Thus, the instruments were considered to be highly reliable (Cohen, Mannion & Morrsion, 2007). Forty questionnaires were administered to teachers in the ten Junior High schools. These 10 schools were selected because the researchers were resource persons to the Mathematics and English clinics that were implemented in schools in the Effutu Municipality, thus, they had already established contact with teachers in the schools. Out of the forty questionnaire items administered to those purposively sampled, thirty eight were retrieved indicating a retrieval rate of 95%. In each school, four teachers who teach JHS Mathematics were sampled for the survey. In all, 40 JHS teachers offered to be part of the study. Ten of the teachers were sampled for the focus group discussion on language use which Junior High school teachers' use in teaching Mathematics concepts to complement as well as validate questionnaire responses through triangulation. These teachers are those who went for the Mathematics and English clinics organized by the Ghana Education Service (GES) to improve teaching and learning of Mathematics and English for basic schools. Descriptive statistics were used to analyze the data collected.

Ethical issues were addressed by revealing to the respondents the aim of conducting the research and assuring them of how their anonymity would be respected. Incoom (2012) points out that high response rate and sincere responses are often provided when respondents' anonymity is usually assured. It was also made clear why respondents were chosen to participate as well as their right to accept, deny or even withdraw from participating in the research. Thus, all those who participated did so with informed consent.

4. Results

The data gathered was discussed under demographic data of respondents and respondents' use of language in teaching Mathematics at the Junior High level of education in Ghana. Thirty-eight participants responded to the data collected; among these respondents, 26 respondent representing 65 % are males and 12 representing 35% are females. This is in support to the African Development Fund Report 2008 report which indicated that there

are more male teachers than females at the basic level of education in Ghana. Six teachers, constituting 6%, have taught for 10 years or more, whiles the remaining 32 teachers, constituting 80% have taught Mathematics between 1-10years.

The second part looked at the open ended–questions of the questionnaire. This asked participants to indicate their favourite Mathematics topics in the JHS syllabus and how they taught them. Five topics which emerged as preferred by most participants are: Equations/inequalities, Fractions, Collecting and handling data, Sets and Percentages. The reason for asking participants to indicate their favourite topics was to find out whether teachers would be more effective in using appropriate language as they interact with students whilst teaching such topics. The following are some of the explanations some teachers gave to the teaching of fraction:

"The top numbers of a franction is known as numerator. The botton number of a franction is called the denominator. When you multiply or divide mixed numbers, you have to change the mixed numbers to improper frnactions before multiplying across"

"To add fractions with the same denominators, you have to get the sum's numerators by adding two numerators, while the sum's denominator is the original denominator"

"In multiplying of proper fraction with improper fraction, you must first reduce and then multiply across. 3 goes into 3, one time, 2 goes into 6, how many times?

"When multiplying a whole number by a fraction, first change the whole number to the denominator one (1) and then multiply across. And when multiplying proper fractions or improper fractions, reduce and then multiply across"

"In teaching fractions, the partitioning of the whole numbers should be equal"

It is noted from the above explanations that, topics teachers were expected to be more effective in using appropriate language to interact with students were poorly handled because there were many faulty constructions and expressions, grammatical errors, and wrong spellings which may hinder pupils' understanding of the concepts.

Table 1 below illustrates some of the teachers' inappropriate use of mathematical concepts and their influence on students' learning. Conversely, if teachers' appropriate use of language in teaching Mathematics is applied in classrooms, it will promote instructional quality among learners, specifically, to improve learners' linguistic and experiential knowledge in Mathematics learning.

Table 1: Summary of some of the teachers' inappropriate use of mathematical concepts

Words/phrases misused	Mathematics concepts/topics	Correct phrases/concepts	Impact of wrong usage
Crosses over the equal sign; e.g. $2x - 5 = 15$	Solving equations	Adding, subtracting, diving or multiplying by a certain number or variable	Missed opportunity
6 goes into 6 how many times?	Division/equivalent fractions	How many groups of 6 do we have in 6?	Missed opportunity
$\frac{3}{7}$ read as "three over seven"	Naming fractions	Three-sevenths	Missed opportunity
Reducing fractions to their lowest terms $\frac{9}{12} = \frac{3}{4}$	Equivalent fractions	Simplifying or renaming fractions	Misconception
The use of the word 'hole' instead of 'whole'	Fractions (defining fractions)	The term 'whole' should be used as an adjective instead of a noun to avoid such occurrence.	Misconception
Thousand	Place value	One thousand	Misconception
The use of the term" average" instead of" mean"	Collecting and handling data	The mean is only one of the three averages. The remaining are mode and median.	Missed opportunity

If teachers fail to use correct vocabulary in Mathematics teaching and learning, competencies pupils have to develop in the study of Mathematics will not be accomplished as expected of them. To support this Friel and Bright (1997) show that teachers' knowledge about content interacts with their knowledge of children.

5. Teachers' Use Of Language In Mathematics Classroom

As researchers observed Mathematics classrooms certain terminologies used by teachers emerged. Among them are 'Minus versus Negative', 'Crossing the equal sign', 'Simplify versus Reduce', 'Average versus Mean', 'Prime versus Odd', 'Breadth versus Breathe', 'Whole versus Hole', 'Similarity versus Congruence', 'just to mention few.

It was observed in the classroom interaction that pupils mention negative numbers using the term minus. For example, instead of saying negative five (-5), most students in the classes we observed would say 'minus 5'. It was prominent that these pupils were confusing the naming of the numbers with the operation. Unfortunately, the teachers could not provide any immediate and constructive feedback to address the situation. However, the difference between the terms negative and minus is that the former is used to describe a non-positive integer, whereas the latter describes an operation between two terms in an expression. For instance, 7-5 is read as 7 minus 5; but -5 is read as negative five.

With the issue of crossing the equal sign, it was recognized that students missed important conceptual understanding. This explains the fact that, students who are taught 'algebraic equations' using such phrases as 'crosses the equal sign' are not encouraged to conceptually grasp the concept of 'inverse' in addition and multiplication inverses. An instance is when pupils were solving the inequality $2x + 2 < 6$, the following is an excerpt of the conversation that went on in the classroom:

> 'The 2 crosses the equal sign so we have 2x< 4. Again, the 2 crosses the equal sign, and so the answer is now x < 2'

A major misconception found here is that the teacher referred to the inequality sign (<) as an equal sign even though it is depicting inequality. No equal sign was in the expression for '2' to cross and this instructional direction is what teachers have to avoid.

To solve this inequality 2x + 2 < 6, we subtract 2 from each side of the equation since the inverse of addition is subtraction, to obtain 2x + 2 –2 < 6 – 2. Simplifying this gives 2x < 4

To obtain the value for x, we divide each side of the equation by 2 because 2 is multiplied by x.

The result is $\frac{2x}{2} = \frac{4}{2}$, which implies x< 2

It can be said that if teachers follow this process each time, it will help students to identify which operation is needed to undo an operation, and this would support the development of conceptual understanding as pupils learn Mathematics. Teachers' ability to recognize mathematical errors resulting from an incorrect or partial understanding of particular words within the mathematical context needs to be emphasized. To support this, Fennema, et al (1996) in Friel and Bright (1997) comment that children's thinking in addition and subtraction and in whole – number arithmetic influences primary grades teachers' instruction, beliefs, and the learning of their children. This enables teachers to make instructional decisions so that children's learning of Mathematics improve.

Using the term 'simplify instead of reduce' as in the case of 'reduce $\frac{2}{8}$ to its lowest term', pupils in reducing to $\frac{1}{4}$ had a misconception that $\frac{1}{4}$ is less than $\frac{2}{8}$ because $\frac{2}{8}$ has been reduced to give $\frac{1}{4}$.

Meanwhile, the two fractions are equivalent, meaning they are same numbers represented differently using different fractional parts. Thus, the term 'reduce' does not give a clear meaning of the process.

Amazingly, some teachers confused the word 'breadth' and 'breathe' when handling measurement of 'area'. On the chalkboard researchers found 'breathe' instead of 'breadth'. Also, the word 'whole' was confused with 'hole' when teachers were teaching fraction. This explains what Shellard & Moyer (2002) commented that there are three critical components to effective Mathematics instruction; teaching for conceptual understanding, developing children's procedural literacy and promoting strategic competence through meaningful problem-solving investigations.

Another, example is the case of 'Average and Mean'. The mode, mean, and median are the three averages. However, some teachers referred to 'average' when they were actually referring to the 'mean'. This is an example of misused opportunity because pupils in such classes have missed the opportunity to learn that there are other averages: the unfortunate thing is that there is very little chance that these students will recover what they have lost in learning. This is what Pimm, (1987) and Ríordáin (2009) emphasize that word and ambiguous terms from everyday English are a key issue that causes significant problems for learners in Mathematics.

In a focus group discussion with teachers one commented:

> "I have taught for 12 years as a class teacher, when I started my teaching profession, the most problematic topic in teaching Mathematics is 'measurement'. The problem emanates from the new standard, how to do the conversion'. To explain this, I use TLMs for example the 'finger span' and the weighing scale but the TLMs are not many. Maths is mostly to play so if you use the TLMs the child can convert it. We haven't got new method to measure our body. Even the Universities even don't have measuring apparatus of which we can borrow. So we have big time teaching measurement".

Another male teacher said:

> "Twenty-five years of teaching; for me my understanding is, if you don't know or understand topics don't teach it at all so that the children will be bored". However, topics I find problem of teaching are 'probability and investigation with numbers'. In handling this problem sometimes I solicit help from other teachers. And even getting ludo and dice the materials to teach is a hell and if you are not well versed in the methods of teaching it too it becomes very difficult to teach.

These discussions were in line with how teachers deal with problematic topics and how they handle it teaching. It was noted from the discussions that sometimes teachers fail to accomplish all the demands of the syllabus since they are unable to teach some of the topics which may inculcate in pupils varieties of problem solving strategies involved in learning Mathematics concept. This may affect their final examination as well.

On the issue of language use to explain Mathematics concepts, two male teachers expressed their views during the focus group discussion:

> "At the upper primary, English is supposed to be used as medium of instruction, but we (teachers) use mother tongue to explain concepts to pupils which sometimes becomes problem too for us because you can't find appropriate word to explain that".

Another commented:

> "Appropriate use of language is essential, using appropriate mathematical registers is what teachers have to emphasize. We follow what we were trained with.

From the above discussions, it was seen that teachers went contrary to the language policy of using English language at the JHS level. Using the mother tongue too, some explanations given to some of the Mathematics concepts by respondents meant different things all together. This was because most of these Mathematics concepts have no local equivalents so most respondents in trying to explain them in their own views using the mother tongue gave wrong meaning.

This may lead to one of the poor foundation factors for pupils who may wish to further their studies in Mathematics or other subjects where Mathematics concepts are essential. With this, Ball (1991) explains that teachers' knowledge of content interacts with their knowledge of children. He continues to say that knowledge of children and their Mathematics is crucial to teaching for understanding.

6. Conclusion

This study touched on how teachers use of language influence pupils conceptual understanding of some Mathematics concepts learnt at the JHS level of education. It also surveyed the effect of teachers' appropriate language use on Junior High School students' understanding of some mathematical concepts.

It was evident from the findings that most teachers used English as medium of instruction as stipulated in the language policy for teaching at the JHS level. On the contrary, others used the mother tongue. Even though majority of the respondents used the right medium of instruction at the JHS level, a greater number of the respondents could not use appropriate mathematical terminologies in teaching. Some borrowed words and ambiguous terms from everyday English were a key issue that causes major difficulties for learners in Mathematics. Teachers gave details that these words tend to be ambiguous due to multiple meanings they have in the Mathematics register, in relation to the everyday usage. The non-mathematical meanings of these terms tend to influence mathematical understanding, and as well became a source of confusion to pupils.

It is believed that acquisition of mathematical ability is a subtle process, but dialogue between the learner and teacher is imperative and this depends on effective communication. Conversely, instructional language in Mathematics classroom at the JHS was seen as a major influence on the level of students' understanding and retention of Mathematics concepts. Evidence was seen in Mathematics teachers' lack of explicit awareness of functional values of some Mathematics concept on the following terminologies: Minus verses Negative', 'Simplify verses Reduce', 'Average verses Mean', 'Breadth verses Breathe', 'Whole verses Hole', 'Similarity verses Congruence', etc which lead to misunderstanding and misinterpretation of mathematical tasks.

Even topics teachers were expected to be more effective in using appropriate language to interact with students were poorly handled because there were many faulty constructions and expressions, grammatical errors, and wrong spellings which hindered pupils' understanding of the concepts.
However the findings of this study indicate that mathematical skills may not be enhanced since teachers are not providing appropriate explanations given to Mathematics concepts through which these skills could be improved in relation to Mathematics study. The learner's inability to form appropriate concept in Mathematics, due to the teacher's use of the wrong instructional language at the JHS level, may affect their interest in studying Mathematics in later years.

However, the rationale for teaching Mathematics indicates that, to achieve sound Mathematics curriculum requires competent and knowledgeable teachers who can integrate instruction with assessment, classrooms with ready access to technology, and a commitment to both equity and excellence. This means that in an increasingly technological age the possession of problem solving and decision making skills is an essential requisite. Mathematics education, which provides the opportunity for students to develop these skills and encourages pupils to become flexible problem solvers, will equip the learners with the attitudes that will provide them with a strong foundation for further studies in Mathematics at the JHS level and beyond. It will also develop in them the curiosity and liking toward the pursuit of Mathematics study MOE (2012). From the findings of the study, it was clear that teachers fail to accomplish all the demands of the syllabus since they were unable to teach some of the topics which may not equip learners with the strong foundation needed to form appropriate mathematical concepts in Mathematics learning which later will hamper the full achievement of the rationale for studying Mathematics at the Junior High school level in Ghana.

7. Recommendation

For the teaching and learning of Mathematics at the JHS level to be effective, language experts with education background should be employed by the government to write Mathematics textbook with appropriate vocabulary of language. With this background, the Curriculum and Research Development Division of the Ghana Education Service should also provide specific mathematical terminologies on all topics in the Mathematics syllabus and teachers' handbook to enable its effective teaching. Further, language experts, in collaboration with Mathematics teachers should develop mathematical concepts that will guide teachers in their teaching process. Afterwards, Head teachers should organize rigorous in-service training on the use of appropriate language in Mathematics to equip both in-service and newly trained teachers in these skills for effective teaching and learning of Mathematics at the Junior High school of education in Ghanaian schools. They also have to supervise its effective teaching to achieve the aims of learning Mathematics at the JHS. With these in place the teaching of Mathematics will equip every young Ghanaian child with the necessary process skills and attitude needed to fit into the global scientific world.

References

Ball, D.L. (1991), "Implementing the NCTM Professional Standards for Teaching Mathematics: Improving, not standardizing, teaching", Arithmetic Teacher, 39(1), 18-22.
Bell, E. (2007), "Business research methods" Oxford, Oxford University Press.
Bishop, A.J. (1988), "Mathematics Education in its Cultural Context. Educational Leadership", 51(8), 4-8. Retrieved January 24, 2014 from http://www.uog.ac.pg/glec/Key/matang/Matang%201996%20MEd%20Thesis/Chapter%201%20-%20Introduction.htm.
Cohen, L., Manion, L. & Morrison, K. (2007), " Research Methods in Education" (6th edition) London, Routledge - Falmer.
Friel, S.N., & Bright, G.W. (1997), " Reflecting on our work: NSF Teacher Enhancement in K-6 Mathematics", Boston, University Press of America, Inc.
Hall, K.J., & Verplaetse, S.L. (2000), "Second and Foreign Language Learning through classroom interaction", Mahwah, New Jersey London, Lawrence Erlbaum Associates.
Högström, P., Ottander, C., & Benckert, S. (2010), "Lab work and learning in Secondary School Chemistry: The importance of teacher and students interaction", Research in Science Education 40, 505-523.
Incoom, A. (2012), "Implementation of initiatives to reform the quality of education in rural Ghanaian Junior High Schools", Unpublished doctorial thesis, Edith Cowan University. Retrieved January 15, 2013 from http://ro.ecu.edu.au/cgi/viewcontent.cgi?article=1485&context=theses
Meyer, J.P. (1993), "The Educational system of Kenya", Milwaukee, Educational Credential Evalutors, Inc.

Ministry of Education Science and Sports (2012), "National Syllabus for Mathematics for Junior High School 1 – 3", Accra, Ghana.

National Council of Teachers of Mathematics (1991), "Professional Standards for Teaching Mathematics", USA, Reston, VA

National Council of Teachers of Mathematics (1989), "Curriculum and Evaluation Standards for School Mathematics", USA, Reston, VA.

Oakes, J., & The Rand Corporation. (1990), "Opportunities, Achievement, and Choice: Women and Minority Students in Science and Mathematics", In C. B. Cazden (Ed.), Review of research in education (Vol. 16), American Educational Research Association, Washington, DC.

Ohta, A.S. (2001), "Second Language Processes in the Classroom: Learning Japanese", Mahwah NJ, Lawrence Erlbaum Associates.

Pimm, D. (1987)., "Speaking mathematically: Language in Mathematics Classroom", London, Routledge.

Protheroe, N. (2007), "What Does Good Math Instruction Look Like?" Principal 7(1), 51 – 54.

Resnick, L.B. (1888), "Treating Mathematics as ill-structured Discipline", Educational Research and Improvement, Pittsburgh Univ., Pa Learning Research and Development Center. Washington DC.

Ríordáin, M. N. (2009), "The role of language in teaching and learning Mathematics", Resource & Research Guides,1(1). Retrieved January 24, 2014 from http://www.nce-mstl.ie/_fileupload/THE%20ROLE%20OF%20LANGUAGE%20IN%20TEACHING%20AND.pdf

Sells, L. (1978), "Mathematics--A Critical Filter", Science Teacher. 45, 28-29.

Schifter, D., & Fosnot, C. T. (1993), "Reconstructing Mathematics Education: Stories of Teachers meeting the challenge of reform", New York, Teachers College Press.

Shellard, E., & Moyer, P.S. (2002), "What Principals Need to Know about Teaching Math", Alexandria, VA, National Association of Elementary School Principals and Education Research Service.

Vygostsky, L. (1978), "Mind in Society: The Development of Higher Psychological Process", Cambridge, Harvard University Press.

The IISTE is a pioneer in the Open-Access hosting service and academic event management. The aim of the firm is Accelerating Global Knowledge Sharing.

More information about the firm can be found on the homepage:
http://www.iiste.org

CALL FOR JOURNAL PAPERS

There are more than 30 peer-reviewed academic journals hosted under the hosting platform.

Prospective authors of journals can find the submission instruction on the following page: http://www.iiste.org/journals/ All the journals articles are available online to the readers all over the world without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. Paper version of the journals is also available upon request of readers and authors.

MORE RESOURCES

Book publication information: http://www.iiste.org/book/

Recent conferences: http://www.iiste.org/conference/

IISTE Knowledge Sharing Partners

EBSCO, Index Copernicus, Ulrich's Periodicals Directory, JournalTOCS, PKP Open Archives Harvester, Bielefeld Academic Search Engine, Elektronische Zeitschriftenbibliothek EZB, Open J-Gate, OCLC WorldCat, Universe Digtial Library , NewJour, Google Scholar