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Teachers' Level of Understanding the Language of Mathematics as a Determinant of Students' Achievement in Mathematics in Nigeria

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Abstract
The study examined the teachers' level of understanding the language of Mathematics as a determinant of students' achievement in Mathematics in Nigeria. Participants included 50 teaching teachers and 1500 students in Ekiti State, Nigeria, who answered questions on teachers' level of understanding of Mathematical terms in the daily use and applications, The data collected were analyzed descriptively using percentages, means and standard deviations. Hypotheses were analyzed using chi-square and t- test. The outcome pointed out the connection between teachers' level of understanding and competencies displayed during lessons, relationship between teachers' level of understanding and students' achievement in Mathematics among others. The study shed light on the extent to which qualification, experience and sex have relationship on teachers cogent interpretation and understanding of the Mathematical terms as determinant of students' achievement in Mathematics. It was suggested that secondary school teachers should learn to understand Mathematical language in order to use it correctly in the classroom
Keyword: Register, Environment, Comprehend, Concept, Mathematics, Language

Introduction

Secondary school students seem to find Mathematics difficult to understand and apply Mathematics language register when solving problems. The students seem to think that Mathematics is abstract. Some Mathematics teachers seem to be deficient in the use of Mathematical language as a means of instruction. The issue in this regard is the level of understanding of the language of Mathematics among the secondary school teachers. Teachers who are good at the understanding of Mathematics register should be able to present everyday problems in Mathematical form to students. This kind of exercise would certainly require a full understanding of the concepts and terms of the subject. Teachers may be able to compute and arrive at correct answers when solving problems posed to their students, but may create more problems as a result of their inabilities to fully explain the technical terms and show their meaning in terms of daily use and application.

This problem is further exacerbated when the technical terms take on meanings that are different from everyday use of the term. Therefore, this study investigated whether students will understand Mathematics better if the terms are simplified within the socio- cultural environment of the students. The study further determined the extent of understanding of the language of Mathematics by secondary school teachers in Nigeria. Teachers were observed at work (classroom), interviewed and interacted with in order to determine the extent of their understanding of Mathematics language

Literature Review

Many studies (Akpan, 1996; Franke, Carpenter, Fennema, Ansell, & Behrend, 1998 and An, Kulm & Wu, 2004) have worked on the issue of competence of Mathematics teachers and their ability to explain Mathematics fully. The opinion is that many teachers of Mathematics including prospective teachers in training have little knowledge and understanding of school Mathematics than is required for the task they face in the classroom. Others studies, Hiebart, Carpanter, Fenneman, Fuson, Wearne Murray (1997), Lin (2000), Geer (2001), Hill & Ball (2004) and Burton, Daane & Giesen (2008) have also found similar thing that Mathematics teachers in many countries have less than the required knowledge of the contents of Mathematics they teach. This condition can probably be informed by the extent of the relevance and mastery of the contents of the curriculum which these teachers were expose to during their training. If the Mathematics curricular in the training departments were full of topics in school Mathematics, and these teachers were able to master the topics, perhaps they would have displayed a better level of competency and preparation in the mastery of Mathematics contents. It has however been shown by Ball & Brass (2000) Haylock (1982) and Simon & Blume (1994) that the Mathematics contents of Mathematics education programme for undergraduates does not contain all that the teachers of the subject at the secondary school need to acquire to qualify them to teach the subject at the secondary school.

Mathematics teachers themselves probably are aware of their own deficiency in the mastery of

Mathematics contents (Shulman, (1986); Tamir, (1988); Eraut, (1994); Haylock & Cockburn, (2003); Ma, (1999) and Lamb & Booker, (2003)). These teachers especially at the primary school level do not feel comfortable in teaching Mathematics and this lack of self-confidence is as a result of lack of understanding of Mathematics contents and also low level of Mathematics attainment while in school. A situation whereby Mathematics teachers do not have enough knowledge of the subject matter and sense of incompetence is certainly a serious problem to the teaching and learning of the subject in our schools. Studies, Wilcox, Lanier & Lappan (1992) & Miller (1991) have shown that content courses that focus on content knowledge have been successful in making the teachers to become competent and effective. Lack of understanding of the contents may serve as barriers to how successful and competent teachers might handle the teaching-learning situations. One relevant question to ask is that at what point do teachers begin to feel this sense of incompetence towards Mathematics teaching?

In measuring Mathematics contents proficiency regarding Mathematics teaching, Burton, Daane & Giesen, 2008 reported that the content proficiency which Mathematics teachers are carrying to the teaching job can be explained through teachers' level of understanding and how fully they can explain the terms in the subject. The study therefore looked into the relationship between teachers' level of understanding of the cogent meaning of Mathematical terms on students' achievement in Mathematics.

Statement of the Problem

The low performance in Mathematics at the secondary school level has been of paramount concern to educators, researchers and even the parents. It is possible that lack of teachers' understanding of technical terms in Mathematics is partly responsible for this low performance. In order to actually understand Mathematics idea and concepts, the technical terms need to be well grasped. It seems as if some mathematics teachers do not have adequate understanding of mathematics language and technical terms which seems to hinder students understanding and achievement in mathematics. Observations by the researchers show that some mathematics teachers were not able to fully explain the meaning of some concepts and found it difficult to discuss them meaningfully so that students can understand better during the lessons. This study therefore investigated the teachers' level of understanding the concept of mathematics, technical terms as they affect the achievement of students.

Purpose

The study examined teachers' level of understanding the language of Mathematics as a determinant of students' achievement in Mathematics in Nigeria, also investigated the Mathematics language the teachers understand in order to teach the students effectively in secondary school. The study also examined how the teachers translate Mathematical language into cogent interpretations for students in the secondary schools

Questions

Based on the problems of the study, the following research questions were raised to guide the study:

1. Will experience of teacher influence the level of understanding the meaning used for teaching Mathematics in school?
2. How well do teachers of Mathematics understand the meaning and able to explain the Mathematical terms during class lesson?
3. DO teachers of Mathematics able to translate their understanding into cogent interpretation on the daily use to students?

Hypotheses

1. There is no significant difference between NCE teachers and other graduates in the understanding of Mathematical terms
2. There is no significant relationship between Students' performance and teachers' level of understanding of Mathematical terms.
3. There is no significant relationship between teachers' teaching experience and cogent understanding of Mathematical terms.
4. There is no significant relationship between sex and cogent understanding of Mathematical terms

Methodology

Design:

A descriptive research design of the survey type was used in the study.

Population

Participants were secondary school teachers who had been teaching in the school in the last one year and secondary school II (SSS2) students in 172 public schools in Ekiti State, Nigeria, numbering about seventeen thousand (16,887) as at 2009/2010 academic session according to the Ekiti State Ministry of Education Records. These teachers have taken some courses in their higher institutions of learning. These students are distributed all over the sixteen (16) Local Government Areas of Ekiti State

Sample and Sampling Techniques: The sample consisted of 50 secondary school teachers teaching Mathematics and about seventeen thousand (16,887) SSSII students as at 2009/2010 academic session according to the Ekiti State Ministry of Education records were selected from 50 Secondary Schools in Nigeria out of which 50 teachers and 1500 students responded to questionnaires on teachers' abilities to fully explain the technical terms and show their meaning in terms of daily use and application, while students responded to whether they understand Mathematics better if the terms are simplified within the socio- cultural environment of the students schools in six Local Government Areas (LGA) of Ekiti- State. The selection was based on multistage sampling technique. Stage 1 was random selection of six LGAs, while stage 2 was random selection of schools using purposive random sampling techniques. The schools were to satisfy the following criteria: 1. They must be co-educational 2. Have been presenting candidates for Senior Secondary School Certificate Examinations for at least five consecutive years and have at least two qualified mathematics teachers.

Instruments: Data were collected through 'Mathematical In- class Questions for Mathematics Teachers (MIQT). MIQT contains bio-data of the respondent' school, local government area, sex, area of subject specialization, teaching experience and qualification. The other section was 'Mathematical In- class Questions'(an achievement test) constructed by the researcher to measure teacher's level of understanding(facilitating learning, using content effectively, knowledge in teaching, addressing students' difficulties in Mathematics, building on students' Mathematical ideas, directing students' Mathematical thinking, engaging students in Mathematical activities, promoting students' Mathematical thinking, ways in which teachers use to explain Mathematics to students, what is expected of the students when they are required to explain some terms and how to evaluate students' understanding during class lesson among others). The test was designed to provide response on 5-item scale dimensions to be answered by the teachers, given a total of 30 marks. Teachers were also observed during class lessons twice per week for 24 weeks to assess how the teachers can facilitate learning, using content effectively, knowledge in teaching, addressing students' difficulties in Mathematics, building on students' Mathematical ideas, directing students' Mathematical thinking, engaging students in Mathematical activities, promoting students' Mathematical thinking, ways in which teachers use to explain Mathematics to students, what is expected of the students when they are required to explain some terms and how to evaluate students' understanding during class lesson. "Students' In- class test on Mathematics (SIMT) is based on teachers' level of understanding of Mathematical Terms was administered on the students. The first part of SIMT contains bio-data of the respondent's school, class, sex and local government area, while, the second part contains students attempting to provide answers to a 12- items question on terms used by teachers in their best abilities in order to build on their Mathematical knowledge, ideas, in promoting students' thinking, directing, engaging students in Mathematical activities, and addressing students' difficulties among others. The items are specifically designed to provide correct conceptions on clearly defined content areas. Each of the items was marked based on the responses provided. The contents were items used in the classroom that can determine their level of understanding. Below are some examples of the question used in the instrument for the students:

a. What would you do when you are to: factorize, expand, simplify some identified problems in Mathematics?
b. Arrange in order of magnitude: $^{5}/_{9}$, $^{7}/_{15}$, $^{11}/_{20}$, $^{3}/_{8}$
c. Simplify: x-5ax+ 3x - 7ax -2

The authors developed the items and three experts in Curriculum Studies Department and Tests and Measurement Department respectively, and two secondary school teachers and tertiary educators did the content validation for relevance and accuracy. The instruments were used for a pilot study of fifteen teachers of mathematics and one hundred senior secondary school students. The instrument was first administered and observation taken while a retest was carried out after three weeks and scores were collected. The scores for the two instruments MIQT and SIMT where collated and subjected to Pearson's Product Moment Correlation statistics. The result yielded correlation co efficient of 0.79 and 0.86 respectively which were considered to be statistically good enough for the instrument to be used for this study personally administered to the respondents.

Data Analysis: The research questions were pre-coded and analyzed using descriptive statistics: frequency counts and percentages. A correct response in the sub- questions was scored 1 if the respondent gave the correct answer and scored 0 if the respondent gave the wrong answer or response. All the points were added to give a total score ranging between 0 and 30 for both teachers and students. Hypotheses were tested using Means, Standard Deviations, chi-square tests and pie charts. All hypotheses generated were tested at α- level of 0.05.

Results

Descriptive Analysis

The research questions were analysed using descriptive statistics and results were reported thus:

1. Will experience of teacher influence the level of understanding the meaning used for teaching Mathematics in school?

Table 1 shows the difference in the Means(15.71) and standard deviations(12.49) of the teachers' experience in content explanation, promote students thinking, directing, engaging students in Mathematical activities, and addressing students difficulties which was used to categorized the teachers into insufficient and sufficient. Hence, any teacher whose mean and standard deviation falls in (0 - 3.22) was classified as having insufficient understanding in Mathematics. Those whose mean and standard deviation fall in (3.23- 18.20) was classified as having sufficient understanding in Mathematics, while, the teacher whose mean and standard deviation fall in (18.18 -21.00) was classified as having high understanding in Mathematical language/ terms. Year of experience 1 -5 of teachers are 32 (64%) have insufficient understanding of Mathematical language/ terms, and between years 6 and 10 5(10%) of the teachers have sufficient understanding of Mathematical language/ terms, while 13(26%) of teachers who have their experience above 10 years have a high understanding of Mathematical language/ terms. Hence, 18 out of 50 teachers have sufficient understanding of Mathematical language/ terms while,32 teachers out of 50 have insufficient understanding of Mathematical language/ terms.

Table 1

Teachers' experience on the level of understanding in Mathematical language/ terms

Experience difference in year among the teachers	**Range of Mean and Standard Deviation**	**Frequency**	**Percentage**
1-5	0- 3.22	32	64%
6-10	3.23-18.19	5	10%
Above 10	18.20-21.00	13	26%
Total		50	100%

2. How well do teachers of Mathematics understand the meaning and able to explain the Mathematical terms during class lesson?

Teachers were observation during class lesson and the following were used:

i. Mathematical knowledge(content)
ii. Building on students' Mathematical ideas, iii. Promoting students' thinking,
iv. Engaging students in Mathematical activities,
v. Addressing students' difficulties.
vi. Ability to explain sufficiently
vii. Content knowledge of the subject
viii. Skillfulness of the teacher to manage the students during Mathematics lesson
ix. Ability to show sufficient understanding

The results of the observation during teaching are as follows:

Table2

Analysis of teachers' level of understanding and explanations of mathematical terms during Mathematics lesson

Level of teachers Understanding	Range	Frequency	Percentage
Insufficient understanding	0-39	10	20
Sufficient understanding	40-59	28	56
High understanding	60- above	12	24
Total		50	100

Table 2, figure 1 shows that, out of 50 teachers who were observed, only 10(20%) scored in the range of 0- 39 are categorized as insufficient understanding of the meaning of Mathematical terms. This is followed by 28(56%) of teachers with the range between 40- 59 are categorized as those with sufficient understanding of the meaning of Mathematical terms. While, only 12(24%) whose scores are between the range of 60 and above are categorized as having high understanding of the meaning of Mathematical terms. Hence, 28(56%) of teachers whose scores are between 40- 59 are categorized as having the highest record of sufficient understanding of the meaning of Mathematics concepts and terminology.

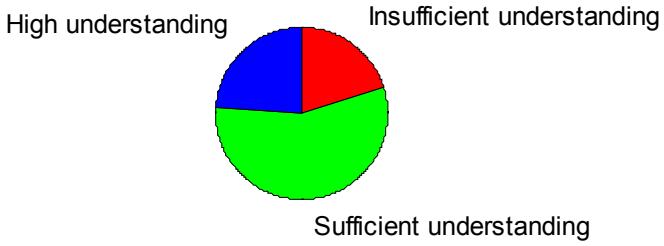

Figure 1: ***Teachers' level of understanding of Mathematical terms***

3. Do teachers of Mathematics able to translate their understanding into cogent interpretation on the daily use to students?

Table3

Translation of teachers understanding into cogent interpretation on the daily use to students.

cogent interpretation	Frequency	Percentage
Insufficient	10	20
Sufficient	34	68
High sufficient	6	12
Total	50	100

Table 3, figure 2 show that, out of 50 teachers examined, 10(20%) could not sufficiently translate their understanding into cogent interpretations of mathematical terms for the daily use in the classrooms to enhance student understanding. Thirty-four (68%) of the teachers could sufficiently translate their understanding into cogent interpretations for proper teaching of students, while, only 6(12%) had high translation of Mathematical terms into cogent interpretation for the teaching of students. Hence, those teachers who could translate their understanding Mathematics into cogent interpretations for proper teaching of students are more than the other.

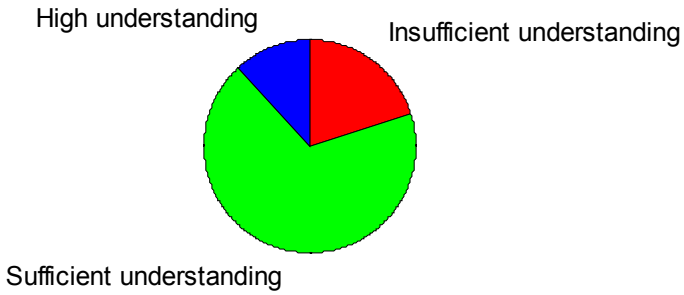

Figure 2: ***Teachers' ability to translate understanding to cogent interpretation for the daily application by students***

Hypotheses Testing

1. There is no significant difference between NCE and other graduates in the understanding of Mathematical terms .This can be analyzed descriptively

Table 4

Teacher's Qualification in terms of their level of understanding of Mathematical language/ terms

Qualification of teachers	Frequency	Percentage
NCE	23	46%
BSc/BA/BSc (Ed)/BA(Ed)	23	46%
M.Ed/ Ph.D	4	8%
Total	50	100

Table 4 shows the qualification of teachers according to their level of understanding of Mathematical terms. Only 23 (46%) of NCE graduates have the understanding of Mathematical language / terms while, 23 (46%) of the B.Sc/BA/B.Sc (Ed)/BA(Ed) teachers have the understanding of Mathematical language/ terms. Only 4(8%) of teachers have M.Ed/ Ph.D with their understanding of Mathematical language/ terms. Hence,

teachers who are NCE and BSc/BA/BSc (Ed)/BA(Ed) have sufficient understanding of Mathematical language/ terms. This is also analysed using t - test statistics as shown below:

Table 5

Mathematical teacher's qualification and level of understanding of Mathematical terms

Qualification	N	Mean	SD	Mean diff.	df	t- cal	t-tab
NCE	23	17.13	17.61	2.63	48	0.732	2.00
Other	27	14.50	5.80				

p> 0.05

Table 5 shows the difference in teachers' qualification and understanding of Mathematical terms. NCE graduates had a mean score of 17.13 with the standard deviation of 17.61, compared to Mathematical teachers who had other qualifications with a mean score of 14.50 and a standard deviation of 5.80. The t- calculated was found to be 0.732, while, t-table was found to be 2.00 at α - level of 0.05. Hence, the null hypothesis was not rejected. Therefore, there is a no significant difference in the level of understanding of Mathematical term among the NCE and other graduates.

2. There is no significant relationship between Students' performance and teachers level of understanding of Mathematical terms.

Table 6

Pearson correlation of Students performance and teachers level of understanding of Mathematical terms.

Variable	N	Mean	SD	r-cal	r-tab
Student performance	1500	12.61	11.16	0.714	0.273
Teachers level of understanding	50	15.71	12.49		

Table 6 shows students' performance and teachers' level of understanding of Mathematical terms. Students had a mean score of 12.61 with the standard deviation of 11.16 as compared to teachers' level of understanding of Mathematical language/ terms with a mean score of 15.71 and a standard deviation of 12.49. The r- calculated was found to be 0.714 greater than r-table (0.273) at α -level of 0.05. Hence, the hypothesis is rejected. Therefore, there is a significant difference between the students' performance and teachers' level of understanding of Mathematical language/ terms

3. There is no significant relationship between teachers' teaching experience and cogent understanding of Mathematical terms.

Table 7

Chi-Square (x^2) analysis of teaching experience and cogent understanding of Mathematical terms

Level of cogent understanding	1-5	6-10	Above 10	Total	df	X^2cal	Table
Insufficient	6 (6)	23 (23)	3 (4)	32	4	0.859	9.49
Sufficient	1 (1)	3 (3)	1 (1)	5			
Highly sufficient	3 (3)	8 (9)	2 (2)	13			
Total	10	34	6	50			

P<0.05

Table 7 shows that X^2cal (0.859) is less than X^2 table (9.49) at 0.05 level of significant. The hypothesis is not rejected. This implies there is no significant relationship between teaching experience of teachers and cogent understanding of Mathematical terms.

4. There is no significant relationship between sex and cogent understanding of Mathematical terms

Table 8

Chi-Square (x^2) analysis of sex and teachers' cogent understanding of Mathematical terms

Teachers' level of understanding according to sex	Male	Female	Total	df	X^2cal	X^2table
Insufficient	- (3)	10 (7)	10	2	8.189	5.99
Sufficient	12 (11)	22 (23)	34			
Highly sufficient	4 (2)	2 (4)	6			
Total	16	34	50			

P<0.05

Table 8 shows the analysis of the sex and teachers' cogent understanding of Mathematical terms. The X^2cal (8.189) is greater than X^2table (5.99) at 0.05 level of significant. Therefore, the null hypothesis is rejected. It implies that there is significant relationship between the sex difference of teachers and cogent understanding of Mathematical terms.

Discussion

The analysis of the data shows that the experience of the teachers has influence on their understanding of Mathematical language. From the analysis of the research question 1, only 26% of the teachers were classified as having high understanding of Mathematical language and they were teachers who had taught for ten years and above. While, those who had been teaching for between 6- 10years were 10%.

On their level of understanding and ability to explain Mathematics term during the lesson 56% of respondents have sufficient understanding (at average level) while, 24% were above average.

The teachers who had ability to translate their understanding to cogent interpretation for the daily use of students were 68% they had sufficient understanding on the average, while, 12% were above average.

The descriptive analyses of research questions 1 to 3 show that a relatively high percentage of the teachers were on the average in terms of understanding language of Mathematics, Mathematical term and translating their understanding to cogent interpretation that will enhance students ability to use Mathematics knowledge to solve problems daily.

The finding from hypothesis one shows that qualification is not a significant factor in the teachers' understanding of Mathematical terms. The implication could be that some NCE teachers are good at Mathematical terms having improved their knowledge through private study while graduate teachers were relying on their degrees. The findings corroborate the work of Burton, Daane& Giesen, 2008 that the content proficiency which Mathematics teachers are carrying to the teaching job can only be explained through teachers' level of understanding. On the findings from the analysis which tested relationship between students and teachers understanding of Mathematics terms show that there is difference between the two variables. This implies that teachers' level of understanding will definitely influence students' achievement. Hence, teachers' contents knowledge and cogent interpretation of the content determined students' achievement in Mathematics. These findings corroborate the work of Ma, (1999) & Eraut, (19994) that Mathematics teachers need to have enough knowledge for the cogent interpretation and translation of curriculum contents so that students can be successful and teachers can handle teaching/ learning situation. The findings from the testing of relationship between teaching experience and teachers' ability to translate teaching experience to cogent understanding that will enable students to use mathematical terms successfully show that there is no relationship between the two variables. The implication is that teacher' inability to translate their understandings to cogent understands for student use may be as a result of not able to have enough knowledge of the subject matter and a sense of competence while in school or that their teacher were not able to interpret the content to practical form. The implication is that if these teachers were able to master the topics, perhaps they would have displayed a better level of competency and preparation in mastery of Mathematics contents. The findings from the testing of relationship between the sex of teachers and understanding of Mathematics language indicated that there is a relationship between the two variables. This finding corroborate the work of Leder (1992) that gender differences was found and the possible explanations for the existing differences include teacher's inability to explain the content properly to learners' related variables as well as cognitive variables.

Conclusion / Recommendations

Findings of this study further established that less than half of the teachers have sufficient understanding of Mathematical language terms. More than half of the teachers who were observed during lessons had high understanding of the meaning of mathematical terms. Also, more teachers were found able to interpret into cogent understanding of Mathematical language. NCE and BSc/BA/BSc (Ed)/BA(Ed) have sufficient understanding of Mathematical language/ terms. It was found that sex of teachers would not have a relationship with the cogent interpretation of Mathematical language/ terms teaching. It is believed that teachers' understanding of contents/ terms in order to make learning meaningful is paramount and have some implications to Mathematics educators and policy makers in re- designing the course contents of the teachers education programs in Nigeria. Teachers' understanding of contents is important. Mathematical language and skills make the greatest influence on the learning outcomes and attitude of the students. Teachers need to be skillful in order to make learners achieve. He also needs to understand how to explain concepts and impact it on students in order to ensure efficient and effective outcomes in Mathematics.

References

Akpan, A. A(1996)Teacher effectiveness as a determinant of students' performance in Mathematics. *A*

theoretical review Journal of Nigerian Education Research 1(1),89-99

An, S. Kulm, G, Wu,Z. (2004).The pedagogical content knowledge of middle school, Mathematics teachers in china and the U.S. *Journal of Mathematics Teacher Education* 7, 145-172.

Ball, D. L(1990b)The Mathematics understandings that prospective teachers bring to teacher education. *Elementary School Journal,* 90(4), p.449-466

Ball, D. L& Brass,H.(2000)Interweaving content and pedagogy in teaching and learning to teach: knowing and using Mathematics. In Jo Boaler (Ed), *Multiple perspectives on teaching and learning*(pp.83-104). Westport, CT: Ablex Publinshing.

Bierhoff, H.(1996).*Laying the foundations of Numeracy*. London: National Institute of Economic and Social Research.Discussion paper No 90

Burton, M, Daane, C.T;& Giesen, J. (2008). Infusing Mathematics content into a methods course: Impacting content knowledge for teaching. Issues in the Undergraduate Mathematics Preparation of School Teachers: *The Journal,* vol. 1 (content knowledge). www.k-12prep.math.ttu.edu

Eraut, M. (1994) *Developing professional knowledge and competence*, London: The Falmer Press.

Franke, M.L. Carpenter, T. Fennema, E; Ansell, E & Behrend, J. (1998). Understanding teachers' self-sustaining, generative change in the context of professional development. *Teaching and Teacher Education*, 14(1), 67-80.

Haylock, D. W and Cockburn, A. (2003) Understanding mathematics in the lower primary years. *A guide for Teachers of Children* 3-8. 2nd edition London: Paul Chapman Publishing.

Haylock. D. W.(1982) 'Understanding in Mathematics: Making connections'. *Mathematics Teaching* MT 92 Making sense: *Teaching and Learning Mathematics with Understanding*. Portsmouth, NH: Heinmann, 18:305-340. DOI: 902238-52-3 Arcib.

Hiebart,j., T.P Carpanter, E.Fenneman, K.C.Fuson, D. Wearne and H.Murray (1997). Making sence: *Teachers and learning Mathematics with Understanding*. Portmouth, NH: Heinmann, 18:305- 340.DOI: 902238- 52-3 Arcib

Hill, H.C. & Ball D.L.(2004). Learning mathematics for teaching: Results from California's Mathematics Professional Development Institutes. *Journal for Research in Mathematics Education,* 35(5), 330-351.

Geer, C.H. (2001).Science and mathematics professional development at a liberal arts University: Effects on content knowledge, teacher confidence and strategies, and Student's achievement. *Proceedings of the 2001 Annual International Conference of the Association for the Education of Teachers in Science.*

Lamb, J. and Booker, G. (2003) The impact of teachers' understanding of division on students' division knowledge. In A Pateman, D. Dougherty and J. Zilliox(Eds.). P*roceedings of Primary Mathematics Education* 27(1), p.207. Honolulu: University of Hawaii.

Leder, G.C. (1992). *Mathematics and Gender: Changing Perspectives*. Handbook for research on Mathematics teaching and learning. Edited by D.A. Grouws. New York, Macmillan: 597-622

Lin, P. J (2002). On enhancing teachers' knowledge by constructing cases in classrooms. *Journal of Mathematics Teacher Education*, 5(4), 317-349

Ma, L. (1999) *Knowing and Teaching Elementary Mathematics:* Teachers' understanding of fundamental Mathematics in China and the United States. Mahwah, NJ: Lawrence Erlbaum

Miller, L. D.(1991). Constructing pedagogical content knowledge from students' writing in Secondary School. *Mathematics Education Research Journal*, 3(1), 30-44

Rowland, T., Martyn, S., Barber, P. and Heal, C. (2000) *Primary teacher trainees Mathematics Subject knowledge and Classroom Performance. I*n T. Rowland and C. Morgan (Ed.) proceedings of the 23rd conference of the international Group for the Psychology of Mathematics Education, Volume 4 pp. 121-128. Utrecht, the Netherlands, Freudenthal Institute, Utrecht University.

Shulman L.S (1986). Those who understand: knowledge growth in teaching. *Educational Research*,15(2),4-14

Tamir, P. (1988). Subject matter and related pedagogical content knowledge in teacher Education. T*eaching and Teacher Education*, 4(2), 99-110.

Wilcox, S. K. Lanier, P., & Lappan, G. (1992). *Influencing beginning teachers' practice in Mathematics education: Confronting constraints of knowledge, beliefs, and context.* (Research Report No 99-1). East Lansing, MI: NCRTL, Michigan state University.

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