

Relationship between Attitude of Teachers to Mathematics and Teaching of Mathematics in Cape Coast Municipality

Ernest Kofi Davis

Centre for Science, Mathematics and Technology Education

Faculty of Education

Monash University, Australia

Abstract

This study explored primary and junior secondary school (basic school) teachers' attitude toward mathematics, the teaching of mathematics and the relationship between the two. A survey of attitude of 190 basic schoolteachers from 22 basic schools in the Cape Coast municipality of Ghana was carried out using questionnaires. Data collected were analyzed using means and standard deviations. Pearson's correlation was used to investigate the relationship between teachers' attitude toward mathematics and the teaching of mathematics. The results from the study revealed among others that teachers had positive attitude towards mathematics ($M = 39$ out of 50, $sd = 8.0$) and the teaching of mathematics ($M = 71.7$ out of 90, $sd = 9.9$). The study also revealed a moderate correlation between teachers' attitude toward mathematics and the teaching of mathematics.

Students' performance in mathematics in Ghana in recent times has not been the best (MOESS, July 2007; Annamuah-Mensah and Mereku, 2005). Statistics show that on the average, 36% of candidates who sat for Basic Education Certificate Examination (BECE) from 2002-2004 in mathematics either obtained a very weak pass or failed (MOESS, July 2007).

Attitude of teachers towards mathematics and its teaching are believed to play a vital role in the teaching and learning of mathematics as well as students achievement in mathematics (Bobis & Cusworth, 1994; Kulm cited in Ernest 1988; Bishop & Nickson 1983; Thompson 1992). Literature shows that teachers have the potential to influence the attitude and the self-concept of young children (Sullivan, cited in Bobis and Cusworth, 1994). The literature suggests that there is a significant correlation between students' attitude and achievement in mathematics (Kulm, cited in Bobis & Cusworth, 1994).

Literature shows that all is not well with the teaching and learning of mathematics at the basic school level in Ghana (Davis, 2004; STM 2001 Ghanaian Group, 2001). Davis (2004) for instance found in his study in the Central Region of Ghana that the teaching of mathematics at the basic

school level was mainly textbook directed, with teachers making very little use of teaching learning materials in their lessons.

A growing body of research have demonstrated that teacher's own perception of self as a teacher in a particular discipline area together with his/her beliefs and attitude about that subject affects the framework in which learning experiences are selected and presented (Clark & Perterson, 1986; Nias, 1989; Smith cited in Bobis & Cusworth, 1994). Some researchers have reported some degree of agreement between teachers' attitude towards mathematics teaching and their instructional practices (Bobis & Cusworth, 1994; Lacefield, 1996). Bobis and Cusworth (1994) asserted that teachers' attitude towards the teaching of mathematics and science is closely related to students' achievement in these subjects. Bishop and Nickson (1983) asserted that there is an important relationship between the attitude of teachers, especially their attitude to mathematics and the effectiveness or the quality of their teaching in mathematics. Lacefield (1996) argued that teachers' attitude towards mathematics instruction are prone to reveal their views of students' mathematical knowledge, how they learn mathematics, and the general functions and missions of schools. He asserted further that regardless of the grade level taught, if any teacher's beliefs concerning mathematics instruction are not positive, students' opportunities for learning mathematics may be stifled.

Fennema and Franke (1992), and Thompson (1992), asserted that the translation of teachers' mathematical knowledge into viable teaching strategies is mediated by the way that knowledge is held. That is to say that one's philosophy of mathematics and of the teaching of mathematics influences how one's knowledge of mathematics per se gets translated into classroom activities. White, Way and Perry (2006) investigated the attitude of pre-service teachers towards the teaching of mathematics and their attitude to mathematics in Australia and found an overall trend towards positive attitude to mathematics and the teaching of mathematics. However, White, Way and Perry (2006) did not report of the relationship between their subjects' attitude towards mathematics and their attitude to the teaching of mathematics although some researchers have called for the need for studies to investigate the relationship between the two (see Ernest, 1988).

There seems to be paucity of studies on attitude of male and female teachers towards mathematics and the teaching of mathematics. However, some studies have shown significant gender differences in interest to

mathematics between male and female students (Kaiser-Messmer, 1993; Eshun, 2000).

Despite the fact that the study reviewed above have found relationship between teachers' attitude towards mathematics and students' achievement on one hand (Kulm cited in Ernest, 1988) and others have found relationship between teachers attitude towards the teaching of mathematics and students' achievement on the other hand (Karp, 1991; Bobis and Cusworth, 1994), not many studies have been done in Ghana to ascertain the attitude of teachers towards mathematics and the teaching of mathematics. The present study was therefore designed to investigate the attitude of teachers towards mathematics, the attitude towards the teaching of mathematics and the relationship between teachers' attitude to mathematics and the teaching of mathematics. It also investigated attitude of male and female teachers towards mathematics and the teaching of mathematics.

Purpose of Study

The purpose of the study was to investigate basic school teachers' attitude towards mathematics, the teaching of mathematics and the relationship between the two in the Cape Coast Municipality of Ghana. The following research question and hypotheses were used to guide the study:

1. What are the attitude of basic school teachers toward mathematics?
2. What are the attitude of basic school teachers towards the teaching of mathematics?
3. What is the relationship, if any, between the attitude of teachers towards mathematics and the teaching of mathematics
4. There is no significant difference between male and female teachers' attitude towards mathematics.
5. There is no significant difference between male and female teachers' attitude towards the teaching of mathematics.

Methodology

Sample

The study used the survey method to explore teachers' attitude to mathematics and the teaching of mathematics. The purposive sampling technique was used to select 22 out of 74 public basic schools from all the six circuits in Cape Coast Municipality. The selection of schools was based on the number of schools in each of the circuits and type of school (rural/urban, single sex/ co-education, performing/non performing schools). The simple random sampling technique was then used to select one hundred and ninety (190) basic schoolteachers from the 22 selected public basic schools. In order to ensure fair representation of the basic schoolteachers, the proportion of primary and junior secondary school teachers were taken into consideration before the selection of teachers in each of the schools. Out of the hundred and ninety basic school teachers who took part in the study 102 (53.7%) were primary school teachers and the remaining 88 (46.3%) were junior secondary school teachers of which 110 (constituting 57.9%) of them were females and the remaining 80 (42.1%) were males.

Instrument

Two sets of questionnaires were developed and used in the data collection. One set elicited information about the attitude of basic schoolteachers towards the teaching of mathematics while the other set elicited information about the attitude of basic schoolteachers towards mathematics. The questionnaire that was used to collect information about teachers' attitude towards the teaching of mathematics was made up of 18 attitudinal items while the one that was used in collecting information about teachers' attitude towards mathematics was made up of ten attitudinal items. The items were the closed-ended 5-point Likert-scale type and respondents had to choose from Strongly Agree, Agree, Undecided, Disagree, Strongly Disagree. The researcher developed the items and validated the instruments among basic schoolteachers in a pilot district. The reliability test for the questionnaires that were used to collect information on teachers' attitude towards the teaching of mathematics gave a Cronbach alpha value of 0.87 whereas the one that was used to collect information on their attitude towards mathematics gave a Cronbach alpha value of 0.92.

Research Procedure

The data collection was done by the researcher and two research assistants in the Cape Coast Municipality at the beginning of the second term of the academic year 2006/2007 (January 2007). The questionnaire administration was done during the first week of school reopening. The schools were visited to administer the questionnaire. In each of the schools, the purpose of the study was explained to the headteacher and teachers before the administration of the questionnaires. The questionnaire on teachers' attitude towards the teaching of mathematics was administered and collected after which the questionnaires on teachers' attitude towards mathematics was also administered. Some of the questionnaires were completed in the presence of the researcher and other assistants while the others were collected later by the research assistants. The return rate of the questionnaires was hundred percent.

Data Analysis

The data collected were analyzed using the Statistical Package for Social Sciences (SPSS) software. Means and standard deviations were computed and used to present and discuss trends in respondents' attitude. In order to ascertain whether there was any significant difference in attitude of male and female teachers towards mathematics and the teaching of mathematics, the two-tailed t-test at .05 level of significance was used. Pearson's correlation coefficient was used to determine whether there was any correlation between teachers' attitude towards mathematics and teaching of mathematics. The scatter plot was used to pictorially present the relationship between teachers' attitude to mathematics and the teaching of mathematics.

For the purpose of analysis the positive attitudinal items were rated as follows; 5-strongly agree, 4 - agree, 3 - undecided, 2 - disagree and 1 - strongly disagree whereas the negative attitudinal items were rated as follows; 5 - strongly disagree, 4 - disagree, 3 - undecided, 2 - agree and 1-strongly agree. For each of the individual items a mean score of more than three indicates a positive attitude, a score of three indicates neither positive nor unfavorable attitude and a score of less than three indicates unfavorable attitude. The overall mean scores were also used to discuss the overall attitude of the teachers. For the overall mean scores, the most positive attitude will have an overall mean score which is equals to the number of items times five, the most unfavorable attitude will have an overall mean

score which is equal to the number of items times one and neither positive nor unfavorable attitude is expected to have an overall mean score which is equal to the number of items times three. Thus for their attitude towards mathematics an overall mean score of more than 30 (3 times 10 items) indicates a positive attitude towards mathematics while an overall mean score of more than 54 (3 times 18) indicates a positive attitude towards the teaching of mathematics.

Results

The results of the study have been presented in three sections namely teachers' attitude towards mathematics, teachers' attitude towards the teaching of mathematics and the relationship between attitude towards mathematics and the attitude towards the teaching of mathematics.

Teachers' Attitude towards mathematics

Results of teachers' attitude towards mathematics are presented in Table 1. The results show that generally teachers seem to have quite positive attitude towards mathematics. This is reflected in their overall mean score of 39.0 out of 50 (i.e. average 3.9 out of 5) with standard deviation of 8.0. A look at the means of each of the individual items shows that their mean score was more than 3.0 in each of the cases (an indication of positive attitude to mathematics). Teachers disagreed that they hate mathematics (mean of 4.4). They also disagreed that they wish they did not come into contact with mathematics (mean of 4.3). A look at the means of some of the items such as "mathematics is easy for me (3.5)", "working mathematics exercises is fun for me (3.7)" and "mathematics is a difficult subject (3.7)" however, seems to indicate that all is not well with the attitude of some these teachers.

Table 1: Teachers' attitude towards mathematics

Items	M	sd
mathematics is easy for me	3.5	1.1
I like mathematics	4.0	1.0
I like studying mathematics	3.9	0.9
mathematics is interesting for me	4.0	0.9
Working mathematics exercises is fun for me	3.7	1.1
I hate mathematics	4.4	0.8
I do not like studying mathematics.	4.1	1.0
mathematics is boring to me	4.1	1.0
mathematics is a difficult subject.	3.7	1.2
I wish I do not come into contact with mathematics	4.3	1.0
Overall mean score (out of 50)	39.0	8.0

Table 2 shows the results of the attitude of teachers towards mathematics by gender. The results show that the overall mean attitude score towards mathematics for the male teachers was significantly higher ($M = 41.0$ out of 50 [average of 4.1 out of 5], $sd = 6.7$) than that of the female teachers ($M = 37.0$ out of 50 [average of 3.7 out of 5], $sd = 8.5$), $t(190) = 2.917$, $p = 0.004$. This implies that male teachers had a more positive attitude towards mathematics than female teachers.

Table 2: Teachers overall mean attitude towards mathematics by gender

Category of Attitude	Sex	Mean (out of 50)	sd
Attitude towards mathematics	Male (N=80)	41	6.7
	Female (N=110)	37	8.5

Teachers' Attitude towards the teaching of Mathematics

Results of teachers' attitude towards the teaching of mathematics are presented in Table 3. Like their attitude towards mathematics, the results in Table 3 show that generally teachers seem to have positive attitude towards the teaching of mathematics. This is reflected in their overall mean score of 70.7 out of 90 (average of 3.9 out of 5) with standard deviation of 9.9. A look at the mean scores of each of the individual items shows that with the exception of one item "I like answering all students' questions in mathematics class (2.5)" the means for each of the individual items was more than three (an indication of positive attitude towards the teaching of mathematics). However, a look at the means of some of the items such as "I find mathematics easy to teach (3.7)" seems to suggest that some teachers need to be encouraged to develop a more positive attitude towards the teaching of mathematics.

Table 3: Teachers' attitude towards the teaching of mathematics

Items	M	sd
I enjoy teaching mathematics.	4.2	0.8
I find mathematics easy to teach	3.7	1.0
Teaching mathematics is interesting to me	4.1	0.9
I like using several approaches in solving questions when I am teaching mathematics	4.0	0.9
I like marking class exercises in mathematics	4.1	0.9

I like preparing lesson notes for mathematics lessons	4.2	0.9
I like involving students in my mathematics lessons	4.0	0.7
I like solving practical mathematics questions with students' in class	4.2	0.8
I like giving homework in mathematics	4.1	0.8
Teaching mathematics is a bother to me	3.9	1.1
Teaching mathematics is boring for me.	4.0	0.9
I do not like attending in-service training in mathematics	4.1	1.0
I wish I would not have to teach mathematics everyday	3.7	1.2
I do not like preparing mathematics-teaching aids	4.0	1.1
I enjoy using the lecture method in teaching mathematics	4.0	1.1
I like answering all students' questions in mathematics class	2.5	1.2
I do not like using teaching aids when teaching mathematics	3.9	1.1
I do not like marking mathematics homework	4.0	0.8
(Overall mean score (out of 90))	71.7	9.9

Table 4 shows the results of the attitude of teachers towards the teaching of mathematics by gender in the Cape Coast municipality. The results show that the overall mean scores of male teachers' attitude towards the teaching of mathematics is not significantly different ($M = 71.1$ out of 90 [average of 4.0 out of 5], $sd = 10.5$) from that of the female teachers ($M = 70.5$ out of 90 [average of 3.9 out of 5], $sd = 11.4$), $t(190) = 0.379$, $p = 0.704$. This implies that the two groups of teachers had similar attitude towards the teaching of mathematics. However the high standard deviations

associated with the means for each of the groups suggests a wide variation in attitude of teachers towards the teaching of mathematics among male and female teachers.

Table 4: Mean Attitudinal Score of the teaching of mathematics by gender of teachers

Category of Attitude	Sex	N	Mean (out of 90)	sd
Attitude towards mathematics	Male	80	71.1	10.5
	Female	110	70.5	11.4

Relationship between Attitude to Mathematics and Attitude towards the Teaching of Mathematics

Figure 1 shows the scatter plots of the relationship between the attitude of teachers to mathematics and the teaching of mathematics. The results from the scatter plot show that the points cluster around the line of best fit. This is an indication that there is a linear relationship between attitude of teachers towards mathematics and the teaching of mathematics. Pearson's correlation coefficient was 0.64. This result shows that there is a moderate correlation between teachers' attitude towards mathematics and the teaching of mathematics. The two variables however share only 41% of the variance in common. This means that 59% of the variance found between the two variables (attitude towards the teaching of mathematics and attitude towards mathematics) remains unexplained.

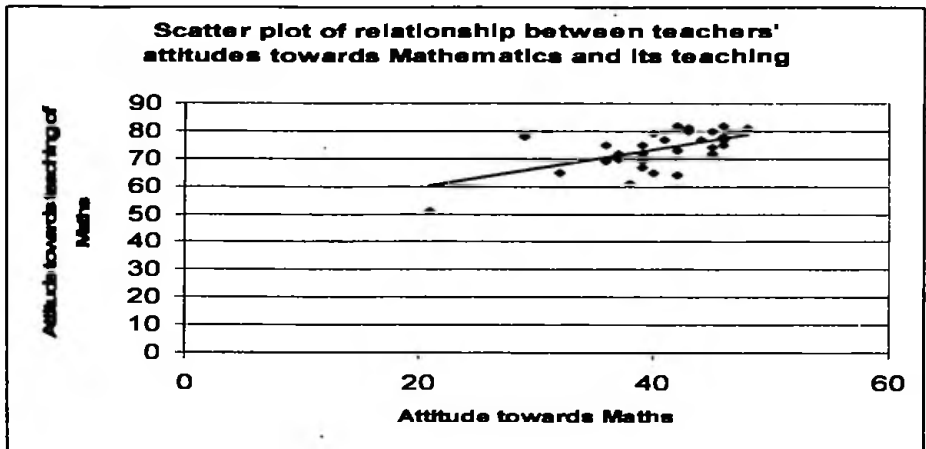


Figure 1: Scatter plot of the relationship between attitude to mathematics and its teaching

Discussion of Results

Teachers' overall mean score of 39.0 out of 50 (i.e., average 3.9 out of 5) with standard deviation of 8.0 on their attitude towards mathematics and their overall mean score of 70.7 out of 90 (average of 3.9 out of 5) with standard deviation of 9.9 on their attitude towards the teaching of mathematics indicate that the basic school teachers in the study had quite positive attitude towards mathematics and the teaching of mathematics, as the mean scores were more than 3 out of 5 (neutral) in each of the cases. This is an indication that teachers generally agreed with the positive attitudinal items and disagreed with the negative attitudinal items. This finding is similar to those of Southwell, White, Way and Perry (2006) who also found an overall trend towards positive attitude to mathematics and the teaching of mathematics in their studies with pre-service teachers in Australia.

A look at the attitude by gender shows that male teachers attitude towards mathematics was significantly more positive (mean attitude of 41 out of 50, [average of 4.1 out of 5]) as compared to the female teachers (37 out of 50 [average of 3.7 out of 5]). Unlike their attitude towards mathematics, there was no significant difference in mean attitude of male and female teachers towards the teaching of mathematics (mean of 71.1 out of 90 [average of 4.0 out of 5] and 70.5 out of 90 [average of 3.9 out of 5])

for male and female teachers respectively). This is an indication that they had similar attitude towards the teaching of mathematics. This shows that even though male teachers seemed to have a more positive attitude to mathematics compared to female teachers, their attitude towards the teaching of mathematics was very similar to that of the female teachers. This shows that female teachers' positive attitude towards the teaching of mathematics could be accounted for by other factors. Finding on teachers' attitude towards mathematics seems to confirm that of Kaiser-Messmer (1993) who also found a significant gender difference in interest in mathematics between boys and girls.

A look at the relationship between teachers' attitude to mathematics and the teaching of mathematics revealed a moderate correlation between the two. However, the high level of the unexplained variance (59%) seems to suggest that teachers' attitude toward mathematics alone does not determine their attitude towards the teaching of mathematics.

Conclusion

Generally basic school teachers in the Cape Coast Municipality of Ghana had positive attitude toward mathematics and the teaching of mathematics. This implies that teachers have the attitude it takes to promote effective mathematics teaching and learning in basic schools. In-service training providers should therefore use the positive attitude of teachers towards mathematics and the teaching of mathematics as an indication that they can be supported to teach mathematics effectively. Attitude toward the teaching of mathematics are only partially explained by attitude toward mathematics. Hence there is the need for further investigation into the other factors that account for teachers' positive attitude towards the teaching of mathematics.

References

- Anamuah-Mensah, J., & Mereku, K. (2005). Ghanaian JSS2 students' abysmal mathematics achievement in TIMSS-2003: a consequence of the basic school mathematics curriculum. *Mathematics Connections*, .5, 1-13.

- 172 E. Davies: *Journal of Educational Development and Practice*, 2 (2008) 160- 173
- Bobis, J. & Cusworth, R. (1994). Teacher Education: An agent of change for attitude towards mathematics and technology, online at www.aare.edu.au/94pap/bobj94072.txt (12/9/2007)
- Bishop, A. J. & Nickson, M. (1983). A review of research in mathematics education part B, NFER, Windsor
- Davis, E. K. (2004). *The effectiveness of in-service teacher training for the improvement of basic school mathematics in Ghana: A case study of the Outreach Program Conducted by the University of Cape Coast*. Masters' Thesis Presented to The Hiroshima University, Japan.
- Ernest, P. (1988). The attitude and practices of student teachers of primary school mathematics. In A. Borbas (Ed.) proceedings of 12th International Conference on Psychology of Mathematics Education, Veszprem, Hungary, vol. 1, pp. 288-295
- Eshun B. A. (2000). Sex difference in attitude of students towards mathematics in secondary schools, *Journal of the Mathematical Association of Ghana* 12, 1-13
- Fennema, E. & Franke, M. L. (1992). Teachers knowledge and its Impact, In Grouws D. (ed.), Handbook of Research on mathematics Teaching and Learning, Macmillan, pp.147-164.
- Karp, K. S. (1991). Elementary school teachers' attitude toward mathematics: The impact of students' autonomous learning skills. *School Science and mathematics*, 1.91, 265-270
- Kaiser-Messmer, G., (1993). Results of an empirical study into gender differences in attitude towards mathematics. *Educational studies in mathematics*. 25, 209-233
- Lacefield, W. O. (1996). Attitude of Primary and elementary teachers regarding mathematics instruction, 96F, GSU, graduate journal. Online at: <http://www2.gasou.edu/eduforum/wolacefield.html> (04/03/07).
- MOESS (July, 2007). Annual year book data. Online at: <http://www.edughana.net/emis%20data/html/emisdata.htm> (09/07/07).
- Southwell, B., White, A.L., Way, J. & Perry, B. (2006). Attitude versus achievement in pre-service mathematics teaching, refereed

proceedings of the Australian Association for Research in Education, Annual conference, Sydney. Online at www.aare.edu.au/05pap/sou05705 (09/07/07).

STM. 2001 Ghanaian Group, (2001). Present conditions and problems of mathematics education in Ghana. Hiroshima: Center for International Cooperation in Education (CICE), Hiroshima University.

Thompson, A. G. (1992). Teachers' beliefs and conceptions: A synthesis of Research. In Grouws D. A. (ed.), *Handbook of Research on mathematics Teaching and Learning*, New York: Macmillan, pp 127-146.