

Level of Students' Achievement in Mathematics at the End of Elementary Education in Yemen

Tarig Mohamed Ali Mohamed Khair,
Ahmad Zamri Khairani,
Universiti Sains Malaysia, Penang, Malaysia

Tahra Aisa Elrofai
University of Aden,
Aden, Yemen

The main purpose of this study was to investigate the level of student's achievement in mathematics in Yemen. This study use a sample of 200 male students and 200 female students, chosen from eight government schools on the basis of diversified sampling techniques. A mathematics test which composed of seventy five items that covered geometrical arithmetical concepts, (national, integers and rational) numbers groups, and it is four basic arithmetical operations as well as the equations, and inequalities that were administered to the selected students. The result showed that 35% of the students answered correctly 50% or more items of the test, while 80% of the students made errors in the arithmetic problems, inequalities, equations solutions, division and addition of decimal fractions and Pythagorean Theorem applications. Result also showed that females tend to achieve better results in mathematics than males do. The most common errors made by the students were found to be the basic arithmetical operations for the group of integers and rational numbers as well as the solution of the equations and inequalities. Recommendations for future research were suggested.

Keywords: mathematics, achievement, elementary education, gender difference

Introduction

The republic of Yemen is a developing country located in the South-west Asia. Like other developing countries, one of the main reasons for its underdevelopment is the low quality education, which in turn has great influence on the country's social, economic and political systems. In the perspective of low quality education, especially at elementary level, talking is associated with many factors related to school, head teacher, teacher, parent and community. Most of the researches that were conducted in Yemen focused on poor performance level of elementary grader students particularly in mathematics, such as Azhar 's research (1994). The following literature review considers the level of student's achievement in mathematics. Particular attention is paid to research studies which focus on elementary school samples. Studies conducted by Hadad (1977), Azhar (1994), and Yemen (1983) revealed students' underachievement in mathematics at the end of elementary education. A study carried out by Saeed, Gondal, and Bushra (2005) indicated that the achievement of the Pakistani Grade five students was the lowest in the subject of mathematics. While Griffin (2007) has found that the level of the Vietnamese Grade five pupils in mathematics was relatively high. In 2003, TIMSS

Tarig Mohamed Ali Mohamed Khair, doctoral candidate, School of Educational Studies, Universiti Sains Malaysia.
Ahmad Zamri Khairani, Ph.D., School of Educational Studies, Universiti Sains Malaysia.
Tahra Aisa Elrofai, professor, Faculty of Education, University of Aden.

(trends in international mathematics and science study) results showed that most of the Grade eight students from the Islamic countries had average scores in mathematics, which was less than the international average (Elsheikhy, 2010).

Many studies also focused on gender differences in mathematics achievement. Morgade and Bonder (1995) found that females' mathematics achievement in the primary grades was the same, compared with that of males, but it decreased in the middle school. Also, Fennema and Sherman's (1977) study showed that girl's mathematics ability tends to match that of boys in the earlier primary school years, but it deteriorates during high school. The results of TIMSS revealed that there is no difference in the average of mathematical achievement between Grade eight male and female students across the countries studied (Ismail, 2009). Studies that were conducted in Africa by some researchers, such as Tilaye and Bedru (2006), revealed that there is a significant gender difference in mathematics and science achievement in favor of males, compared with that of females students. Similarly, studies conducted by Janson (1996) and Mullis, Martin, Beaton, Gonzalez, Gregory, and Garden (2000) have pointed out that female student's achievement in mathematics was significantly lower than that of their male counterparts. The underachievement of girls against boys, due to mathematical attitudinal differences, was reported by Leedy, LaLonde, and Runk (2003). Although there has been a major emphasis on girls' achievement in mathematics, researchers have also pointed out the under-performance by boys, compared with the performance of girls (Burton, 2001, Cortis & Newmarch, 2002; Holmes, 2007).

Several studies discussed the factors affecting students' achievement in mathematics. Study by Demir, Serpil, and Ozer (2009) found that student background, self-related cognition in mathematics and learning strategies and school environment have significant effects on the achievement. While Hammouri (2004) indicated that mother's perception of mathematics importance, success attribution to hard work, attitudes towards mathematics and confidence in mathematics ability have strong positive total effects on mathematics achievement, success attribution to luck and friends' perception of mathematics importance have negative direct and total effects on mathematics achievement. Moreover, Wang's (2004) study focused on family factors and motivation effect on mathematics achievement. The results indicated that Chinese students outperformed their US counterparts in mathematics score, even though most factors were significantly related with mathematics achievement for both countries. Findings from other studies revealed significant and positive relationship between attitudes towards mathematics and mathematics achievement (Ai, 2002; Ma & Kishor, 1997; Singh, Graville, & Dika, 2002).

Achievement in mathematics is inextricably linked to future career opportunities, plays an important role in the level of the students general learning acquisitions, as well as a reliable criterion to divide students into scientific or literary streams. Also, achievement in mathematics can be a gate way to well rewarded and high-status positions. Accordingly, teachers, parents and researchers noticed that students are suffering from difficulties in mathematics at all levels. The current study attempted to identify the level of student's achievement in mathematics at the end of elementary education in Aden Province, Republic of Yemen. In order to realize this aim of the study, three questions were framed to guide the study:

- (1) What is the level of student's achievement in mathematics at the end of elementary education?
- (2) Are there any statistical significant differences in mathematics achievement associated with gender?
- (3) What were the most common mistakes made by the students in mathematics?

Methodology

At the time of data collection, there were 21 secondary schools in three educational districts of Aden province. Eight schools (four each from boys and girls) with 38% of the total number of schools were selected, based on a stratified sampling procedure. A sample of 400 students from the eight schools, including 200 males and 200 females, were selected randomly. The sample of the students was given an achievement test in mathematics in the first month of the academic year (1999-2000). In order to maintain the objectivity of the data collection, the researchers constructed the achievement test in the following procedures:

(1) Due to lack of official document which determined the objectives of teaching mathematics in the elementary education, content analysis for the mathematical syllabus from Grades four to nine was done by the researchers;

(2) Identification of the behavioral objectives of teaching mathematics from Grade four to nine was done;

(3) Eight major content areas from the objectives, stated in step 2 of Grade four to nine mathematics syllabus, were identified, based on the analysis and in consultation with the mathematics teachers and experts in measurement and evaluation. The areas include: geometric, algebraic and arithmetical concepts, and numbers groups, and it is arithmetical operations, measurements units and arithmetical problems, algebraic fractions, analysis of algebraic expressions, equations and inequalities;

(4) The common areas that were identified in the list stated in step 3 were used to serve the construction of items that could construct the achievement test. The size of the items from each portion was determined based on the content analysis of the syllabus and Blooms taxonomy of objectives;

(5) Seventy-five items were chosen to constitute the final version of mathematics achievement test, out of which 30% was knowledge, 30% focused on comprehension and 40% dealt with application;

(6) The achievement test was further pilot-tested in one school with 50 Grade nine students, including 25 boys and 25 girls. The aim of the pilot-test was to compute the discrimination index and the level of difficulty index for each item of the test, to determine the tentative time allocated to the test, as well as to ensure validity and reliability of the test.

To investigate the level of the student's achievement in mathematics, frequency distributive table was organized to represent the scores of the students, according to gender. Furthermore, the descending cumulative frequency was calculated for each interval. Success percentages rate for each item of the test was gathered into six intervals, less than 20%, 20-34%, 35-49%, 50-64%, 65-79% and more than 80%. The independent samples *t*-test was used to identify the significant differences for gender on the achievement test, while 54% of the students' solutions taken from the upper and lower groups of the students score were revised to identify the mistakes frequently made by the students.

Results

The results from Table 1 showed that students' correct answers to half or more than half of the test items were 35% of the whole sample, 23% were males and 48% were females. Those who gave correct answers to 70% of the test items were 6% of males, 8% of females and 7% of the whole sample. It is evident from Table 1 that about 98% of boys, 100% of girls and 99% of the whole sample had scored at interval (5-10) and fallen within poor scorers. Similarly, about 81.25% of the whole sample, in which 75.5% were boys and 87% were girls, had scored low level of achievement at the interval (20-25). While about 23% of boys, 47.5% of girls, and 35.25%

of the whole sample had achieved on "average" level of performance at the interval (35-40). Seven percent of the whole sample, 6% were boys and 8% were girls who had scored above average at the interval (50-55). Those who had scored high level of achievement were 0% of boys, 1.5% of girls and 0.75% of the whole sample at the interval (60-65).

Table 1

The Frequency Distribution for Males, Females and the Whole Sample of the Test Items

Interval	Males			Females			Whole sample		
	Frequency	Cumulative frequency	Relative frequency (%)	Frequency	Cumulative frequency	Relative frequency (%)	Frequency	Cumulative frequency	Relative frequency (%)
0-5	4	200	100	0	200	100	4	400	100
5-10	5	196	98	0	200	100	5	396	99
10-15	10	191	95.5	8	200	100	18	391	97.75
15-20	30	181	90.5	18	192	96	48	373	93.25
20-25	41	151	75.5	20	174	87	61	325	81.25
25-30	36	110	55	34	154	77	70	264	66
30-35	28	74	37	25	120	60	53	194	48.5
35-40	16	46	23	32	95	47.5	48	141	35.25
40-45	14	30	15	30	63	31.5	44	93	23.25
45-50	4	16	8	17	33	16.5	21	49	12.25
50-55	7	12	6	7	16	8	14	28	7
55-60	5	5	2.5	6	9	4.5	11	14	3.5
60-65	0	0	0	2	3	1.5	2	3	0.75
65-70	0	0	0	0	1	0.5	0	1	0.25
70-75	0	0	0	1	1	0.5	1	1	0.25
Total	200			200			400		

To investigate the gender difference across the achievement test, independent-samples *t*-test was conducted to compare the achievement in mathematics between male and female students. There was statistical significant differences between the scores for males (mean = 27.8, standard deviation = 11.6) and females (mean = 34.03, standard deviation = 11.8; $t = 5.35$, $p < 0.05$). This result revealed that females' achievement in mathematics test was significantly higher than that of males. To confirm the above result, the students' success percentages for both males and females on the achievement test were found to be 20.5% and 43.5%, respectively. By using *Z*-test shown in Table 2, it was revealed that gender significant differences on the achievement test favored females ($p < 0.05$).

Table 2

Show Males, Females Success Percentages, Z, Value for Significance Differences

Males success percentage	Females success percentage	Z-value	Level of significance
20.5	43.5	4.79	$p < 0.05$

According to the data analysis regarding the success percentage rate for each item of the test, it was found that 80% of the students made errors in the arithmetic problems, inequalities and equations solution, division and addition of decimals fractions and Pythagorean Theorem application. The results also revealed that the

success percentage rate for the items that was less than 50% was related to algebraic and arithmetic operations. Furthermore, the items with success percentage rate that was between (65%-79%) were covered geometric and algebraic concepts. The most common mistakes done by the students were associated with the basic arithmetical operations for the group of integers and rational numbers, analysis of algebraic expressions, equations and inequalities solutions.

Discussion

The results indicated that male students' average score on the achievement test was 27.8, while it was 34.08 for females and 30.91 for the whole students. Also, the study revealed that the most frequent common were done by the students in the test. The findings of this study revealed that the overall achievement level of students of Grade nine is low in Aden Province, which enjoys relatively better educational opportunities in the Republic of Yemen. This underachievement in mathematics may be due to the lack of using variety types of teaching methods or audiovisual ethics and dependence on memorization in teaching mathematical concepts. Furthermore, it also may be due to relatively high commitment of teachers in this province, the people in high cities are generally more materialistic, and the private teaching has lowered the quality of classroom instruction. These results support other studies, such as Elsheikhy (2010), Saeed et al. (2005) and Azhar (1994).

The result of the data analysis revealed that achievement in mathematics was strongly associated with gender differences, and it shown that females achievement was significantly upper than that of the males. This finding is at odd with the study done by Leedy et al. (2003). But it seems to be in consonance with the studies done by Burton (2001), Cortis et al. (2002) and Holmes, (2007). This result might be due to the differential growth characteristics between males and females at this age level, as females' perception and maturity is upper than those of males (Jaber, 1977). Regarding the most common mistakes done by the students, which were associated with the basic arithmetical operations for the group of integers and rational numbers, analysis of algebraic expressions, equations and inequalities solutions, this could be due to the insufficient time given for teaching these subjects, lack of teaching qualities, contents defects in the syllabus and unavailability of teaching aids (Azhar, 1994).

Conclusions

It was unfortunate that the results of the study showed underachievement of the students in mathematics. Another conclusion of this study is the underachievement of males, compared with that of females. Moreover, the study reported that the basic arithmetical operations for the integers and rational numbers as well as the solution of equations and inequalities were the most common mistakes done by the students. These findings were in consistent with the study by Azhar (1994). To improve the mathematics teaching and raise students' achievement level in mathematics is to rehabilitate the teacher of mathematics and provide him/her with educational training programs, upgrade his/her level academically and professionally through the educational supervision services. Based on the results of this study, it is suggested that similar studies should be conducted on secondary education level. It is also recommended that mathematics curriculum in elementary education level should be improved by identifying the mathematics teaching objectives and syllabus topics. A special consideration should be given to some aspects like relativity of these topics and their logical sequence in the same class and at the whole elementary level. Designing of another study focusing on detecting mathematics teaching difficulties at the elementary education and examining the mathematics teaching strategies and methods

of evaluation employed in teaching mathematics in Yemen were suggested for further researches.

References

- Ai, X. (2002). Gender differences in growth in mathematics achievement: Three-Level longitudinal and multilevel analyses of individual, home, and school influences. *Mathematical Thinking and Learning*, 4(1), 1-22.
- Azhar, A. (1994). *The students common mistakes in the basic arithmetic operations in the Republic of Yemen*. Education, Bagdad, Bagdad University.
- Burton. (2001). Fables: The tortoise? The hare? The mathematically underachieving male. *Gender and Education*, 11(4), 413-426
- Cortis, N., & Newmarch, E. (2002). Boys in schools: What's happening. In S. Pierce, & V. Muller (Eds.), *Manning the next millennium: Studies in masculinities* (pp. 151-168). Fremantle: Black Swan Press.
- Demir, I., Serpil, K., & Ozer, D. (2009). Factors affecting Turkish students' achievement in mathematics. *US-China Education Review*, 6(6), 47-52.
- Elsheikhy, S. (2010). Trends in international mathematics and science Study (TIMSS) results of mathematics achievement of saudiarabia grade 8 students. Paper presented at *the Scientific Research Strategies Conference on the Islamic World Universities*. Malaysia, 2010.
- FAWE (Forum for African Woman Educationists). (1997). *Female education in mathematics and science in Africa* (unpublished research report). Nairobi.
- Fennema, E., & Sherman, J. (1977). Sex-related differences in mathematics achievement, spatial visualization and effective factors. *American Educational Research Journal*, 14(7), 57-71.
- Griffin, P. (2007). Mathematics achievement of Vietnamese grade 5 pupils. *Asia Pacific Education Review*, 2, 233-249.
- Hadad, E. (1977). *Students achievement in mathematics at the end of the primary education*. Education, Amman. Master.
- Hammouri, H. (2004). Attitudinal and motivational variables related to mathematics achievement in Jordan: Findings from the third international mathematics and science study (TIMSS). *Educational Research*, 46(3), 241-257.
- Holmes, M. (2007). *What is gender? Sociological approaches*. London: Sage.
- Ismail, N. A. (2009). Understanding the gap in mathematics achievement of Malaysian students. *The Journal of Educational Research*, 102(5), 389-394.
- Jaber, A. E. (1977). *Educational psychology: Elnahda Arabic home for publishing and distribution* (p. 68). Jordan, Aman.
- Janson, S. (1996). The contribution of large-scale assessment programs to research on gender differences. *Educational Research and Evaluation*, 2(1), 25-49.
- Leedy, M. G., LaLonde, D., & Runk, K. (2003). Gender equity in mathematics: Beliefs of students, parents, and teachers. *School Science and Mathematics*, 103(6), 285-292.
- Ma, X., & Kishor. (1997). Assessing the relationship between attitude toward mathematics and achievement in mathematics: A meta-analysis. *Journal for Research in Mathematics Education*, 28(1), 26-47.
- Morgade, G., & Bonder, G. (1995). Women, mathematics and natural science. In R. Clair (Ed.), *The scientific education of girls: Education beyond reproach?* Paris: UNESCO.
- Mullis, I. V. S., Martin, M. O., Beaton, A. E., Gonzalez, E. J., Gregory, K. D., & Garden, R. A. (2000). *TIMSS 1999 international mathematics report: Findings from IEA's trends in international mathematics and science—Study at the eighth grade*. Boston: International Association for the Evaluation of Educational Achievement, Boston College.
- Saeed, M., Gondal, M. B., & Bushra. (2005). Assessing achievement of primary grader students and factors affecting achievement in Pakistan. *International Journal of Educational Management*, 19(6), 486-499.
- Singh, K., Graville, M., & Dika, S. (2002). Mathematics and science achievement: Effects of motivation, interest, and academic engagement. *The Journal of Educational Research*, 95(6), 323-332.
- Tilaye, K., & Bedru, K. (2006). Girl's performance in mathematics in upper primary schools of Addis Ababa. *Indian Journal of Gender Studies*, 13, 401-424.
- Wang, D. B. (2004). Family background factors and mathematics success: A comparison of Chinese and US students. *International Journal of Educational Research*, 41(1), 40-54.
- Yemen, M. O. E. (1983). *Analytic study on the reality of teaching mathematics in Aden Province*. Education, Aden.