Available online at www.elixirpublishers.com (Elixir International Journal)

Educational Technology

Elixir Edu. Tech. 89 (2015) 36961-36967

ISSN: 2229-712X

The Influence of Gender and Age on Computation of Fractions at the Primary School Level; Kenyan Case

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ARTICLE INFO

Article history:
Received: 31 October 2015;
Received in revised form:
7 December 2015;
Accepted: 12 December 2015;

Keywords
Gender,
Age,
Fractions,
Computing,
Primary Schools.

ABSTRACT

It is probable that performance in mathematics at the standard eight classes in Kenya is a reflection of the pupil's mathematical ability carried forward from standards seven, six and other classes of the primary tier. Gender disparities have persisted in the general performance of this subject, with notable differences in topics like geometry and algebraic fractions at secondary level. This study set out to investigate the influence of gender and age on computation of fractions by the primary pupils in Kenya and its findings were hoped to make a difference in performance of similar topics at secondary school level. The research was carried out in Bungoma County, Kenya. It involved 320 pupils and 8 teachers of mathematics from 8 primary schools. Data were collected by means of a diagnostic test for pupils and a questionnaire for teachers of mathematics. Inferential statistics, namely the t-test and the Pearson r, and frequency distributions were used in data analysis. The study revealed that the pupils had some knowledge of fractions but they encountered a lot of difficulties in computing work on fractions, which limited their level of understanding the topic and that gender had little or no influence on the pupils' ability to compute fractions at the primary level; while age did. On the basis of the findings, the researcher recommends that teachers be sensitized on age differences in the learning of fractions.

Introduction

Fractions form a very important part of mathematics curriculum in the primary school education. Mathematics in general is an essential subject to any child's education. This is evidenced by the fact that it is compulsory in the Kenyan school curriculum from the primary to secondary level. The emphasis usually given to mathematics implies that the subject is deemed as crucial in achieving the general objectives of education in Kenya. According to the Kamunge Report (1988), one of the aims of primary education is to; impart literacy, numeracy and manipulative skills in the children. In order to achieve this objective, mathematics becomes an important part of any child's education, and there is need for proper understanding of the mathematical concepts such as fractions, that children are exposed to.

Friel (1965) observed that the concept of fractions is frequently misunderstood and that difficulties first encountered in primary school persist into later life. Similarly, Ng'ang'a (1999) points out that pupils face difficulties in topics such as Algebra, Ratio and Numbers, that involve fractions because they lack knowledge on basic concepts of fractions. Wanjala (1996) on the other hand, has also explained that lack of proper understanding of the concept of fractions in its initial stages of introduction creates problems in later learning where the concept is applied, an error likely to contribute to poor performance in both KCPE and other examinations. The KNEC reports (1984, 1988, 1989, 1990, and 1998), standard eight, revealed that performance was low on questions set on fractions. For instance, according to the KNEC (1988) KCPE newsletter, performance in applied number problems was very low. The only two word problems involving fractions in the KCPE mathematics examinations (1987) were poorly done. The two questions (15 and 40) tested the candidates' knowledge and understanding of fractions.

Statement of Problem

It is probable that performance on fractions at the standard eight classes in Kenya is a reflection of the pupils' computational skills carried forward from standards seven, six and other classes of the primary school tier. The KNEC's (1984, 1988, 1989, 1990, 1998) KCPE newsletters revealed that fractions were frequently misunderstood and that there was a general weakness in this area of learning that contributed to poor performance, by the standard 8 pupils, on items set on this topic in the KCPE examinations. Since fractions constitute a large part of the mathematical content, poor performance in items involving them is likely to affect the entire performance in mathematics even at higher levels. Performance in mathematics and on fractions in particular, at both secondary and primary school levels in Kenya has persistently remained poor. This implies that a crucial factor in the teaching and learning of fractions has not been identified. Given the scenario, no known study has been carried out on the learning of fractions in the primary schools in Kenya, which could be the source of the difficulties experienced at the secondary school levels.

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This study was therefore undertaken to establish whether there exist any notable differences and difficulties that both boys and girls of different age groups encounter in computing fractions, which in turn, may be contributing to the low performance in mathematics at higher levels of learning in Kenya.

Research Questions

The study sought to answer the following questions generated from the above statement of the problem:

- Is there any significant difference in the in the ability to compute fractions between primary school boys and girls?
- Is there any significant relationship in the ability to compute fractions between primary school boys and girls?
- Is there any significant difference in the ability to compute fractions among primary school pupils when categorized by age?
- Is there any significant relationship in the ability to compute fractions among primary school pupils when categorized by age?

Null Hypotheses

The following null hypotheses were generated from the above research questions:

Ho_1:There is no significant difference in the in the ability to compute fractions between the primary school boys and girls

Ho_2:There is no significant relationship in the ability to compute fractions between the primary school boys and girls

Ho_3:There is no significant difference in the ability to compute fractions among primary school pupils when categorized by age

Ho_4:There is no significant relationship in the ability to compute fractions among primary pupils when categorized by age

Related Literature

On Gender Differences

It is not uncommon to see people raise their eye brows whenever they hear of a female mathematician. This is a long standing attitude that many people both men and women have adopted without any concrete proof that men are better mathematicians than women.

Studies that have been done show that women are generally under-represented and exhibit poor performance in mathematics. Samumkut (1986) made an attempt to find out whether the gender factor influenced the performance in mathematics of primary school pupils in Kenya. He used the mock examination results of 38 standard 8 pupils and found significant gender differences among pupils in favour of boys on mathematics performance. Both Kibanza (1980) and the Cockcroft report (1982) found that there were significant sex differences in achievement in mathematics in favour of boys at the higher cognitive levels while at the lower levels no significant sex differences were found. Mwangi (1986) investigated the factors that influenced performance and learning of mathematics among secondary school students in Kenya, aged 16 to 18 years and also came up with same findings that indicated that the sex of the pupil was significantly related to performance in mathematics in favour of boys. His findings were biased towards the age bracket of between 16 – 18 years. Most pupils in this age bracket are already in secondary school, few if any, may be found in primary school. A study on pupils below this age bracket is necessary so that the researcher can determine reasons that lead to a decline in the Girls' performance as they entered the age bracket of 16 – 18 years in Kenya. The present study therefore attempted to find out whether some gender differences existed in performance on fractions among primary school pupils aged 10 to 16 years.

Mondoh (1986) carried out a study on the relationship between gender and the mathematical ability of a pupil as measured using various tests among primary school pupils. She found no overall significant gender differences in mathematical abilities. The gender effects on mathematical ability were therefore attributed to other psychological, social and cultural factors. The present study investigated the primary pupils' gender differences in the ability to compute fractions in particular.

Irumbi (1990) investigated the pupils' characteristics that affected the performance of standard 8 pupils in mathematics. He found no significant difference in performance between pupils of different age groups. This study attempted to establish any age differences in performance on fractions among standard 6 pupils.

Joffe and Foxman (1984) pointed out three main in their features in their research about sex differences in a mathematics test performance:

- That at the ages of 11-15 years, there was constant performance across some topics. Boys seemed to perform better in practical areas such as measures, rates and ratios, while girls seemed to perform better in computation topics with whole numbers, decimals and some algebra.
- That by the age of 15 years, boys seemed to perform better than girls in all topics
- That generally there was no statistical difference in performance between boys and girls. But as the children grew older (15 years and above), they begin to realize the value of mathematics, and boys seemed to perform better.

This study tried to investigate gender differences among pupils, aged 10-16 years, in computing sums on fractions.

Weiner (1994) on the other hand, attempted to give reasons as to why female pupils' achievement levels slipped in mathematics as they progressed through the school. He said that female pupils favour serialistic learning (proceeding from certainty to certainty, learning, remembering and recapitulating) whereas male pupils are likely to take a holistic approach (more exploratory, working towards an explanatory framework). While Scott-Hodgetts (1986) suggested that male pupils were likely to be more successful learners in mathematics because they are more versatile and capable of switching learning strategies where necessary. However, these findings were based on studies done on pupils in secondary schools. The current study set out to find out if related observations could be found in primary schools.

Other studies have found that female pupils are more likely than their male counterparts to display "Learned Helplessness" (Licht and Dweck, 1983). A well trained teacher should be able to help the female pupil out of this problem. Therefore it is necessary that the researcher finds out what teachers are doing about this problem in case it exists among primary pupils in Kenya in order to make them perform better in mathematics. However, primary teachers in Kenya are not trained to teach specific subjects, but rather to teach all the subjects. This becomes a problem because the mathematics teacher has not acquired specific skills and knowledge to teach mathematics and therefore he or she may not know how to handle a pupil with such a problem.

Nicholls (1979) pointed out that whereas male pupils are more likely to attribute success to their ability and failure to lack of effort; female pupils tend to relate success to effort and failure to lack of ability. Female students show a stronger tendency to view their successes as due to factors such as "Luck" which implied some uncertainty about their ability to succeed in future.

Similarly, Eshiwani (1985) observed that girls under-achieved in mathematics as compared to boys. He pointed out two categories of factors that have been found responsible for underachievement in mathematics among girls as; those which stress biology in terms of innate characteristics, and those which stress environmental causes, usually described in terms of socialization. This meant that the school plays a major role in socializing the pupils in order to make them perform better in terms of providing enough learning resources, equipment and trained teachers. However, most schools in Kenya do not have enough learning resources as well as trained teachers. It is necessary for a study like this one to be undertaken to find out what the school is doing to assist both boys and girls to perform better in mathematics and particularly on fractions.

Eshiwani (1975) in his research on sex differences among students in Kenya towards the learning of mathematics revealed that girls had a negative attitude towards mathematics and this affected their performance. He also found out that lack of self-confidence (Mathematics anxiety) was a problem that existed more among the girls than boys and that single sex schools performed significantly better than mixed schools in mathematics. This was a study done among secondary school pupils. It was necessary that research be done among primary pupils to find out whether they display similar problems in computing fractions and what the teachers are doing to help the female child.

In general, the studies carried out showed that pupils had difficulties in solving mathematical problems involving fractions both in relation to age and gender. Not much has been done to find out if similar problems were experienced in primary schools where the concept was first encountered by children of a different age group, given the gender differences. This study therefore sought to find out the pupils' ability to compute fractions when categorized by age and gender.

Methodology

Descriptive survey study was used to investigate by comparison the influence of pupils' gender and age on the understanding and computation of fractional sums. Rosier (1980) pointed out that the descriptive survey research involved the collection of information from members of a group of students, teachers, or other persons associated with the educational process, and the analysis of this information to illuminate important educational issues.

The sample for this study consisted of 8 primary schools, 320 pupils and 8 teachers of mathematics. Purposive and Random sampling techniques were used in the selection of the sample. The only single sex school was purposively sampled to enable the researcher to obtain data on mathematics performance among girls only. The other 7 mixed schools were selected through simple random sampling (SRS) techniques.

Forty (40) pupils were selected from each of the eight schools to give a total of 320 pupils. Selection of the 40 pupils from the only single sex school was done through SRS to ensure an equal chance of selection among the pupils in all the classes, while selection of pupils in the 7 mixed schools was done through both stratified and simple random sampling techniques.

The eight teachers were purposively sampled as they were directly responsible for teaching mathematics in these classes. Data were collected using a diagnostic test and a questionnaire. This was a researcher-own made test, for purposes of determining pupils' ability to compute fractions. The researcher used Gagnés theory of a learning hierarchy as a guide in the selection of items to be included in the test.

The questionnaire sought to find out the gender observations on mathematics performance, especially on fractions, and also bring out any notable age differences in computing fractions among these pupils Scoring of the items in the questionnaire was done using the five-point Likert scale. Pretesting of these instruments enabled the researcher to determine their reliability and validity. To establish reliability, the instruments were pre-tested on two occasions at an interval of two weeks before being used in the main study. A Test-retest coefficient was then determined by correlating the scores obtained on the second administration. The instruments were considered reliable since the reliability coefficients for the test and the TMQ were 0.97 and 0.89 respectively with (n-2) degrees of freedom.

To improve on the reliability of the test, researcher checked on the difficulty level of each item. According to Ebel (1972) an item which all examinees answer correctly, or all miss, contributes nothing to test reliability. An item in which just half of the examinees answer correctly is potentially capable of contributing more to test reliability than an item that is more difficult or less difficult. In this study, items of middle difficulty, that is, from, 25 to 75 percent correct response, were considered as capable of contributing much to test reliability and therefore were selected for the main study.

Data were analyzed both qualitatively and quantitatively. Inferential statistics were applied. The researcher tested the hypotheses to determine whether or not there was significant difference or relationship among the variables. Suitability of the results was tested at $P \leq 0.05$ significance level (alpha level) since most of the related studies used the same criterion and with N-2 degrees of freedom because analysis was done on data in pairs (N is the number of pairs). The t-test was used to analyze data concerning differences in computing fractions among pupils when categorized by sex and age. The t-test statistic was therefore used to evaluate Hypotheses Ho_1 and Ho_3.The Pearson product moment correlation coefficient, Pearson r, was used to analyze data concerning relationships in computing of fractions among pupils when categorized by age and sex. The Pearson r statistic was therefore utilized in evaluating Hypotheses Ho_2 and Ho_4

Findings

The purpose of this study was to investigate the pupils' understanding of the concept of fractions when categorized by age and gender. The ability to compute the sums correctly was taken to be an indication of their understanding of the concept of fractions. Any mistakes made by the pupils while computing the sums were taken to be indicative of the difficulties encountered by the pupils and pointed to the areas that needed further reinforcement in order for the pupils to achieve proper understanding of the concept of fractions.

The test had a mean score of 43.81 percent. This was a below average performance and pointed to the fact that the pupils had not understood the content taught on fractions well and that they had misconceptions and difficulties in computing work on fractions. The test items were therefore subjected to Item Analysis. It was hypothesized that a low score was indicative of the many difficulties experienced by the pupils and that a high index of difficulty was indicative of what knowledge and skills needed further instruction and reinforcement. The frequencies of correct responses for both the lower (27 percent) and the upper (27 percent) groups were also analyzed as a basis for detecting the knowledge and skills that needed further attention for better performance and understanding of fractions. The index of difficulty was taken to be the proportion of the pupils who did not answer the question correctly. It reflected the group's ability to perform the required skill and their eventual understanding of the content being tested.

The sample of items to be analyzed was therefore selected from the item analysis table using the following procedure:

(i) Items with a high index of difficulty were identified. The items with more than 50 percent incorrect scoring were selected.

(ii) Both numerical sums and word problems were selected in order to test pupils' computational skills. The pupils' ability to compute and get the correct answer was considered to indicate the pupil's level of understanding fractions.

(iii) Some items were found to be testing similar skills or ideas. Analyzing all such items would have led to repetitive findings. Other items which had been selected on the strength of criteria (i) and (ii) were therefore omitted under this criterion.

(iv) A variety of items were selected to cover the different areas of the fractions syllabus tested i.e. common, decimal and percentage fractions.

(v) Items with a low discrimination index (<0.40) were selected. These were bad items, but they were taken because of their relevancy to the skills to be measured by the test.

In total, 25 items were selected for analysis. The items were analyzed to determine any difficulties encountered by pupils in computation that may have led to wrong answers. According to Dean (1982), the errors (mistakes) made by a pupil are a manifestation of the difficulties that the pupil encounter and the misconceptions he or she has in the process of learning mathematics and they are the best indicators of the areas where mathematical understanding needs to be improved

Gender differences

This study sought to determine if there were any relationships and differences among primary school boys and girls in computing fractions. Data used in this section was solicited by both instruments; the diagnostic test and the TMQ. The test was administered to 320 pupils of varying ages ranging between 10 to 16 years

Comparison was done on performance on fractions between boys and girls in the 7 mixed schools. The 7 schools were used in this section because they had an equal number of boys and girls (20 from each group). Averages were used for comparison. A mean score of less than 50 percent was taken to mean a below average performance. Table 4.2 shows the mean scores obtained by boys and girls in each of the seven schools.

Table 4.2. Mean Scores attained by Boys and Girls in each School

School		1	2	3	4	5	6	7
Mean score (%)	B	65.65	34.25	42.6	48.4	49.1	38.75	20.55
	G	72.9	38.35	41.5	48.1	56.9	35.75	29.05

From Table 4.2, it was noted that the mean scores for girls in 4 out of the 7 schools were higher than those of boys. This meant that the girls could have been better than those boys in computing work on fractions and therefore understanding fractions. Such information was verified further through the use of Pearson r correlation and the t-test. The Pearson r correlation was used to test for any significant relationship between boys and girls in computing fractions. By significant relationship in this study, it was implied to mean that both groups exhibited the same ability to compute fractions and the same level of understanding of fractions i.e. they were low, high or moderate achievers in the topic and faced the same if not similar difficulties in understanding the topic.

The Pearson r correlation coefficients (r_{xy}) calculated for the seven schools ranged between 0.94 and 0.98 ($0.94 \leq r_{xy} \leq 0.98$). This was a strong positive correlation. However, when testing the correlation coefficient for statistical significance the null hypothesis (Ho_1) was rejected at $P \leq 0.05$ with N-2 degrees of freedom, since the critical values for r_{xy} were less than the calculated $r_{xy.}$ This meant that the Ho_1(There is no significant relationship between the primary school boys and girls in computing fractions) was rejected. This further implied that there was a significant relationship; that both groups had the same ability and level of understanding in fractions, and that they had some difficulties in computing work on fractions. It was then noted that the differences in mean scores shown in table 4.2 were not significant. They could have been due to other factors not investigated in this study.

This observation was further confirmed by testing the Ho_2 for any significant difference between boys and girls in computing fractions. Significant difference here meant that they displayed varied abilities and levels of understanding fractions.

The t-test statistic was used to determine any significant difference. The calculated values of ,t, for the 7 schools varied between 0.94 and 1.36, yet the critical value for , t, at $P \leq 0.05$ with 38 degrees of freedom was 2.03. Since the obtained values of t were less than the critical value, the Ho_2 was accepted; that there was no significant difference between the primary school boys and girls in computing fractions. They had the same ability and level of understanding fractions, and could have been facing similar difficulties in solving sums on this topic. This meant that the difference between their means as shown in Table 4.2 was not a real difference; it may also be due to any other factors not investigated in this study.

The findings revealed by the Pearson r and the t-test statistics were in agreement with the Cockcroft report of 1982, which pointed out that there were no significant sex differences in mathematics achievement at lower cognitive levels (primary schools).

A comparison was also done between pupils in mixed schools and the single sex school. The comparison was done between girls from the 7 mixed schools and those from the single girls' school. The r_{xy} obtained varied between 0.84 and 0.92. These were high positive correlations; an indication that both groups had the same ability in computing fractions and also had the same level of understanding fractions. Any difficulties encountered, therefore, were common among the two groups. Accordingly, the differences in their means were not real. This was in disagreement with the findings of a study done by Eshiwani (1975) on secondary school students in Kenya; that single sex schools seemed to perform better in mathematics.

Responses from the TMQ showed similar observations; that there was no significant difference between the primary school boys and girls in adding, subtracting, multiplying and dividing fractions. The teachers (62.5%) also disagreed with the fact that boys displayed a positive attitude towards learning fractions than the girls. This implied that the two groups had a similar ability in computing work on fractions and that this was not influenced with their attitude. In general, the average performance on fractions for 6 (75%) of the 8 schools was low. See table 4.3.

Table 4.3. Mean Scores attained by each School in the Test

School	1	2	3	4	5	6	7	8
Mean score (%)	69.28	36.3	46.5	44.95	53	37.2	24.8	38.48

From table 4.3, it was noted that the mean scores for the 6 schools were less than 50 percent, which indicated a below average performance of fractions. This observation further indicated that there was a general weakness in performance in this area of fractions.

Age Differences

This study also sought to find out if there were any significant relationships and differences among standard 6 pupils in computing fractions when categorized by age. The 320 pupils were categorized into 6 age groups as shown in table 4.1. The ages fall within Piaget's formal operational stage. Table 4.4 shows the number of pupils in each age group and their respective mean scores obtained in the test.

Table 4.4. Mean Scores for each Age Group

Age Group (Years)	10 to 11	11 to 12	12 to 13	13 to 14	14 to 15	15 to 16
No. of pupils	16	78	97	69	50	10
Mean Score (%)	40.25	48.96	50.19	39.16	34.16	18.7

From table 4.4, the study sample seemed to be dominated by pupils of age 12 to 13 years; an age group that has the highest means score, followed by the 11 to 12 years age group. There were a few pupils in both the 10 to 11 and the 15 to 16 age groups. However, the 10 to 11 age group seemed to have a larger mean score than the 13 to 14 and 14 to 15 age groups, with the later having the lowest. Table 4.4 shows that pupils of age 11 to 12 and 12 to 13 were superior to other age groups in computing fractions and those pupils from the 10 to 11 year group were better than pupils in the 15 to 16 year group. This observation was subjected to analyses to find out if real differences and relationships existed.

The Pearson r correlation (r_{xy}) was used to determine any relationships among the age groups in computing fractions. This was used to test Ho_5.

It was discovered that all the calculated values of r_{xy} for all the age groups were less than the critical values of r_{xy} at $P \leq 0.05$. The Ho_5 was therefore accepted at $P \leq 0.05$ with n-2 degrees of freedom. This meant that there was no significant relationship between the compared age groups in computing fractions. The pupils of different age groups, therefore, displayed varied abilities and levels of understanding fractions. All the age groups used in this study had some knowledge of fractions but they did not have the same ability to compute and understand sums on this topic. This observation indicated that the mean scores shown in Table 4.4 were real and that some age groups were superior to others when it came to computing fractions. In this study, the most superior group was that of 12 to 13 year group followed by that of 11 to 12 years, 10 to 11 years, 13 to 14 years 14 to 15 years and finally 15 to 16 years. From this observation, it was noted that pupils below 11 years of age were yet to grasp the full meaning and understanding of fractions (assimilate) due to their mental age and consequently have problems with accommodating the same data in order to solve related problems or those presented in an unfamiliar form.

As these children entered the 13 to 14 year group, they seemed to drop in performance. Informal interviews between the researcher and the teachers revealed that this was due to attitudes and beliefs formed by pupils towards the learning of fractions. Many seemed to regard mathematics as a difficult subject and therefore ended up performing poorly in tests or examinations.

Responses from the TMQ revealed that pupils in all age groups had difficulties in solving problems on fractions. The teachers (87.5 %) strongly disagreed to the fact that pupils of the age groups used in this study had no difficulties in solving mathematical problems that involved fractions.

The t-test was used to evaluate for any differences among the age groups in computing fractions. This analysis led to answers to question 3 and testing of Ho_3.The results of these calculations led to the acceptance of Ho_3 in some cases and it was rejected in others. This was done at $P \leq 0.05$ significance level with 18 degrees of freedom. Where the hypothesis was accepted, it meant that there was no significant difference between the two age groups in computing fractions. This further pointed to the fact when compared; these groups had almost the same level of understanding fractions. They had similar abilities in solving problems on fractions and any difficulties encountered were common among both groups compared.

Comparing this observation and the analysis done using the Pearson r correlation, it was noted that these groups, when compared, understood fractions at a fairly same level. The difference was insignificant.

The Ho_3 was rejected for some groups, e.g. the 14-15 vs the 15-16 year age groups. This meant that there was a significant difference between the two groups in computing fractions. The differences in their mean scores shown in Table 4.4 were the real and not a chance difference. The 15-16 year age group seemed to have the lowest level and therefore, low ability in understanding and working with fractions. This group could not, therefore, be matched with any other group in the study. It was inferior to others in computing fractions; perhaps, a group of slow learners or those with low intelligent quotient (I.Q).

The overall impression given by the above presentation was that; age and therefore the cognitive level affected the understanding of fractions. Pupils of ages between 11-14 years seemed to do better and therefore, could compute work on fractions better than pupils below 11 years of age as well as those above 14 years of age in the primary schools of Kenya.

Conclusions

From the findings, it is clear that both boys and girls at the primary school level in Kenya exhibited the same ability in computing fractions at the primary school level, and that they encountered similar difficulties in working with fractions. There was a significant relationship and no significant difference between boys and girls in computing fractions. It was also established that 62.5 percent of the teachers disagreed with the idea that boys displayed a positive attitude towards learning fractions as compared to girls.

The study sample had pupils of ages ranging between 10 and 16 years old. It was noted that age affected the pupils' ability to compute fractions. Pupils of ages between 11-14 years seemed to do better than those below 11 years old and above 14 years old in the primary schools. The groups involved the study were arranged in order of good performance on fractions as follows;

12-13, 11-12, 10-11, 13-14, 14-15 and finally the 15-16 year old group.

A significant relationship was found among girls from mixed schools and those from the girls' school only. Both groups had similar abilities in computing fractions and they both encountered similar difficulties to the same degree in working with fractions.

Recommendations

From the findings and conclusions made in this study, the researcher made the following recommendations to assist in the better computation of fractions in primary schools;

- That since gender had no effect on primary pupils' understanding of fractions; teachers in secondary schools should look into other factors that may be influencing poor performance on topics related to fractions among secondary school girls.
- That since age affects pupils' understanding of fractions, and that pupils of ages between 11 and 14 years seem to do better than others, teachers should be advised to mix pupils of different ages in groups so that they can help each other to understand the areas that may seem difficult to them as well as compute work on fractions with ease.
- That the teachers of mathematics be sensitized on errors commonly made by pupils in computing fractions so that they know how to help the pupils to avoid similar problems in later learning.
- That the mathematics curriculum be revised to address the age differences in the teaching and learning of fractions
- That the teachers of mathematics to be given regular in-service courses in order to be sensitized on any issues related to the teaching of mathematics for better performance in the subject.
- Research should be done to establish factors that lead to declining performance in fractions as pupils grow in age, particularly as they attain the age of 14 years and over

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