

Improving the Understanding and Achievement of Senior Secondary Two Students in Linear Inequalities Word Problems Using Open-Inquiry in Jos, Plateau State, Nigeria

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ABSTRACT

This article is an experimental study on the effectiveness of open-inquiry teaching method on SSII students' understanding and achievement in word problem solving in linear inequalities in mathematics. This is crucial to establish whether the method will assist the students to learn, understand and achieve results in linear inequalities better than the use of traditional method with recourse to mitigating the persistent problem of underachievement in general mathematics which is indispensable in national development in Nigeria but many students in the secondary schools find the subject difficult to learn, master, and achieve good and expected results. The study adopted quasi-experimental pretest and posttest non-equivalent control group research design to achieve this purpose. Sample comprised 108 (54 males and 54 females) SSII students from two selected public senior secondary schools in Jos metropolis, Plateau state, Nigeria. Data collection was done using ATLIWP tagged pre-ATLIWP and post-ATLIWP with a reliability coefficient of 0.74. Data analysis was done using descriptive statistics and Analysis of Covariance (ANCOVA). The findings from the study showed among other things that the treatment group achieved significantly better than the control group with a mean achievement scores of 48.75 and 37.65 respectively, implying that the experimental group gained more than the control group that did not receive treatment for instance in terms of problem identification, and solution. It was recommended among other things that teachers should try and adopt the open-inquiry method in teaching inequalities word problem solving to assist students increase their understanding and achievement in mathematics.

Key words: Open-inquiry, Teaching, Mathematics, Understanding, Learning, Achievement.

1. INTRODUCTION

The search for new and better methods of teaching mathematics in the secondary school in Nigeria and many countries in the world is a continuous process to ameliorate the persistent problems of lack of enthusiasm, poor understanding and achievement in the subject. A number of stakeholders including parents and the government have decried these problems because of the belief that the whole world is undergoing rapid scientific and technological reforms which mathematics is indispensable such that no country including Nigeria can afford to be left behind without properly educating their citizens in the knowledge of mathematics (Ukeje, 1999; Odili, 2006; Bot, 2014; Bot & Gushi, 2015; Bot & Golji, 2015; Chief examiners' reports for WAEC 2011, 2012, 2013; Fwanshak & Gyang, 2015). In particular, it has been argued that for students to remain useful and functional in the present dispensation, they need mathematics knowledge more than ever before to be able to understand numerous changes in the world better, cultivate habit of accuracy, logical thinking and reasoning, critical and creative thinking, and problem solving skills (FME, 2006; Ifamuyiwa & Akinsola, 2008; Wilen, Hutchison & Ishler, 2008). Beyond the acquisition of these values, mathematics is said to be a powerful tool that consists of symbols and signs, and concepts such as matrices, linear programming, calculus and so on and so forth that are all useful and required for the study of many important courses including physics, chemistry, economics, astronomy and statistics for creating and sustaining meaningful development (Nakhanu, 2012; Lassa, 2012). It is no wonder then that Adetula (2003), Ezeugwu (2013), Ugwu (2013) and Nakhanu (2012) averred that mathematics is the king-pin of science and technology, pivot of all sciences, and the gate and key of science. This means in the absence of mathematics, no meaningful development can occur since no one will be able to understand science and technology easily and apply it successfully.

Suggestions have been offered on effective mathematics teaching to students especially through correct utilization of principles involved, using appropriate diagrams, careful reading and interpretation of solutions and teaching of logical reasoning (Chief examiner's report for WAEC 2014, 2015, 2016). This is because many teachers in the classroom have been handling the subject perfunctorily thereby making it difficult for students to understand, develop interest and apply it successfully. Researchers (Usman & Musa, 2015; Bot & Gushi, 2015; Eze, 2008) alluded that the manner which mathematics is taught in schools to students in recent years has not been proper and this has resulted in the students frequently failing to understand and apply it through traditional teaching, teachers have not been effective since they teach students the same way they were taught in the olden days and also that the teachers have been dominating class activities instead of allowing their students to participate fully, and the students have not been involved in active learning processes either. Thus it is no wonder saying that mathematics teaching has been in a deplorable state as Lassa (1984) pointed out few decades ago stating that in Nigeria, mathematics is in a sorry state in the primary, secondary, colleges and universities. This is shown in poor teaching, performance and achievement where a lot of students especially females are majorly affected. In achievement for instance, Uwadiae (2011) has revealed that in 2008, only 23.54% of candidates credited the November/December WASSCE mathematics. In 2009, the figure rose to 31.96%, and in 2010, it declined to 20.04%. This achievement down trend is worrisome and unacceptable considering the need for Nigeria to develop scientifically and technologically with mathematics serving as the bedrock.

Consequently, to assist students most especially female students with weak knowledge of mathematics to be able to read and understand mathematics, that is, to be able to identify, solve, explain and interpret solutions to problems; improve their achievement as well as their problem

solving ability (Muscio, 1993; Moses, 2004; Adewale, 2005); and also giving the need for the provision of equal education to all school-going children in Nigeria irrespective of their gender for active participation in national development, mathematics teachers have been urged to use newer instead of older traditional teaching methods mainly rote learning/memorization, expository method and drill that yield discouraging results (Eze, 2009), cause negative attitudes (Oloyede, Adebowale & Ojo, 2012) and which are rule-bound instead of being learner-friendly (Lampert, 1990). The traditional methods are not learner-friendly because most of the time, students find it difficult to understand and apply the rules involved thereby making it difficult for them to learn mathematics with full interest and progress smoothly; hence it is necessary for teachers to discontinue their use and embrace new methods, strategies and techniques that very often lead to significant improvement in interest generation, conceptual understanding and achievement. For example, Oginni and Owolabi (2012) revealed that the use of programmed instruction, a new strategy, assist to beef up curiosity in students resulting in greater learning, retention and mastery in mathematics. Bot (2013) found out that mathematical modelling being a new teaching technique is effective and efficient in teaching the applications of mathematics to secondary school students through problem solving with significant mean score difference compared with the use of traditional teaching methods. Therefore, Bot recommended that for students to develop good problem solving skills and apply same in solving practical problems, mathematics teachers need to employ and promote mathematical modelling in the classroom. In a similar vein, Bot and Davou (2016) discovered that the use of back-to-back instructional strategy being new, is effective in assisting students in the secondary school to increase their motivation level to learn and their achievement in algebra significantly with the differential effect favoring males as opposed to female students. Thus it was suggested that teachers should adopt the strategy in teaching algebra and experiment it with other mathematics topics in the secondary school in Nigeria.

Gleaning from the above review, the imperative of a new method, strategy or technique in mathematics instruction, therefore, cannot be underestimated. Thus it is proper to continue to search for newer means that will substantially mitigate the prolonged problem of poor achievement in mathematics among secondary school students in Nigeria. One new instructional method that teachers neglect but can be used to overcome the bitter challenges associated with the use of the old traditional teaching methods and equally assist their students to learn and improve their achievement in mathematics especially in solving word problems in linear inequalities is open-inquiry. As a teaching method, the open inquiry has been defined as the process of learning in which students are given freedom to initiate and think for themselves (Wilén, Hutchison & Ishler, 2008). Put in another way, it is the process of learning in which students are made to engage in analyzing and solving problems in a systematic way. It consist of five parts as follows: identify and clarify a problem; formulate hypotheses; collect data; analyze and interpret it; and draw conclusions. In essence, hypotheses refer to proposed solutions to the problem, data describes information obtained from different sources about the hypotheses, and analysis and interpretation refer to the processes required to reduce the list of hypotheses for conclusions to be drawn whether to reject, modify or accept the final ones. The conclusions in the final analysis may be explanations, generalizations or solutions arrived at which are very important in making decision about the problem(s).

Although some forms of inquiry teaching method exist like guided inquiry where a teacher provides data and question students inductively to solve and draw conclusion, and individualized inquiry which is based mainly on the number of students to be used as the name implies, open-inquiry method is particularly important and useful for obvious reasons. It allows the teacher to serve as facilitator in raising questions and finding appropriate solution on a given problem thereby

giving students opportunity to be responsible for their learning without depending much on the teacher. It give students the freedom to initiate and think for themselves about their proposed solutions; it enables them collect, analyze data and draw conclusion themselves; it helps them learn to practice their skills; it improves their critical thinking, socialization, problem solving ability, decision making and so on and so forth. This is in tandem with the thinking of Wilen, Hutchison and Ishler (2008) who contended that even though inquiry method is sparingly used, it is an extremely versatile instructional method being advocated by educators to help students attain the goal of subject matter understanding since it can be used in teaching content, problem solving, critical thinking skills and decision making.

Apart from being important and necessary in many respects, researches have shown that inquiry method is effective and efficient in instructional delivery causing better understanding and significant improvement in achievement of students in mathematics compared with the use of old traditional teaching methods. For instance, Usman and Musa (2015) examined the effect of inquiry teaching method on students' achievement in algebra in Bauchi metropolis, Nigeria. It was discovered that the treatment group performed higher and better than the control group; hence the authors concluded that inquiry teaching method makes it simpler for students to learn algebra leading to more and better conceptual understanding, retention, more positive attitudes, and higher achievement scores. Cooper, Bailey and Briggs (2015) discovered that the use of modified-moore-method, inquiry-based approach, helped students learn pre-calculus in class most especially female students to perform significantly better than their counterpart group exposed to learning from traditional methods. Similarly, Abdi (2014) investigated the effect of inquiry-based learning method on students' academic achievement in science course and found out that those instructed with the method achieved higher scores with a significant difference in achievement levels compared to those instructed through a traditional method; hence it was suggested that classroom teachers should consider how to prepare and incorporate the method in their teaching. Other researches (Huneyda, Omer & Ceren, 1994; Kurumeh, Jimin & Mohammed, 2012; Ogheneakoke, 2014; Shafqat & Hussain, 2015) have gotten similar results demonstrating the efficacy of the inquiry teaching method in enhancing knowledge acquisition, achievement, retention, attitudes, skills and comprehension among different sets of students at different educational levels thereby concluding that overall, inquiry-based teaching is better and preferable to time-tested methods like lecture and expository teaching in learning different subjects including physics, chemistry and social studies.

Since inquiry method generally has been found effective in teaching mathematics and other related school subjects, it is important, therefore, to examine it and see the extent to which in particular open-inquiry teaching can be used to help students understand and improve their achievement in linear inequalities word problem solving in the secondary school.

1.1 Statement of the Problem

The understanding and achievement of secondary school students in mathematics have been consistently poor in Nigeria and many countries in the world due to the persistent use of traditional methods in mathematics instruction as well as the use of poor quality teaching and learning materials, large classes and so on and so forth (Cox, 2000; Betiku, 2002; Odili, 2006; Iji, 2006; Eshiwani & Shikuku, 2001). Furthermore, many students tend to experience a lot of difficulties in trying to solve word problems compared to having direct computational problems or direct calculations in mathematics due to lack of proper training and engagement in general problem solving. In view of the fact that mathematics is indispensable in national development and students tend to have poor problem solving skills in addition to the issue of poor achievement, there is the

need to assist the students to develop good skills in problem solving to eventually make them competent problem solvers. This study thus set out to examine the effects of open-inquiry teaching method on students' ability to understand and solve word problems in linear inequalities, and achieve better results in mathematics compared to the use of traditional teaching method. Linear inequalities is not just a topic in mathematics for inculcating critical, reflective and logical thinking, problem solving skills and imaginative thought among students, it is useful also for cultivating positive values and promoting greater mathematics application through analysis, synthesis of information, drawing conclusion and decision making. Thus any effort to increase students' ability and potency in this direction will help improve their lot in mathematics.

1.2 Aim of the Study

This study was aimed at examining open-inquiry teaching method to see whether or not it will help students achieve better results in solving word problems in linear inequalities as opposed to the use of a traditional teaching method namely expository method. The specific objectives of the study, therefore, are as follows: To determine the effect of open-inquiry teaching method on understanding and achievement of students in linear inequalities word problem solving; to find out their levels of understanding in solving linear inequalities word problems when the method is used; to examine the type of difficulties, and the extent to which their achievement will differ when traditional expository teaching method is used compared with the open-inquiry method.

1.3 RESEARCH QUESTIONS

The following research questions were raised to guide the study:

1. What is the level of achievement of students when open-inquiry teaching method is used in teaching linear inequalities word problem solving in mathematics?
2. How does open-inquiry teaching method affect students' achievement in linear inequalities word problem solving in mathematics based on gender?
3. How does open-inquiry teaching method affect students' understanding and ability to solve word problems in linear inequalities in mathematics?
4. What type of difficulties students encounter in solving linear inequalities word problems when open-inquiry teaching method is applied?

1.4 HYPOTHESES

The following null hypotheses were formulated and tested at 0.05 level of significance:

1. There is no significant mean difference in the pretest and posttest achievement scores of students in the experimental group.

2. The achievement mean scores of male and female students in the experimental group will not differ significantly.
3. There is no significant mean difference in the posttest achievement scores of students in the experimental and control groups.

2. Methodology

This study examined the effects of open-inquiry teaching method on understanding and achievement of students in linear inequalities word problem solving using quasi-experimental pre-test and post-test research design. Sample for the study comprised of 108 senior secondary two (SSII) students (56 in the experimental group made of 33 males and 23 females; and 52 in the control group made of 21 males and 31 females) selected from two public senior secondary schools in Jos metropolis, Plateau state, Nigeria. The sample was selected through purposive and the simple random sampling techniques for choice of schools and assignment of subjects to the experimental and control groups respectively coded as SCH-A (Control group) and SCH-B (Experimental group).

Data for the study was collected using Achievement Test in Linear Inequalities Word Problems (ATLIWP) administered before and after treatment tagged Pre-ATLIWP and Post-ATLIWP respectively. The ATLIWP consisted of five multistage essay questions with code number T001 for proper identification and documentation. Each of the five questions contained in the ATLIWP carried 20 marks giving a total of 100 marks (100%) in all. The ATLIWP was edited by experts in mathematics education, and pilot-tested for face, content validities and reliability as well. The coefficient of reliability for the internal consistency was 0.74 derived from SPSS version 23.0.

The experiment was carried out in mid first term of 2017/2018 academic session in the two secondary schools chosen for the study. Two qualified and trained research assistants were employed, one administered the treatment in the experimental group (SCH-B) while the other taught the control group (SCH-A) through the use of well-prepared researcher lesson plans in linear inequalities consisting of word problem solving. Each lesson in the experimental group followed the principles of: identify/clarify the problem; formulate hypotheses; collect relevant data; analyze and interpret the data; conclude, decide or take a decision. Specifically, students in the experimental group had freedom to initiate and think freely, read and propose solutions, gather relevant information or data (e.g. symbols, signs, values, graphs, techniques, processes, relations, equations, etc.), represent the data, solve the problems, analyze the procedures and results, draw conclusion and interpret the results. These activities led to active participation of students in learning by asking questions, searching for solutions, conjecturing, generalizing, discussing, drawing conclusion with the research assistant providing the problems, facilitating the learning process (e.g. asking questions on how the problems can be solved, what else should be done, what values are required, what symbols are available, necessary or required, etc.) and also coordinating the solutions (e.g. discusses to accept, reject or modify the final solutions, interpret them and so on).

However, before the treatment, the control and experimental groups were pre-tested to determine a statistical baseline in their entry behaviors. The treatment took four weeks; hence the students in the experimental group had ample time of participating in all the activities of solving the linear inequalities word problems designed for the experiment.

The control group on the other hand was trained in linear inequalities word problem solving using traditional expository teaching method by the second trained research assistant. At the end of

the treatment, a post-test was administered to the experimental and control groups taking two hours like the pretest. The data collected was analyzed using descriptive and inferential statistics namely means, standard deviation, percentiles and analysis of covariance statistics with pretest as covariates.

3. RESULTS

The findings from the study are presented as follows:

Table 1: Students' Levels of Understanding Linear Inequalities Word Problem Solving through Open Inquiry Teaching Method

Number	Levels of Understanding	Freq.	%	Remark	Training
28	Problem Identification	140	50.00	Good	Little
20	Solution/Result Process	100	35.71	Poor	Much
27	Conclusion/Final Solution	135	48.21	Average	Little
11	Interpretation	55	19.64	Very Poor	Very Much

Table 1 shows that 28 students (50%) need little assistance in terms of training on identifying problems to improve their ability to solve linear inequalities word problems successfully. This is in contrast to 11 students (19.64%) who require huge (very much) training in interpretation.

Table 2: Students' Achievement Levels in Linear Inequalities Word Problem Solving from Using Open Inquiry Method of Teaching

Achievement Level	Marks Range	Freq.	%	Remark	Decision
Low	00-39	20	35.71	High (Failures)	Fail
Moderate	40-49	08	14.29	Few (Passes)	Pass
High	50-69	17	30.36	Many (Credits)	Pass
Excellent	70-100	11	19.64	Few (Distinctions)	Pass

From Table 2, the level of achievement of students in solving linear inequalities word problems through the use of open inquiry teaching method is low (00-39) with 20 students (35.71%) having high failure rate giving that only few (11) of them representing 19.64% got excellent marks. This implies despite the fact that open inquiry teaching method assisted the students to learn to solve linear inequalities word problems, their achievement is mainly at low level. This situation at least need further intervention to remedy it.

Table 3: Difficulties Students Encountered in Solving Linear Inequalities Word Problems by Open-Inquiry Method of Teaching

Type of Difficulty	Freq.	%	Remark
<u>Understanding:</u> Identification, definition, sorting, reading, copying, underlining, explaining, etc.	28	50.00	Poor
Selection and use of appropriate signs and symbols	28	50.00	Poor
<u>Representation:</u> Developing and forming equations, selecting and using relevant variables, etc.	25	44.64	Average
<u>Solution:</u> Calculating right/correct solution/answer, verifying/checking, interpreting the solution	45	80.36	Very poor

In Table 3, the experimental group appear to experience some difficulties in solving the linear inequalities word problems despite the fact that they had better achievement scores against the control group. The difficulties ranged from poor understanding (50%), poor representation (50%) to very poor solution approach (80.36%).

Table 4: Achievement of the Experimental and Control Groups in Linear Inequalities Word Problem Solving

S/N	Group	Test	N	Mean	SD	Range	Percentile: 25, 50, 75
1	Experimental	Pretest	56	37.52	18.25	71	22, 39, 50
		Posttest	56	48.75	19.07	70	30, 50, 65
2	Control	Pretest	52	34.62	18.42	76	18, 34, 49
		Posttest	52	37.65	16.42	61	26, 35, 50

Table 4 shows before treatment commenced, no much mean difference in pretest achievements between the experimental and control groups since that of the experimental group is 37.52 with a standard deviation of 18.25 while that of the control group is 34.62 with a standard deviation of 18.42. However, after treatment with reference to posttest, the experimental group with a mean achievement score of 48.75 and a standard deviation of 19.07 achieved better results than the control group with a mean achievement score of 37.65 and a standard deviation of 16.42. Also, the mean achievement score of the experimental group increased from 37.52 in pretest to 48.75 in posttest more than that of the control group with 34.62 in pretest to 37.65 in posttest. This means that the experimental group gained more from the treatment compared with the control group that did not receive it.

Table 5: Posttest Achievement of Students in the Experimental and Control Groups Based on their Gender

S/N	Group	Test	Sex	N	Mean	SD	Range	Percentile: 25, 50, 75
1	Experimental	Posttest	Male	33	43.97	20.20	70	26.5, 40, 63
			Female	23	55.61	15.25	50	48, 55, 66
2	Control	Posttest	Male	21	34.76	13.73	49	24, 35, 48
			Female	31	39.61	17.97	61	30, 36, 54

Table 5 shows that male students in the experimental group with a mean achievement score of 43.97 with a standard deviation of 20.20 in posttest achieved below female students in the same experimental group with a mean achievement score of 55.61 and a standard deviation of 15.25. Furthermore, Table 5 shows that the male students in the experimental group with a mean achievement score of 43.97 in posttest achieved better than male students in the control group with a mean achievement score of 34.76. The male students in the experimental group also achieved better than female students in the control group in posttest with a mean achievement score of 39.61. Similarly, female students in the experimental group with a mean achievement score of 55.61 in posttest achieved better than male students in the control group with a mean achievement score of 34.76. They also achieved better than female students in the control group with a mean achievement score of 39.61 in the posttest. Overall, this suggests that females achieved better results than male students in solving linear inequalities word problems through the open inquiry teaching method.

Table 6: ANCOVA Computation of Achievement Scores of the Experimental and Control groups

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	26362.681 ^a	2	13181.341	129.116	.000	.711
Intercept	4403.673	1	4403.673	43.135	.000	.291
Pre-test	23042.876	1	23042.876	225.713	.000	.683
Group	2056.943	1	2056.943	20.148	.000	.161
Error	10719.393	105	102.089			
Total	240576.000	108				
Corrected Total	37082.074	107				

a. R Squared = .711 (Adjusted R Squared = .705)

Table 6 revealed that there is a significant difference in achievement of the experimental and control groups since $F_{(1, 105)}=20.15$, $p=0.000<0.05$ (level of sig.). This implies that the treatment resulted in significant effect on students' achievement in linear inequalities word problem solving than the use of traditional teaching method.

Table 7: ANCOVA Computation of Achievement Scores in the Experimental Group Based on their Gender

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	13243.078 ^a	2	6621.539	51.873	.000	.713
Intercept	2941.125	1	2941.125	23.041	.000	.294
Pre-test	11407.026	1	11407.026	89.362	.000	.664
Gender	59.755	1	59.755	.468	.497	.008
Error	6765.422	53	127.649			
Total	153096.000	56				
Corrected Total	20008.500	55				

a. R Squared = .662 (Adjusted R Squared = .649)

In Table 7, the results revealed that $F_{(1, 53)}=0.468$, $\alpha=0.497 > p=0.05$. This implies that there is no significant gender difference cum variation in the achievement of boys and girls from the experimental group. This also means that the treatment led to equivalent achievement for the students from the experimental group irrespective of their gender.

4. DISCUSSION

The focus of the present study was primarily on seeing how to employ a relatively new teaching pedagogy namely open inquiry teaching method in Nigeria classroom in assisting students to overcome the problems of poor understanding and achievement in mathematics particularly the solutions of linear inequalities word problems. These problems arose from the fact that over a long time period, mathematics teachers have been relying principally on the utilization of old traditional teaching methods mainly expository method and there has been no genuine attempt on their part to examine and explore newer strategies and techniques of teaching mathematics for the benefit of their students. Thus it is believed that if a new approach such as open-inquiry teaching is employed, and it is found to be effective, teachers could be urged to shift emphasis from relying on using the old traditional methods. Therefore, this study was done against the backdrop that except the aforementioned problems are mitigated totally, Nigerian students will continually find it difficult to make useful and important contributions in national development efforts with poor mathematical background.

Consequently, the findings from this study in Table 1 revealed that whereas quite a number of the students developed poor understanding of how to solve linear inequalities word problems [(Table 2, low marks 00-39 with 20 (35.71%) students high failure rate)], 28 (50%) of them will need little training assistance on problem identification but 11 (19.64%) will require huge training in problem interpretation. However, with reference to posttest, the experimental group with a mean achievement score of 48.75 did better than the control group with 37.65. The difference was statistically significant (Table 6, $F_{(1, 105)}=20.15$, $p=0.000 < 0.05$). This means that the experimental group that received treatment being a new strategy achieved significantly better than the control group that did not receive it. This concurs with the findings of Oginni and Owolabi (2012) who demonstrated that programmed instruction, a new strategy, assisted a lot of students to learn, understand and achieve the mastery of mathematics concepts with significant improvement in their achievement, Bot (2013) who discovered that mathematical modelling, a new strategy, is effective in teaching the applications of mathematics, and also Bot and Davou (2016) who found out that back-to-back instructional strategy is effective in helping students to increase their achievement in

algebra significantly. Also, the findings from this study is in tandem with that of Usman and Musa (2015) that investigated the effect of the inquiry teaching method on the achievement of students in algebra and found it effective and efficient since students from the experimental group achieved higher than their counterparts from the control group.

Furthermore, the findings from this study (see Table 5) revealed that male students from the experimental group with a mean achievement score of 43.97 gained less in posttest than female students in the same group with a mean achievement score of 55.61. But the difference was not statistically significant (Table 7, $F_{(1, 53)}=0.468$, $\alpha=0.497 > p=0.05$). This implies that the students from the experimental group benefited equally from the treatment irrespective of their gender. Also, on the average, female students from the experimental group with achievement mean score of 55.61 in posttest achieved better than males from the control group with a mean achievement score of 34.76. Overall, the difference was statistically significant considering the results in Table 6. This implies that the female students learned and achieved better results from using open inquiry teaching in solving linear inequalities word problems than males from the control group. This contradicts the findings of kurumeh, Jimin and Mohammed (2012) and Bot and Davou (2016) who found out male students achieved better than females in mathematics. This goes to demonstrate that the claim of superiority of males over female students or vice versa in achievement cum performance in mathematics is not certain. Consequently, male and female students need to be treated equally in the classroom by mathematics teachers without sentiments.

5. CONCLUSION

This study has shown that students understand and perform better in linear inequalities word problem solving when open inquiry teaching method is used as opposed to using traditional expository method. Thus it is concluded that open inquiry teaching is effective and it is better than the traditional expository teaching which teachers consistently rely upon. For this reason, if teachers are to assist their students to understand and achieve better learning outcomes in mathematics particularly the solution of linear inequalities word problems, open inquiry teaching is one of the methods that can be used with assurance.

6. Recommendations

The following recommendations are put forward based on the findings from this study:

- Students learn, understand and achieve better results in solving linear inequalities word problems when open inquiry teaching method is used. Mathematics teachers are thus encouraged to use the open inquiry teaching method whenever they want to engage their students in this topic in the classroom.
- The government should provide teaching and learning materials namely textbooks that incorporate open inquiry teaching method. This will not only introduce novelty in the methods that teachers are supposed to use but it will ensure the materials are up-to-date.
- Mathematics teachers should learn and integrate open inquiry teaching method in their teaching of linear inequalities word problems to enhance the achievement of students in mathematics.
- Seminars, conferences and workshops should be organized for teachers especially those with weak or poor pedagogical knowledge to learn how to apply open inquiry teaching method in mathematics particularly on teaching linear inequalities word problems.

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