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Investigating the Causes of Poor Performance of Grade 12 Pupils in Physics Lessons Involving Graphs of Motion

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Abstract

The objective of this study was to investigate the causes of poor performance among grade 12 pupils on topics related to graphs of motion in Luampa District of Western Province at Luampa and Mbanyutu Secondary schools. In order to attain the objective of this study pre-post quasi experimental and survey designs, meaning qualitative and quantitative research approach was used. The subjects of the study were 32 learners or students and 2 teachers of physics who were selected by simple random sampling technique. The instruments used in this study were questionnaire and observation and to supplement these instruments, tests, pre-test and post-test were used to collect data of the study. The data gathered through tests were analyzed by using statistical package for social science, observation and questionnaires were analysed using QDA Miner Lite. Results of the study revealed that learner centred approach and planning lessons before teaching can improve the performance of grade 12 learners on topics involving graphs of motion. This in turn improves the performance of learners in physics. The researcher assessed the impact of learner centred on grade 12 learners' academic achievement physics as a result of his assessment he assured that the learner centred approach has an impact on academic achievement of grade 12 pupils in physics. So, the schools which were under study can make continuous program to support learner centred approach to improve the academic performance of grade 12 learners in physics. All the findings showed that learner centred and effective lesson planning can improve the performance of grade 12 learners in topics which involve graphs of motion in Luampa district,especially at Mbanyutu and Luampa secondary schools.

Keywords: collaborative learning, performance, poor performance, grade 12

1. Introduction

Physics is one of the subjects which enable those who complete a three-year senior secondary school course to pursue a science related career courses at tertiary levels. But there are few students who register themselves to do science

related courses due to the fact that most of the students who complete secondary school course do not perform well in their final examinations which certify the learners to further their education. According to the Examination Council of Zambia, poor performance has been recorded consecutively for the past five years, 2016 to 2020, more especially in science (physics), on questions which involve graphs. Hence, this prompted the researcher to investigate the cause of poor performance on questions involving graphs of motion.

As a teacher who has taught physics for ten years, it was noticed with great concern that pupils should be taught scientific skills in order for them to analyze and interpret science effectively. Most of our pupils have challenges in putting physics problems on graphs. This was noticed during physics lessons on graphs of motion. For example,

A car starting from rest accelerates uniformly to 20m/s in 5s. And it accelerates more to 40m/s in 2s and then decelerates until it stops 8s later. Draw the speed-time graph.

The above question demands a pupil to present the information on the graph and such a question give challenges to most grade 12 pupils.

Being an examiner, it has been noted that most of the pupils who fail science paper one (physics) are those who do not perform well in section C. This is a section where pupils are demanded to put certain information, mostly in figures on the graph or giving a description from the information presented on the graph. This has been a trend for five years now (ECZ, 2017)

However, it has been realized that most learners have difficulties in constructing and interpreting of graphs in physics, this is due to the fact that learners spend most of the time learning stories about science rather than learning how to construct and read graphs (Williams, 2014).

2. Statement of the Problem

Science is all about analyzing and constructing information systematically using figures. These figures can be interpreted meaningfully using graphs. Scientists and teachers find it easy to explain and interpret given numbers on a particular information using graphs. Despite a lot of graphs being used in science, physics, most of the students especially grade 12 experience difficulties in interpreting the given data with figures on graphs during their grade 12 final examinations (ECZ, 2017). The pupils cannot connect the topic being learnt with the skill of generating figures, they cannot choose a suitable and reasonable scale that can be used on the axes (Beichner & Saul, 2014).

Most of the pupils fail even to label axes which makes them fail even to identify the name of the graph. The researcher intends to fill this gap and the result of this study will be used to minimize the misinterpretation and misconceptions on lessons involving graphs of motion. Systematic explanation should be done to pupils by perfecting the planning before teaching and ensure that pupils are engaged from the beginning to promote full participation by all learners (Mathewson, 2013).

3. Purpose of the Study and Research Questions

The main purpose of the study was to investigate the reasons why grade 12 pupils perform poorly in physics lessons involving graphs of motion since 2017 at Mbanyutu and Luampa Secondary schools of Luampa district of western province of Zambia.

The research questions on the poor performance of grade 12 pupils on graphs of motion (the study) were to investigate;

1) What causes poor performance in physics lessons involving graphs?
2) What challenges do teachers and students face during the lessons involving graphs of motion?
3) What can be done to reduce the challenges faced by both teachers and students in order to improve learners' performance on graphs of motion?

3.1 Research Design

The study used both pre-post quasi experimental and survey designs, meaning qualitative and quantitative research approach was used. The research questions are the most important guidelines because they show the type of information needed to be collected. For example, the first two research questions needed descriptive type of information, hence qualitative and the last research question needed both descriptive and statistical type of information. The experimental group allowed the collaborative learning testing and intervention as compared to the whole class approach. The whole class approach means

learners sit in a bus arrangement form, learners are not divided into groups.

3.1.1 Participants

The sample was drawn from a population of 80 pupils from two schools namely Mbanyutu and Luampa secondary schools of Luampa district of western province of Zambia. The sample consisted of fifty (32) pupils; sixteen (17) from Mbanyutu secondary, (8 girls and 9 boys) and sixteen (15) from Luampa secondary school, (8 girls and 7 boys). The sample was chosen using simple random sampling.

3.1.2 Data Collection Instrument

***Tests*:** Tests were used during experimental process, these were pre and post tests conducted to the experimental group. Pretest-posttest designs are the preferred method to compare participant groups and measure the degree of change occurring as a result of treatments or interventions. The pre- test was done to find out the pre-requisite knowledge learners had in order to identify the best teaching methods to be employed during teaching topics which involve graphs and also to identify the source of challenges encountered by pupils.

***Observation*:** Systematic observation is a quantitative method of measuring classroom behaviors from direct observations that specifies both the events and behaviors, for example, how regular can a learner choose the correct scale for a particular graph and how they are to be recorded. Generally, the data that is collected from this procedure focuses on the frequency with which specific behaviors or types of behavior occurred in the classroom and measures duration, like how long has the lesson lasted. The observation of the classroom interaction or activity of sampled students in physics period was used to get extra data on top the data collected by questionnaires and experimental tests.

***Questionnaires*:** Questionnaires were used to get experiences from teachers before and during teaching. Other questionnaires were given to pupils to find out the challenges they face in learning of graphs of motion. To meet the objective of this study the questionnaires were developed. The closed ended questionnaires as well as likert scale were developed for it keeps the respondents on the subject, is relatively objective and is fairly easy to tabulate as well as to analyses and likert scale type were used in developing the questionnaire because, the likert scale type was chosen because of its advantage in assessing one's attitude toward some particular issue. Teachers' questionnaire had 19 items and learners' questionnaire had 16 items.

4. Research Findings and Analysis

This section presents the findings and analysis of the study. This will be followed by analysis of the data collected through questionnaires for both pupils and teachers and then observation of the classroom learning in connection with the research questions.

The two schools under study were Mbanyutu and Luampa secondary schools. Mbanyutu is purely government school and Luampa is a grant aided school for Evangelical church of Zambia (ECZ).

4.1 Tests

***Pre-Test*:** Before teaching any sampled participant an experimental group, test was given to sampled pupils, called pre-test. The results for the pre-test were as follows:

Table 1. Table showing results of pretest for sampled learners

Number Of students	Score out of 20																				Mean
32	8	6	4	2	0	0	0	0	0	0	6	4	8	4	4	0	4	0	6	8	0	3.03
	0	0	4	6	4	4	4	2													

As shown in Table 1 in the pre-test result of 32 sampled students of grade 12 physics, mean result was 3.03 and this mean result was used to evaluate the change or improvement of academic achievement of students of grade 12 in physics on topics involving graphs. The total number of pupils who were present during pre-testing was twenty-nine (29) out of thirty-two (32). This entails that three pupils were missing or absent.

Thereafter, the pupils were put into two groups which consisted of experimental and control groups. The control group was taught using the methods desired by the teachers using their normal routine. The experimental group was taught using learner centred methods which encouraged learners to construct their own knowledge through collaborative learning, for example, group discussions. The two groups were taught using different approaches because the researcher wanted to single out the most effective teaching method that can be used when teaching topics involving graphs of motion. The approach which would have produced or yielded better results was considered to be the most effective one.

***Post-Test*:** Thereafter, the two groups were given another experimental test called post-test and the results were as follows:

Table 2. Table showing post test results for both control group and experimental group

Number of students	Score out of 20																				Mean
32	1	2	1	3	0	4	2	9	9	9	10	16	12	10	9	3	7	0	2	3	13	7.6
	11	15	9	19	10	16															

As shown in table 2 of post-test, it is easier to tell that there was an improvement, 7.6-3.8=3.8, the performance improved by 3.8, which is one hundred percent improvement. Even though, we are not yet sure where the main contribution of improvement came from, either from control group or experimental group, because table 2 combines both control group and experimental group results. The total number of pupils who sat for post-test was twenty-seven (27) out of the total initial of 32 pupils, hence the increase in absenteeism.

The results for experimental group which was extracted from the above table were as follows:

Table 3. Table showing the results for experimental group.

Number of students	Score out of 20																		Mean
16	0	2	3	3	3	7	9	10	11	13	15	16	19						8.5

The mean result of the experimental result for the score is 8.5.

The following were the results for control group, which was taught in a usual way, employing methods desired by teachers.

Table 4. Table showing results for the control group.

Number of students	Score out of 20																Mean
16	0	1	1	2	2	4	9	9	9	9	10	10	12	16			6.7

The mean score of the results of the control group is 6.7. We can see improvement from the results of the control group as compared to pre-test. The tremendous improvement was observed from the mean results of experimental group. Therefore, it was seen that the experimental group can bring better results as compared to control group by 8.5-6.7=1.8. Therefore, we can tell that the most effective teaching method on graphs of motion at Mbanyutu and Luampa secondary schools is group discussion or learner centred approach which in turn encourages collaborative learning among learners.

4.2 Questionnaires

***Pupils' Questionnaire*:** The first part the pupils' questionnaires results were as follows:

Table 5. Table showing results for pupils' questionnaires for part one

	QUESTION	SAMPLE/%	YES	NO
1	Did you cover any topic in physics Which involve graphs?	n=32	31	1
		%	97	3
2	Do you enjoy topics which involve graphs?	n=32	8	24
		%	25	75
3	Did you do graphs of motion in grade 10 or 11?	n=32	25	7
		%	78	22
4	Did you enjoy the topic, graphs of motion?	n=32	6	26
		%	19	81
5	Do you have challenges in learning topics involving graphs?	n=32	23	9
		%	71	29
6	Do you enjoy the way teachers teach physics on topics which involve graphs?	n=32	11	21
		%	34	66
7	Do you think teachers have challenges which they face when teaching topics involving graphs?	n=32	22	10
		%	69	31

Referring from table 5, pupils' questionnaires had two (2) variables and seven items. The variables were YES and NO. The items were questions from number one (1) up to number seven (7). The analysis was done in relation to the research questions.

4.3 Challenges Faced by Learners on Graphs of Motion

ITEM 2-According to table 5 above, it was clearly seen that pupils did not enjoy learning topics which involve graphs. Most of the reasons gotten from pupils showed that teachers do not concentrate on explaining how the graphs can be constructed and interpreted, instead they just cruise to finish the syllabus. This was seen through the number of pupils who refuted to the question as compared to those who accepted to the question. The number of pupils who did not enjoy in learning topics which involve graphs was twenty-four (24) out of thirty-two (32) participants, which represents seventy-five percent (75%) of the participants as compared to those who enjoyed. Eight (8) learners, out of thirty-two (32) participants, represent twenty-five percent (25%), of the pupils who participated in the research, did not enjoy learning on topics which involve graphs. Meaning learners had challenges in terms of guidance from teachers. They lacked proper guidance from learners on how to construct and interpret graphs.

ITEM 4- According to table 5, it showed that most of the learners did not enjoy learning the topic, graphs of motion. The reasons pupils gave indicated that teachers were fast and quick when dealing graphs of motion, and this further showed that teachers used lecture method which disadvantaged learners from getting the concepts on graphs. Lecture method of teaching involves teachers standing in front of learners teaching learners what to do, meaning a teacher is the source of knowledge and consider learners to be empty vessels.

Teachers were teaching in order to finish the syllabus not for pupils to acquire skills. Table 5 really showed that eighty-one percent (81%) of the pupils who participated did not enjoy the topic, graphs of motion. Only nineteen percent (19%) came out in open that they enjoyed learning on topics which involve graphs of motion. This means that most of the learners did not acquire any skill on graph interpretation and

construction.

ITEM 5- The results of the questionnaires showed most of the learners who participated have challenges on graphs of motion. This was so, because twenty-three (23) out of thirty-two (32) participants came openly that they had challenges on topics involving graphs of motion. This represents seventy-two percent (72%) of the participant. The most eminent reason learners gave was that teachers do not answer their questions which troubles them during lessons involving graphs. Only nine (9) out of thirty-two (32) pupils showed that they did not have challenges learning on topics which involve graphs of motion. This represents twenty- eight percent of the participants.

ITEM 6- Most of the learners' responses showed that teachers do not employ teaching methods which motivates learners to acquire skills on graphs. Twenty-one (21) learners out of thirty-two (32) participants indicated that they do not enjoy the way teachers teach physics on topics which involve graphs. Meaning sixty-six percent (66%) of the pupils who participated did not enjoy the way teachers teach physics on topics involving graphs at Mbanyutu and Luampa secondary schools. Eleven (11) out of thirty-two (32) pupils who participated indicated that they enjoy the way teachers teach physics on topics which involve graphs. These pupils represent thirty- four percent of the pupils who participated. When employing wrong methods of teaching, it is automatic that learners did not acquire any knowledge and skill, hence the poor performance on graphs of motion. In other words, the challenges identified are the causes of poor performance among grade 12 learners on graphs involving graphs of motion.

4.4 Challenges Faced by Teachers on Graphs of Motion

ITEM 7: Do you think teachers have challenges which they face when teaching topics involving graphs? Most of the responses pupils gave indicated that teachers have challenges which teachers do encounter as they teach physics on topics which involve graphs. The main reason which came out strongly was that teachers teach and demonstrate using a plain chalkboard and during tests they are given graph papers. This clearly confuses learners because they do not practice on graph papers but during tests and mostly on final examination, they are told to use graph papers. This can be proved by looking at the number of respondents who agreed as compared to those who refuted to the question. Twenty-two (22) out of thirty- two (32) agreed that teachers have challenges which they face when teaching topics which involve graphs. The pupils who agreed represented sixty- nine percent (69%) of the participants. Then ten (10) out of thirty-two (32) participants showed that teachers do not have challenges when teaching on topics which involve graphs, which represent thirty-one percent (31%) of the participants.

Generally, from the questionnaires carried out, the responses showed that grade twelve learners of Mbanyutu and Luampa secondary schools have challenges on topics involving graphs of motion. These challenges if not handled properly can lead to poor performance on graphs of motion.

The following are the results for part two of the pupils' questionnaire conducted at Mbanyutu and Luampa secondary schools.

Table 6. Showing results for pupil's questionnaire part two

	QUESTIONS	SAMPLE	1	2	3	4	5
			SD	D	Ud	A	SA
1	There are no challenges experienced during Lessons involving graphs of motion.	n=32	7	15	0	5	5
2	Teachers teach well on graphs of motion.	n=32	12	15	1	4	0
3	The number of physics teachers is not enough in the school.	n=32	2	0	3	17	10
4	I enjoy learning on topics which involve graphs of motion.	n=32	18	10	0	2	2
5	I can construct graphs without challenges.	n=32	14	17	0	1	0

6	Graphs are difficult to interpret.	n=32	3	8	1	12	8

In this section of the pupils' questionnaires, there are five (5) variables, these are SD, D, Ud, A and SA and the questionnaire has six (6) items. The meanings of the abbreviated variables are as follows;

SD=Strongly Disagree, D=Disagree, Ud=Undecided, A=Agree and SA=Strongly Agree.

ITEM 1: Item 1 states that there are no challenges experienced during lessons involving graphs of motion: The number of learners that disagreed strongly was seven (7), disagreed fifteen (15), undecided zero (0), agreed five (5) and agreed strongly was five (5). Fifteen learners disagreed to the statement and seven learners strongly disagreed. The total number of learners who refuted to the statement was twenty- two (22) out of thirty-two (32) learners, this represents 68.75%. Those who agreed to the statement were just ten (10) out of thirty-two (32) learners and this represents 31.25%. From item one, it was clearly seen that most of the learners have challenges which they do experience on topics involving graphs.

ITEM 2: This item stated that teachers teach well on graphs of motion. From table 6, it was seen that the number of learners who strongly disagreed to the statement was twelve (12), disagreed fifteen (15), undecided one (1), agreed four (4) and no one agreed strongly. The total number of learners who disagreed that teachers teach well on graphs of motion was twenty-seven (27) out of thirty-two (32), representing eighty four percent (84%) of the pupils who participated. This entails that pupils felt that teachers do not teach according to their expectations. On this item, it was clearly noted that pupils blame teachers for their poor performance on topics involving graphs of motion.

ITEM 3: The number of physics teachers is not enough in the school; referring from table 6, it was seen that the number of learners who disagreed strongly to the statement was two (2), disagreed was zero, undecided was three (3), agreed was seventeen (17) and strongly agreed was ten (10). Therefore, the total number of learners who agreed inclusive of those who strongly agreed was twenty-seven (27). This meant that twenty-seven (27) learners agreed that the number of teachers of physics is not enough at both Mbanyutu secondary and Luampa secondary schools. The number of learners who conquered that the number of teachers of physics is not enough represents eighty-four percent (84%) of the participants. Therefore, pupils believe that they cannot perform well due to insufficient number of teachers.

ITEM 4: States that, learners enjoy learning on topics which involve graphs; using table 6 of the pupils' questionnaires, it was clearly observed that the number of learners who did not enjoy learning on topics which involve graphs are more than those who enjoyed. According to table 6, the number of learners who strongly disagreed that they did not enjoy learning topics which involve graphs was eighteen (18), disagreed was ten (10), no one was undecided, two (2) agreed and two (2) again strongly agreed. This represents eighty-eight percent (88%) of those who participated, which implies that eighty-eight percent (88%) of learners who participated did not enjoy learning on topics involving graphs.

ITEM 5: Pupils can construct graphs without challenges: The number of pupils who participated was thirty-two (32). The number of pupils who disagreed strongly to the statement was fourteen (14), disagreed was seventeen (17), only one (1) agreed and no one agreed strongly. The total number of pupils who disagreed to the statement was thirty-one inclusive those who strongly disagreed. The total number of learners who disagreed represents ninety-seven percent (97%). This indicates that pupils still have challenges in constructing of graphs.

ITEM 6: Graphs are difficult to interpret; the total number of learners who disagreed strongly to the statement was three (3), eighty (8) disagreed, one was undecided, twelve (12) learners agreed and eight agreed strongly. The total number of learners who agreed, strongly agreed inclusive was twenty (20) out of thirty-two (32). This represents sixty-five percent of the participants. This means that sixty-five percent of those who participated have challenges on how to construct graphs.

From the questionnaires conducted we can clearly tell that learners have challenges on topics involving graphs, like graphs of motion.

4.5 Teachers' Questionnaires

From the two secondary schools where questionnaires were conducted, Mbanyutu secondary school had only one physics teacher and his major is mathematics education and minored in physics education. The teacher is a degree holder and has been at Mbanyutu for eight years. Luampa secondary school has two teachers who teach physics, the head of department who specialized in biology and chemistry and one diploma holder who specialized in biology, chemistry and physics. The head of department is a degree holder and the other teacher is a diploma holder. During the time questionnaires were being conducted, the head of department was on leave and no questionnaire was given to him because he was away. The teacher at Luampa has served for six years and has been in service for thirteen years. Therefore, questionnaires were conducted only to two teachers, one from Mbanyutu secondary and the other one from Luampa secondary school. All the teachers who were given questionnaires were above twenty-six years of age and all were males.

The following were the results obtained through questionnaires conducted from two teachers:

Table 7. Table showing results for teachers' questionnaire Part I

QUESTION/ STATEMENT/ITEM	YES	NO	POOR	GOOD
i. Do you enjoy teaching topics involving graphs?	2	0	0	0
ii. Do you have challenges in teaching a topic, graphs of motion or any topic which involve graphs?	1	1	0	0
iii. How is the performance of pupils on topics involving graphs, e.g., graphs of motion?	0	0	2	0

According to table 7 part I, the two teachers who received questionnaires indicated that they did enjoy teaching topics involving graphs of motion. On the part of challenges, the teacher from Luampa indicated that there were no challenges experienced when teaching graphs of motion but the teacher from Mbanyutu secondary indicated that there were challenges experienced during teaching of topics involving graphs of motion. The teacher showed that the challenges were as a result of lack of teaching materials such as graph boards and graph papers. The performance of pupils from the two secondary schools showed that it was poor despite lack of challenges from Luampa secondary school. The reason which was given for poor performance of pupils was as a result of poor reading skills because most of the pupils migrate from grade seven to grade eight without having enough reading skills hence facing challenges to understand grade eight and nine concepts, which is the foundation of the senior level. The other teacher stated that the performance is poor because most of the pupils do not come to school consistently. The following results were obtained from a questionnaire using a likert scale;

Table 8. Table showing teachers' questionnaire results, part two

STATEMENT/ ITEM		VARIABLES				
		SD	D	Ud	A	SA
i) There are no challenges I experience when teaching lessons involving graphs of motion	n=2	0	1	0	1	0
ii) Teachers teach well on graphs of motion	n=2	0	2	0	0	0
iii) The number of physics teachers is not enough in the school	n=2	0	0	0	1	1
iv) Learners enjoy learning on topics which involve graphs	n=2	0	2	0	0	0

v) Pupils can construct graphs without challenges	n=2	0	2	0	0	0
vi) Graphs are difficult to interpret	n=2	0	0	1	1	0
vii) Teaching of graphs is simple	n=2	0	0	0	2	0

4.6 Challenges Faced by Teachers on Teaching Graphs of Motion

According to the likert scale above, a physics teacher from Mbanyutu secondary showed that challenges were experienced during teaching of topics which involve graphs because of lack of teaching and learning resources. Whereas the teacher from Luampa secondary showed that there were no challenges experienced during teaching of topics which involve graphs.

From their personal experiences, the two teachers showed that teachers do not teach well on topics which involve graphs, like graphs of motion. This could be due to the fact that the number of teachers of physics is not enough at the two secondary schools under study.

The two teachers of physics from the two secondary schools who took part in the study through questionnaires indicated that the pupils from the two secondary schools do not enjoy learning physics on topics which involve graphs. In short, learners developed negativity on graphs of motion. Teachers found it difficult to remove this negativity in learners. Due to the fact that learners do not enjoy learning on topics which involve graphs, hence experiencing challenges in constructing and interpreting of graphs.

Observation: As stated earlier in the study, at each secondary school, the participants were put into two groups, the control and experimental groups. The control group pupils were taught normally, as teachers used their desired styles of teaching. Whereas the experimental group pupils were taught using learner centered approach where the researcher also participated. The observation was done in the control group of pupils. The observation results obtained were as follows;

Teacher 1: The teacher was observed throughout the topic. The minimum observation started at 15:40 hours and ended at 17:34 hours. The lesson lasted for one hour fifty-four minutes, close to two hours. The maximum observation lasted for two hours twenty minutes. The three lessons observed were supposed to last for forty minutes and the four were eighty minutes lessons. Teacher one taught without a lesson plan. The rationales for the lessons were not known because the teacher had no lesson plans throughout the topic during teaching. The rationales were known by the teacher only, hence the lessons were also teacher centred as most of the talking was done by the teacher. The lesson outcomes were not known but the outline was given during introduction of the first lesson. Due to the fact that the lessons were teacher centred, the learners' participation was very low and poor. After giving an outline of the topic during first lesson, the pupils seemed to have a vision on what they will cover under the topic linear motion.

During the lesson delivery, the teacher used whole class approach where pupils were made to sit in a bus arrangement- form. No defined group was seen in the classroom. The teacher gave activities to the pupils at the end of the lesson throughout the topic. The teacher used to mark few pupils' books and then ended the lesson. Conclusions were not done, instead the teacher used to give the same activities to be done at home as homework.

As a result of the absence of the lesson plans, there were no evaluations or reflections of any kind. The teacher never used any teaching and learning material that benefited the pupil to acquire skills on graph construction. The only materials used were chalks, chalk board and a physics textbook called learners' achievers pupils' book.

Teacher Two: The teacher taught five lessons and completed the topic. The teacher had two lesson plans throughout the topic, one lesson plan was supposed to last for forty minutes and the other one was eighty minutes lesson plan. For all the lessons taught, the maximum took one hour five minutes, and the minimum took ninety minutes. The teacher contextualized the lesson in real life situation, the questions the teacher asked encouraged learners to bring out the terms used in mechanics. Introduction part for most lessons was very interactive because pupils were actively involved.

During development of the lessons, most of the talking was done by the teacher, hence, teacher centred. Few learners asked questions, but the

teachers kept on telling the pupils that what they were asking were yet to be covered and did not take note of the questions. Surely, other questions were covered on other lessons but pupils who asked the questions did not realized that their questions were answered.

In all the lessons, the teacher used to give the activity to pupils at the end of the lessons and mostly the activity was not marked, instead the teachers encouraged learners to continue doing the activity and bring the books the following day. According to the observation, the pupils' books were not seen being marked even the following day. As a result, no conclusion and evaluation were seen in all the observations made.

5. Discussions of The Study

5.1 The Causes of Poor Performance in Learners

After analysis of the pre-test results of the experimental and control groups of the sampled learners, it was found out that most of the learners performed poorly on graphs which involve graphs of motion. Only a handful, were on overage and above. After teaching learners who were put into two different groups, experiment group and control group, using different teaching approaches. The experimental group was taught using learner centred approaches and control group was taught using approaches desired by physics teachers. Some learners improved in terms of performance after giving the post test. Few improved under control group as compared to experiment group which recorded a good number of learners who improved in terms of performance. Most of the learners under control group performed poorly as compared to those under experimental group because mostly, teachers used teacher centred approach to deliver the lessons, where learners were considered to be empty vessels. Therefore, learners were forced to be listening throughout the lesson. Hence forcing learners to memorize certain concepts. The only time learners interacted on their own was during homework at home. During lessons for learners under control group, teachers were teaching to finish the syllabus because their aim was to ensure learners cover a lot in order for them to pass the examination at the end of the year. As a result, most of the learners did not participate during the lessons because they were not given chance to ask where they were behind so that teachers can cruise and finish the syllabus within the specified period of time. Hence disadvantaging learners from acquiring skills. Because learners memorized a lot of content, other information was lost after sometime, hence poor performance. One of the scripts showing poor performance of the learners who were taught using teacher centred approach was as follows;

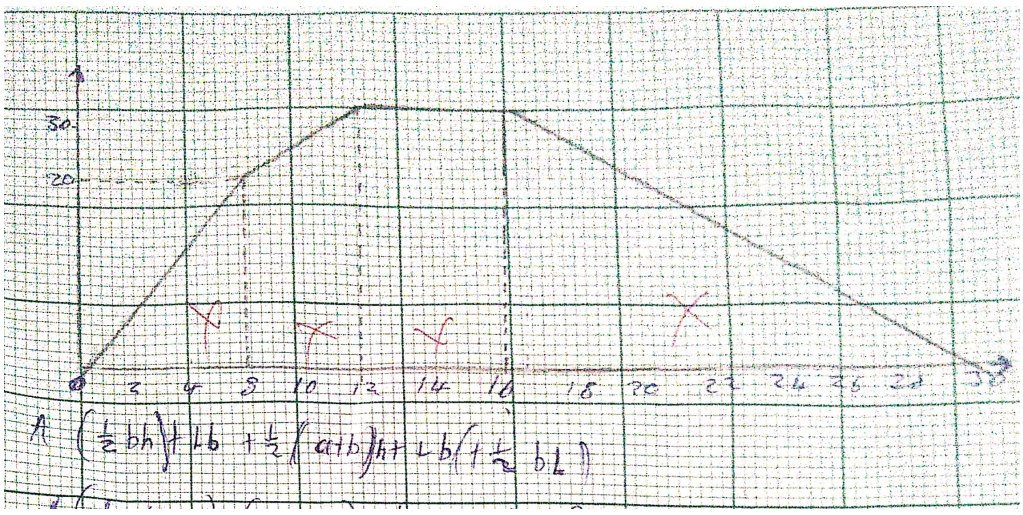

Figure 1. Showing one of the scripts for pupils taught using teacher centred

5.2 *Challenges Faced by Both Teachers and Learners on Graphs of Motion and Solutions to Reduce the Challenges Faced*

Teachers used to give a lot of content under one lesson in order to finish the syllabus within a short period of time; this made the teachers not to observe time. Lessons which were supposed to finish within 40 minutes used to be taught in one hour thirty minutes. This in turn affected

the attention span of learners. According to Chirwa (2015:66), if learners are aware that they are supposed to learn a certain lesson within 40 minutes, whatever you say after 40 minutes have elapsed, it will never be accommodated in the brains of a learner. Therefore, to address this challenge teachers should be time conscious to avoid disturbing the attention span of learners. Once the attention span is disturbed it means the participation will be poor, hence poor performance.

From figure 1. The learner failed to label the axis of the graph, making it difficult to identify the name of the graph. On the Y-axis the scale is not consistence, hence making a learner to experience challenges to produce a suitable graph. The challenge can be solved by a teacher through proper guidance on the steps involved to produce a graph. Some of the steps involved in graph construction which teachers consider less are as follows:

Axes labelling, scale identification, points plotting and points joining.

After analyzing why physics teachers, plans a lot of content under one lesson, they justified that physics teachers were very few in the two schools under study and this was confirmed by the researcher to be true considering the number of physics teachers who were involved in questionnaires. This implies that each school had only one physics teacher against grades 8-12. This makes teachers not to concentrate in their planning, hence employing wrong teaching approaches on graphs of motion, hence poor performance. The teachers should be encouraged to plan effectively despite the number of challenges faced, like overloads in terms of the number of periods. Physics teachers should be supported to capacity build themselves by attending provincial and national conferences like Zambia Association of Science Education (ZASE) so that they grow professionally.

Teaching and learning materials such as graph boards are supposed to be provided regularly to make teaching and learning more enjoyable and interactive, hence reducing challenges faced by both teachers and learners.

Poor performance was also due to truancy, a lot of absenteeism. This means that learners do not come for lessons regularly and consistently. The learners who participated in questionnaires were 32 in total but those who participated in pretest- posttest were twenty-seven (27). Meaning, five (5) students were absent, two from control group and three from experimental group. Also, during learning, it was observed that a number of learners used to vary. Sometimes the turnout used to be poor. These were the pupils who performed poorly especially in posttest. One of the scripts of the learner who used to attend lessons poorly was as shown in figure 2. The performance was poor because their practice on graph interpretation and construction was inconsistence, and the connections of the lessons did not make any meaning to them. Mostly learners who were not attending lessons were due to a lot of initiation ceremonies happening in the area. The common initiation ceremonies are Mukanda (initiation ceremony for Mbundas and Luvales) for the boys, which encourage young boys to take part in Makishi (a person dressed in a mask of any form of an animal) dance to raise money for the ceremony. Mostly, they allow recently graduands of the ceremony to perform and dress in makishi clothes. During such periods, learners, both boys and girls tend to abandon the school lessons just to take part in dancing and watching. Such activities become very active the moment rain season ends, from April to October. Thus, the only term pupils seem to concentrate academically is just term one, January to April of every year. Beyond April very few learners attend lessons. Girls are secluded in an initiation ceremony called Sikenge for three months and not allowed to leave the home, hence poor performance academically. Poor performance of learners in some schools is contributed by culture of the society where the school is situated (UNESCO, 2017).

Poor performance in learners caused by culture can be reduced by sensitizing the community surrounding the school the importance of education through annual general meetings and use of non-government organizations like Social Welfare, Save the Children and World Vision. These are some of the organization which seems to be more active in terms of educational promotion in Luampa district of Western province.

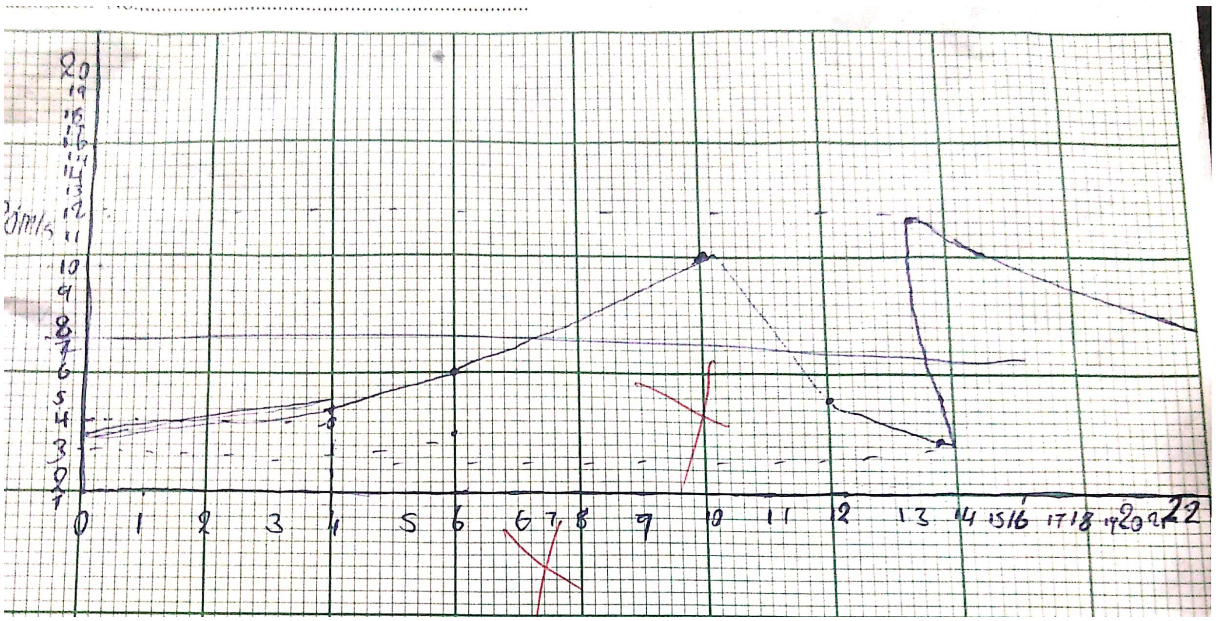

Figure 2. Showing one of the scripts for the pupils who do not attend lessons regularly

From figure 2 it was easily seen where learners had challenges even after learning. It was deduced that the learner just used the graph during the test. From the few lessons the learner attended, the learner never practiced constructing a graph on a graph paper instead the learner used to see a teacher demonstrating on how to construct a graph using a chalk board, and this made a learner to face challenges putting the graph on the graph paper. Such a learner cannot benefit and acquire any skill using teacher centred approach. The solution to such a challenge is through promoting school administrators to be providing teaching and learning materials and teachers in turn to show to administrators how these materials can influence the performance of learners. This should be so, because some school administrators do not have knowledge on how some teaching and learning materials can benefit a child.

Teachers should also show interest in their teaching to enable learners develop confidence in physics teachers.

The other challenge which learners face, according to the figure above was that learners did not understand the representation of the boxes on the graph paper, hence failing to come up with a scale suitable for the figures given in the question. The moment a learner fails to come up with a suitable scale, the desired graph cannot be produced. Hence poor performance. All these challenges were encountered because of the lack of practice on graph construction and interpretation. In this situation, practice on graph construction is paramount in the teaching of graphs construction and interpretation.

The pupil also did not have the idea on how plotting is supposed to be done. It is clearly seen that the learner was just putting points the way he or she feels like or even guessing. Therefore, teacher guidance and practice should be encouraged to enable production of good results and performance.

6. Conclusions

The main aim or purpose of the research was to conduct the investigation on the causes of poor performance among grade 12 pupils in topics related to graphs of motion. According to the findings and analysis, the causes of poor performance among grade 12 pupils on topics related to graphs of motion were due to lack of consistent planning among teachers of physics and the lack of the use of appropriate or required learning approach which encourage learners to discover their own learning from the given contents. Most of the teachers use teaching approaches which does not encourage learners to practice graph construction and interpretation during learning.

The mind is everything. What you think you become, and therefore in accordance to that statement our mind is responsible for the actions we take. In this case, poor teaching methods have highly affected our mind and our thinking,

making us feel that we are not good at certain subjects, even making us go as far as hating the subject, whereas all that is required is a different approach. This has in turn affected student's action thereby making them shun away from such subjects when it comes to subject choices (Buddha, 2014)

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