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JUNIOR HIGH SCHOOL TEACHERS USE OF MANIPULATIVE MATERIALS IN TEACHING MATHEMATICS IN THE UPPER WEST REGION OF GHANA

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Abstract

The Ministry of Education (MoE)/Ghana Education Service (GES) requires all teachers to use manipulatives to teach mathematics in Junior High Schools (JHSs) because they have the potential to demystify learning of the subject. The study was designed to examine the use of manipulatives in teaching mathematics among junior high school teachers. Three instruments, namely, questionnaire, interview guides and observation guides were used to collect data from 94 teachers, 10 head teachers sampled from 73 JHSs, and one mathematics coordinator. Descriptive statistical analysis was applied to the quantitative data obtained from the questionnaire while content analysis was applied to the qualitative data from the interviews and observations. The study showed that teachers' use of manipulatives in teaching mathematics was at variance with their practice in the classroom. The study concluded that most JHS teachers do not use manipulatives in their classrooms because of the foregoing challenges. The study recommends that stakeholders in education should boost up the supply of manipulatives and organise periodic in-service training for JHS teachers on the use and development of manipulatives for teaching mathematics. Supervision should also be strengthened to ensure that mathematics teachers do what they are supposed to do.

Keywords: *Manipulatives, Foundation, Curriculum, Concept, Performance*

INTRODUCTION

Mathematics is one of the core subjects in the pre-tertiary school curriculum throughout the world. The subject occupies a privileged position in the school curriculum. In Ghana, about 25% of the instructional time is allocated to the study of mathematics. It is one of the three core subjects in which one must obtain credit in order to progress beyond the pre-tertiary level. Indeed, it is used as a screening device for students' entry into higher education and certain professions (Charles-Ogan, & Otikor, 2016). The importance of mathematics can also be seen in its application in our daily lives and technology. No other subject forms a strong binding force among the various branches of science subjects than mathematics. Without mathematics, knowledge of science often remains superficial. The inclusion of mathematics as a core subject in the Junior High Schools' (JHSs') curriculum is therefore not accidental but due to the key role in promoting science and technology, and the provision of a trained skilled workforce in the applied sciences, technology and commerce.

Ghana as a nation cannot develop fast if sustainable efforts are not put in place to improve upon the teaching and learning of mathematics at the JHS level, since the students are the future workforce and leaders of the nation. The educational structure should provide learners at this level with a good mathematical foundation to enable them to develop the requisite mathematical know-how to effectively contribute their quota toward national development. This is why mathematics is a core

subject of study at the pre-university level of education and should be made simpler and easier for students at the basic level to learn (Ministry of Education, 2012 & Obeng, 2013) by teaching it in ways that involve hand-on-minds-on learning.

The curriculum has considered the desired outcomes of education for learners at the basic level. Mathematics is concerned with the development of attitudes and is important for all citizens to be mathematically and technologically literate for sustainable development. Mathematics therefore ought to be taught using manipulatives that the learners will find fun and adopt the culture of studying the subject always (Ministry of Education, 2012)

According to the Ministry of Education, 2012, the use of manipulatives will help pupils form mathematical concepts and provide a foundation of practical experience, in which pupils can build abstract ideas. It encourages these pupils to be inventive, helps to develop their confidence and encourages independence. Teachers need to make use of an appropriate range of manipulative to focus the pupils' thinking on the concept to be developed, modifying the manipulatives to pupils' understanding and growth. The use of manipulative also facilitates the pupils thinking during the problem-solving process.

The use of manipulatives in teaching and learning also plays a key role in deepening pupils' understanding of mathematical concepts at the basic school level (Ministry of Education, 2012). When manipulatives are used in teaching and learning pupils can easily explore to understand the subject effectively. According to Cope (2015), the use of manipulatives in teaching mathematics motivates students in learning the subject. In addition, pupils can easily remember what they have learned. For example, pupils who had failed a symbolic algebra assessment were found to score 100% pass when manipulatives were used in teaching them (Goracke, 2009).

The Ministry of Education, 2012 sees manipulatives as necessary tools for teaching and learning mathematics and this body has directed all teachers to include manipulatives in preparing their lessons notes and using them in teaching in the classroom (Ministry of Education, 2012). Different types of manipulatives are suggested in the mathematics curriculum materials. Headteachers and Circuit Supervisors supervise to check the type and appropriateness of manipulatives teachers use in teaching mathematics and to assist them.

PROBLEM STATEMENT

Manipulatives are suitable for students of all academic abilities (McIntosh, 2012). For mathematics to be easier and simpler for pupils to understand and improve their performance at the JHS level, the Ministry of Education, 2012 recommends and promotes the use of manipulatives as tools for instruction. The importance of the use of manipulatives helps children form mathematical concepts is well known. Using manipulatives provides a foundation of practical experience on which children can build abstract ideas. It encourages them to be inventive, helps to develop their confidence and encourages independence. Teachers need to make use of an appropriate range of apparatus to focus the children's thinking on the concept to be developed, modifying the manipulatives as the learner's understanding grows. The use of manipulative also facilitates the children's thinking during the problem-solving process.

In spite of the government and the Ministry of Education's support to promote the use of

manipulatives in the mathematics classroom to enhance pupils' performance, the Basic Education Certificate Examination (B.E.C.E.) results consistently indicate massive failure of students in mathematics (Ghana Education Service 2016). In 2014, 56.3% failed in mathematics as compared to 41.4% and 42.2% who failed in English and Science respectively. In addition, 2015 saw an increase in the failure of to 58.7% in Mathematics as compared to 42.6% and 44.3% in English and Science respectively. The 2016 failure in Mathematics further increased to 60.3% as compared to 35.8% and 40.7% in English and Science respectively (Ghana Education Service, 2016). Notwithstanding the pivotal role of manipulatives in teaching and learning mathematics, most teachers fail to use manipulatives (Fuchs et al., 2013) and others consider them as toys only to be used on special occasions or for a short period of time (Green, Flowers, & Piel, 2008). It was against this backdrop that the study was designed to focus on JHS teachers' use of manipulatives in teaching mathematics

RESEARCH QUESTIONS

Since manipulatives are important tools teachers used to aid easy learning in the classroom, this study was guided by the following questions:

1. What types of manipulatives are often used by JHS teachers in teaching mathematics?
2. How do JHS teachers obtain their manipulatives for teaching mathematics?
3. What are the teaching methods JHS teachers used in teaching mathematics with the use of manipulatives?

THEORETICAL FRAME WORK OF THE STUDY

The study was anchored on Piaget's stages of cognitive development theory. According to the theory, learners are born to understand abstract concepts later but with only the understanding of concrete materials at the initial stage of their learning development (Elida, Jamilah, Carolyn & Angela, 2015). According to Piaget (1952), mathematical understanding in children is closely associated with sensory perception and concrete experience. Children begin to understand symbols and abstract concepts only after experiencing the ideas on a concrete level. Manipulatives are concrete and effective tools in mathematics education used to help children move from a concrete to an abstract level of understanding. Students who see, touch, take part and manipulate physical objects begin to develop clearer mental images and can represent abstract ideas more completely than those whose concrete experiences are limited (Dennis, 2011).

O'Donnell, D'amico, Schmid, Reeve and Smith (2008) stated that by learning Piaget's approach, teachers can offer pupils classroom environments that are stimulating, interesting, and complex enough to nurture them into higher-order thinking. Pupils should be allowed to discover ideas by themselves using manipulatives. That is in line with Piaget's cognitive development theory and his discovery-based learning theory. Teachers should avoid teaching methods that place students in a passive mode of thinking but rather adopt methods that encourage students to explore the objects and activities around them (Piaget, 1952). This implied that when students use manipulatives in mathematics lessons, they become enthusiastic and more open to learning the subject (Pham, 2015). This signified that student understanding of mathematics concepts is higher and easier with the use of manipulatives in the teaching and learning process.

RESEARCH DESIGN

The study employed mixed-method approaches to get an in-depth view of examining the use of

manipulatives in teaching mathematics among JHS teachers since one approach alone cannot adequately provide all the answers. Creswell (2009) stated that adopting both qualitative and quantitative methods of data collection allows the researcher to gain an in-depth understanding of the phenomena under study.

PARTICIPANTS

A simple random sampling technique was used to select 105 participants made up of 94 mathematics teachers, comprising 77(81.9%) males and 17(18.1%) females, while, purposive sampling was used to select 10 public school head teachers, comprising 8(80%) males and 2(20%) females and 1 mathematics coordinator. The choice of head teachers and mathematics was because of their long services as well as their roles as immediate supervisors of teachers who ensure that teachers use the right teaching and learning materials, methodology and activities during teaching.

RESEARCH INSTRUMENT

The study employed mixed-method approach to data analysis, the researcher used questionnaires, interview guides and observational guides as instruments for data collection for the study. The questionnaires consisted of items grouped in three sections namely: A, B and C.

The items in section "A" contains 11 items, which consist of three-point Likert-scaled type items and open-ended items to collect data on the type of manipulatives teachers used in teaching the individual topics in mathematics at the JHS level. They rated the extent to which they agreed or disagreed with the statement of the items. The open-ended items were to collect data on the manipulatives that were not stated by the researcher but can be used to teach the individual topics listed. In addition, this part collected data on the type of manipulatives used mostly and why they use such manipulatives to teach those topics. Section "B" contained nine (9) items, which sought answers on how teachers obtained their manipulatives for teaching mathematics at the JHS and Section "C" also contained two items on the teaching methods used in teaching mathematics with the used of manipulatives. Respondents were asked to select from lists of teaching methods suitable for teaching mathematics with manipulatives at the JHS level and –open-ended questions seeking other methods used by these teachers but not indicated by the researcher.

Also, semi-structured interviews were conducted with ten (10) head teachers and the mathematics coordinator. In addition to this, observation was carried out among 10 out of 94 mathematics teachers to ascertain the use of manipulatives in teaching mathematics. Teachers were –pre-informed of the researcher's intention to carry out observation in their various classes. However, the date of observation was not communicated to teachers because the researcher wanted the intention of the observation not to influence teachers' normal way of lessons delivering.

DATA ANALYSIS

Three research instruments were used: a questionnaire that produced quantitative and qualitative data and interview guides and observation guides that produced qualitative data. Using Statistical Product and Service Solutions version 20 software, the questionnaire data were edited, coded, and entered into the software to calculate the descriptive statistics (frequencies, percentages, mean and standard deviation) of the sample. Similarly, a matrix-ranking method was used to rank the frequency of teachers using specific types of manipulatives for teaching mathematics. The interview

data were analysed using content analysis, which according to Krueger (1988) is comparing the similar words used in the answers of the respondents in the same themes. The researcher studied the field notes, reduced the tapes into transcripts and carefully read them. This was done to look for themes and similar ideas or responses to the questions that were posed to the respondents of which the respondents' information or speeches were translated into specific categories of themes for the purposes of analysis. While, the observation data was studied and similar themes were carefully taken note of, which were used to support the claims of teachers' use of manipulatives when questionnaires were applied.

RESULTS AND DISCUSSIONS

The study examined the use of manipulatives in teaching mathematics among junior high school teachers in the municipality. The study involved one (1) mathematics coordinator, ten (10) head teachers and ninety-four (94) JHS mathematics teachers sampled from seventy-three (73) junior high schools. Out of the ninety-four (94) mathematics teachers. The instruments used to collect the data were the questionnaire, interview guide, and observation guide. The questionnaire yielded quantitative data while the interview guide and observation guide produced qualitative data. Data were analysed using descriptive statistics – frequencies, percentages, matrix ranking and the results presented in Tables and Graphs.

WHAT TYPES OF MANIPULATIVES ARE OFTEN USED BY JHS TEACHERS IN TEACHING MATHEMATICS?

The purpose of this section is to identify the types of manipulatives respondents use in teaching mathematics at the JHS level. The types of manipulatives used by respondents were analysed using frequency, percentages, mean and standard deviation. Matrix ranking was also used to ascertain the type of manipulatives teachers used most in teaching various topics in the JHS syllabus. The matrix representing the proportion of teachers who use or do not use the particular type of manipulatives is presented in Tables. In matrix ranking, respondents were asked to indicate which manipulatives they used most in teaching some topics at the JHS. The manipulatives were categorised to reflect some topics in the JHS mathematics syllabus.

Table 1: Matrix of Manipulatives JHS Teachers Use in Teaching Number and Numeral, Sets, and Fractions

Topics	Type of Manipulatives	Matrix Ranking		Use of Manipulative			Mean (M)	Std. Dev. (SD)
		Scores	Ranks	Used	Not used	Not sure		
Numbers and Numerals	Place Value Chart Abacus	63 55	1st 2nd	88(93.6%)	3 (3.2%)	3(3.2%)	1.10	0.39
	Bug counters Coloured-coded	10 4	3rd 4th					
	Bottle Tops	3	5th					
Sets	Bottle Tops Stones	62 42	1st 2nd	90(95.7%)	Nil	4(4.3%)	1.04	0.20
	Sticks	40	3rd					

	Books, Pen and Pencils	39	4th					
	Erasers	17	7th					
	Chalks	25	5th					
	Attributes Blocks	14	8th					
	Bug Counters	18	6th					
Fractions	Strips of Papers	61	1st	87 (92.6%)	1 (1.1%)	6(6.4%)	1.09	0.32
	Fraction Charts	54	2nd					
	Addition Machine Tape	6	5th					
	Cuisenaire Rods	16	3rd					
	Oranges	9	4th					

Source: This Study Field Survey, May 2017;

In Table 1, the majority 88 (93.6%) with a mean of 1.10 and a standard deviation (SD) of 0.39 of the respondents use manipulatives in teaching numbers and numerals. However, a few 3 (3.6%) do not use manipulatives whiles 3 (3.6%) were uncertain as to the use of manipulatives in teaching the topic. The most frequent type of manipulatives used in teaching numbers and numerals were ranked as place value chart (1st) and abacus (2nd), bug counters (3rd), coloured-coded (4th) and bottle tops (5th), This shows that the majority of teachers use varied manipulatives in teaching numbers and numerals in the municipality.

In teaching sets, 90 (95.7%) of the teachers (mean=1.04; standard deviation = 0.20) use manipulatives. However, only 4 (4.3%) were uncertain about the use of manipulatives in teaching the topic. The manipulatives were ranked to ascertain the type often used in teaching sets. From the Table 1: bottle tops (1st), stones (2nd), sticks (3rd), books, pens, and pencils (4th) and chalk (5th) show the rate on how some manipulatives are used in teaching the topic sets. The least frequently used manipulatives were bugs of counters (6th), erasers (7th), and attributes blocks (8th).

In teaching fractions, Table 1 shows that majority 87 (92.6%) of the teachers (mean=1.09; standard deviation=0.32) indicated they used manipulatives to teach pupils. However, only 1 (1.1%) teacher responded not using manipulatives and few 6 (6.4%) were uncertain. On the most frequent type of manipulatives used in teaching fractions, were: strips of papers (1st), and fraction charts (2nd), Cuisenaire rods (3rd), and oranges (4th) were indicated. The least used manipulative material was the addition of machine tape which occupied the fifth (5th) position.
When teachers were requested to suggest why they use a particular type of manipulatives in teaching numbers and numerals, sets and fractions in the open-ended item in the questionnaire, some of the responses include: *"I use place value chart and abacus so frequently to teach numbers and numerals because the use of these manipulatives involves the child in the process of learning and pupils can easily understand" (*Teacher)

A careful study of their responses brought to fore their varied views on why a particular manipulative material is used for a particular topic. These teachers' responses confirm the Ministry of Education's

(MoE, 2012) suggestion that in teaching "Number and Numerals", teachers should use manipulatives like Abacus, Place value charts while a topic like "Fractions" should best be taught with Strips of paper, Fractions, and "sets" are taught using stones, bottle topic, etc.

HOW DO JHS TEACHERS OBTAIN THEIR MANIPULATIVES FOR TEACHING MATHEMATICS?

Items 45-52 of the questionnaire required teachers to provide the sources of manipulative materials for teaching mathematics. They were also to indicate how frequently they received the supply of the materials from the sources stated. Teachers' sources of manipulatives for teaching mathematics in the classrooms include improvisation by teachers and pupils, supply from the Ministry of Education (MOE) or Ghana Education Service (GES), donations from NGOs and Municipal Assembly, and the PTA. Teachers' responses were organised using frequency counts and percentages as presented in Table 2

Table 2: JHS Teachers Sources of Manipulative Materials (n= 94)

Source	Freq. of Supply	Basis of Supply			
		No Supply	Termly	Yearly	Once a While
Improvisation by teachers and pupils	72(76.6%)	5(5.3%)	58(61.7%)	4(4.3%)	27(28.7%)
Supply from MOE/GES	13(13.8%)	49(52.1%)	6 (6.4%)	11(11.7%)	28(29.8%)
Donations from NGOs or Assembly	2 (2.1%)	72(76.6%)	1(1.1%)	4(4.3%)	17(18.1%)
PTA and philanthropists	7 (7.4%)	65(69.1%)	3 (3.2%)	5(5.3%)	21(22.4%)

Source: This Study Field Survey, May 2017.

From Table 2, the major 72 (76.6%) indicated that the sources that supply schools with manipulatives were improvisation by teachers and pupils. A few 13 (13.8%) teachers had their manipulatives from the MOE/GES. Also, 7(7.4%) of the teachers agree they obtain manipulatives from the parent-teachers association (P.T.A) and philanthropists. Also, only 2 (2.1%) agree they obtain manipulatives from donations from NGOs and Assembly. Meaning, that many of the manipulatives used by teachers in teaching mathematics in JHSs were improvised by themselves or the pupils. The core mandate of the MOE/GES is to supply schools with enough manipulatives. However, teachers receive very little from them because of inadequate funding. According to a headmaster, "*the only fund used by MOE/GES to supply schools with manipulatives is through 'capitation' which is not enough and most times it is delayed to be received…once in a year*" (Headmaster, May, 2017).

Based on how often schools receive manipulative materials from the suppliers, Table 2 indicates that 58(61.7%) teachers improvise manipulative materials termly, 4(4.3%) yearly, 27 (28.7%) once a while and 5 (5.3%) not improvising at all. Confirming this, a teacher said, "*I do improvise manipulative materials by myself because the office pays lip service to the supply of these manipulative materials forcing me to improvise any time I intend to use them in the classroo*m" (Teacher, May 2017).
The results suggest that a greater number of mathematics teachers in the municipality obtain their manipulative materials through improvising.

Table 2 further indicated that schools received manipulative materials termly 6 (6.4%), yearly 11 (11.7%), once a while 28 (29.8%) from MOE/GES and with no supply 49 (52.1%). Confirming this, the municipal mathematics coordinator said: "*Since I entered into this office, I have never received any*

budgetary allocation for the supply of manipulative materials *for teachers and when I ask the office, they simply tell me no funds has be allocated for that purpose and little can be done for now"* (Mathematics Coordinator May, 2017).

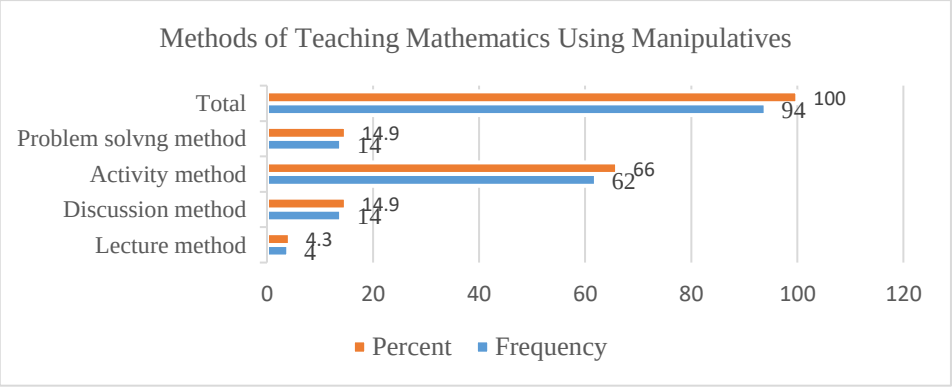
This suggests that the MOE/GES does not value the use of manipulative materials or is highly constrained to perform its duty of supplying manipulative materials to schools (Ministry of Education, 2012).

In addition, teachers obtain manipulative materials termly 1(1.1%), yearly 4(4.3%), once a while 17(18.1%), and no supply 72(76.6%) from donations from NGOs and the Assembly. Also, a few teachers indicated that they receive little supply of manipulative materials from PTA and other bodies termly 3 (3.2%), yearly 5(5.3%), once a while 21 (22.4%), and in most cases no supply at all 65 (69.1%). The results suggest that many teachers do not use manipulatives in their classrooms and the few that use them have to improvise. This means that improvisation plays a major role in the supply of manipulative materials for teaching mathematics in JHSs. The findings confirm Pham's (2015) assertion that many teachers do not use manipulative materials in teaching because they are not available in schools.

WHAT ARE THE TEACHING METHODS JHS TEACHERS USED IN TEACHING MATHEMATICS WITH THE USE OF MANIPULATIVES IN THE MUNICIPALITY?

To determine the methods JHS used in teaching mathematics with the use of manipulatives in the classroom, Section "C" of the questionnaire asked teachers to select the methods they use when teaching mathematics with manipulatives. Teachers' responses were organised and presented in a bar graph in Figure 1.

Figure 1: Teaching methods JHS teachers use in teaching mathematics using manipulatives.



Source: This Study Field Survey, May 2017

Figure 1 shows that about two-thirds of 62 (66.0%) of the teachers indicated they use the 'activity method' to teach mathematics with the aid of manipulatives. Whilst 14 (14.9%) indicated they used the discussion to teach mathematics with the aid of manipulatives. Also, 14 (14.9%) of teachers indicate they used problem-solving to teach mathematics with the aid of manipulatives and only 4(4.3%) used the lecture methods.

To probe more into the methods used by JHS teachers in teaching mathematics using manipulatives, an interview with the teachers, head teachers and the municipal mathematics coordinator came out with the following oral responses "*activity method of teaching mathematics is interactive and help pupils to understand concepts or topics well*" (Teacher,). "*I make sure my teachers use the right methods in teaching and learning in the classroom. In the case of mathematics, I ensure my teachers use the activity method and problem-solving method to teach the children because these methods are child-centered"* (Headteacher,).
"I hardly visit teachers in the classroom to ensure the right methods are used, but trust me during workshops and in-service training for these teachers, we educate them to use the activity method, problem-solving method in teaching mathematics. The use of these methods involves the child in the lesson" (Coordinator).

Though assertions from the questionnaires and the interview that the activity method is used when teaching mathematics with manipulatives, findings from the sit-in-observation proved contrary. Among ten (10) schools purposively selected to visit, only one (1) teacher used activity method with manipulatives in teaching probability (coin and die). Even though the remaining other teachers stated in their lesson notes to use manipulatives did not use them to teach pupils. In an interview with teachers on why they did not use manipulatives and activity method or problem-solving method of teaching, it was confirmed that; *"… activity or problem-solving methods of teaching using manipulatives is time-consuming…also, most of us were not trained that way…therefore difficult for us to use…though stated in the syllabus*" (Teacher).

Confirming the fact that, teachers were only fulfilling their mandatory requirement of stating in their notes that they used manipulatives (Ministry of Education, 2012) at the blunt of deception. Therefore, these confirm the fact that teachers' refusal to use manipulatives and the appropriate methodology in teaching mathematics affected pupils' performance in mathematics and could be one of the reasons why many pupils hate and they fail mathematics. This supports the assertion that the use of manipulatives in teaching mathematics improves the performance of pupils (Skolverket, 2013). However, this could not provide a substantive result in this study because teachers' failed to exert physical actions on the manipulatives stated (Cooper, 2012). As a result, pupils could not make the acquisition of the mathematical symbols and language as contended (Rosli, Goldsby, & Capraro, 2015).

Therefore, the foregoing confirms the assertions that; most teachers fail to use manipulatives (Fuchs et al., 2013) with the excuse that there is insufficient time and others consider manipulatives as toys only to be used on special occasions or for a short period of time (Green, Flowers, & Piel, 2008).

SUMMARY RESULTS

The study leaned on the fact that using manipulatives to teach mathematics improves pupils' ability to appreciate mathematical concepts, as a result, the MOE/GES requires all mathematics teachers to use manipulatives to teach mathematics in JHSs. Though the credit on the use of manipulatives held by MOE/GES and teachers, little empirical evidence existed to demonstrate teachers' actual use of manipulatives.

DISCUSSION

The study found that the majority of the teachers were only perceived to have been using manipulatives in teaching. But in reality, as observed through the sit-in observation, the findings proved the contrary that, many teachers did not use manipulatives as stated in their lesson notebooks.

The findings were that, in many cases where manipulatives were used, they were improvised by teachers or pupils often with little supply from the MOE/GES and other benevolent groups like NGOs, Assembly, PTA and philanthropists. Teachers normally received these manipulatives termly, yearly or once in a while. The MOE/GES insufficiency and inability to supply manipulatives to schools is as a result of inadequate funding from the government. Because, as currently, the only source of funding by the government for providing manipulatives to schools is through "capitation grants" which take years to be processed and approved. Therefore, these factors compelled many teachers to ignore the use of manipulatives in teaching mathematics in JHSs though some teachers and pupils make effort to improvise on their own, to supplement what is provided by the benevolent groups.

The study found that the majority of the teachers were only perceived to have been using activity methods and problems solving methods too to teach pupils with the use of manipulatives. However, as observed through the sit-in observation by the researcher, the findings proved contrary that, many teachers did not use the stated manipulatives in their lesson notebooks. They taught pupils using discussion or lecture mode though some teachers used manipulatives through activity methods or problem-solving teaching methodologies. As a result, many pupils could not understand the topics taught by their teachers who neglected the use of manipulatives.

CONCLUSION

The study examined the use of manipulatives in teaching mathematics among junior high school teachers. The study suggests that where teachers indicated the use of manipulatives in teaching mathematics in JHSs, it was far from the truth practicality. There is the need for authorities to re-examine the situation and ensure a balance so that theories reflect the practicability of best teaching methodologies and strategies.

Therefore, in dealing with teachers' perception to reflect their practice, MOE/GES and school heads would have to strengthen supervision, monitoring and evaluation system to ensure that teachers used the best and appropriate tools and teaching methodologies to deliver lessons as demonstrated in their lesson note books. By so doing, the MOE/GES and other stakeholders like NGOs, Assembly, PTA, philanthropists and old school unions should be robust in the supply of teaching and learning kids like manipulatives to enable teachers to deliver their best for pupils' understanding and learning outcomes.

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