# RELATIVE EFFECTIVENESS OF TEACHING, MOTIVATION, DRILL AND PRACTICE PACKAGE (TMDP$^2$) ON STUDENTS' PERFORMANCE IN JUNIOR SECONDARY SCHOOL MATHEMATICS IN EKITI STATE

**[1]Popoola A. A, [2]Oginni I.O. & [3]Kolawole K.B**
[1,2]Department of Science Education, Faculty of Education, Ekiti State University.Ado-Ekiti
[3]School of Engineering, Bamidele Olumilua University of Education, Science and Technology, Ikere-Ekiti

**Abstract**
*This study examined the relative effectiveness of teaching, motivation drill and practice package (TMDP ) on students' performance in junior secondary school Mathematics in Ekiti State. The study adopted quasi experimental research design of pre-test, post-test control group. The population for this study consisted of all the Junior Secondary School (JSS 11) students. The sample consisted of intact classes of junior secondary schools using purposive sampling technique (considering the schools with computer facilities and internet for Youtube and TV based teaching). The students were categorised into experimental and control groups.s The instrument used for the collection of data was Mathematics Performance Test (MPT) in Algebra. The validity of the instrument was ascertained and the reliability coefficient obtained was 0.72. The data collected were analysed using frequency counts, means and standard deviation to answer the research questions and the hypotheses formulated were tested using t-test, ANCOVA while Multiple Classification Analysis was used to locate where the significant F-ratio exist. The hypotheses were tested at 0.05 level of significance. The findings of the study revealed that was a significant effect of teaching, drilling and motivation package on students' performance in Mathematics. Also, there was significant effect of gender on students' performance when exposed to treatment in Mathematics. Based on the findings of this study, it was reccommended that the teacher should incorporate motivation, drill and practice package for effective teaching to be actualised.*

**Keywords:** Motivation, drill and practice, Teaching, Performance, Self efficacy

## Introduction

Mathematics has become a tool for mental development that plays a significant role in the understanding of science, social science, art, management and language. Mathematics is a mechanism for communication and a veritable tool for human to organise their lives such that logical reasoning and abstract thinking become feasible. Mathematics influences modern development with latest technology trends, business ideas, digital marketing strategies which helps in the refinement of personality through organisation and accuracy.

Mathematics is one of the compulsory subject and a prerequisite for admission into any higher institution in Nigeria today. Attempts have been made by researchers to improve students' understanding in the subject.Yeh et.al. (2019) remarked that the conventional teacher-led instruction remains dominant in most elementary mathematics classrooms. Under such instruction, the teacher can rarely take care of all students. Many students may then continue to fall behind

the standard of Mathematics performance and lose their interest in Mathematics; they eventually give up on learning the subject. There is always a certain tension between the intellectual preparation of teachers and the practice of teaching as manifested in student teaching. Oginni and Owolabi (2013) carried out an empirical assessment of the physically challenged students in Mathematics with a view of recognising and reintegrating the brains among them.

Researchers such as Biotenbeck (2011) and Clement (2013) noticed with dismay what happens often where some Mathematics teacher do not equip themselves with improved teaching methods in the classroom, most of them focus only on how to complete the main contents that are in the course syllabus, in which the basic concepts of Mathematics are haparzardly taught thereby makes the students get bored in the subject, and the required knowledge that should be mastered by the students becomes difficult to learn.

Teaching, Motivation, Drill and Practice Package (TMDP2) is tripartite in nature. It was designed in order to enhance self-efficacy and practice in the learning of Mathematics among the students through systematic and deliberate commitment on the part of the teacher to improve student self-confident and reliance, which is an integral part of personal factors that contributes substantially to students' success in Mathematics. Its origin is traceable to Bandura's social cognitive theory that sees human functioning as an emergence of a dynamic interaction system between personal (self-efficacy) andbehavioral (use of effective approaches to learning) (Bandura, 2012). Teaching, Motivation, Drill and Practice Package (TMDP2) is three in one package that is technology based. The development of TMDP2 is basically to enhance students' skills in Mathematics in its various aspects, using suitable techniques and teaching methods for making it interesting and attractive for the students.

Teaching is an activity or process of transfering knowledge and development of skills, attitudes, ideas and appreciation in learners. With the increasingly rapid technological advancements such as the birth of the industrial technology based teaching, thinking along the trend of 5G or 6G and is successive to the next generation technologies for teaching. Mathematics is the way to go in this era of technological revolution. There are suggestions, demands and even requirements that the traditional roles of classroom teachers should as well be re-examined and change along the way to adjust accordingly. There is no way any teacher can be teaching the same way and be expecting different result. This call for a paradigm shift from local talk and chalk teaching strategy to a modern technique that can arouse the curiousity of students and as well bring the best out of them.

Teaching with inspiring TED Talks, popular internet sites, TV based talk shows, World Wide Web, Internet connection or Google search engine, YouTube-based lectures would definitely increase the level of student competence with high quality teaching. Teachers can stay relevant and can continue to do so effectively by recognizing, appealing and utilizing traits that are trending and appealing to human emotions and having tendency to enjoy, having fun, humor use, playing music and even singing songs in the classroom. Teaching that make students different through the use of powerful–seemingly unlimited and apparently endless-high energy robotic machines based tools such as Google, YouTube or Facebook (Chesser, 2013). The term motivation was derived from the Latin verb “movere” which means “to move” .What gets learners to move towards an activities and to describe the characteristics of these activities. ”Motivation is referred to as a student's willingness, need, desire and compulsion to participate in, and be successful in the learning process” (Md. Yunus, Wan Ali, 2009, Pintrich, 2003). The willingness of the present generation of students’ lies in

technology based phenomenon, an activities that tinkle students' fancy towards learning Mathematics concept which culminate students' interest in order to achieve their desire result. Accordingly, the importance of student motivation is reflected in the realm of Mathematics education which treats motivation as a desirable outcome and a means to enhance understanding.

The complexity of teaching has led teacher educators to move toward developing a package in which teachers are provided with extensive training and support to implement new practices. A practice whereby teaching Mathematics is being taught technologically with extrinsic motivational tools that could enable problem-solving techniques becoming a worthwhile approach via infusing technology into the teaching (Pantziara and Philippou 2015). Students may joyfully experience formal Mathematics education for years and they can be motivated everywhere across the expansive Mathematics curricula because teaching often requires both cognitive and practical experiences throughout the continua of their Mathematics education to be productive 21st century citizens (Abramovich, et.al. 2019). When students are confident about their ability to do Mathematics, they are motivated to explore new concepts even if they are not immediately successful.

Drill and Practice are integral part of Mathematics teaching learning process. A creative teacher of 21st century would endeavour to weave drilling into the tapestry of Mathematics learning. Technology is a valuable tool for repeated practice and systematically integration of Drill and practice into teaching learning process would make the teaching interesting and joyful. The process of drilling would resuscitate the joy of learning Mathematics and thrill the learner to seek more. Drill and practice can be interesting if the teacher of Mathematics has the ingenuity to repeat teaching in various ways. Several studies show that drill and practice must be coupled with periodic reviews to achieve tangible results (Kumar, 2010). Drilling has brought Mathematics, which is about playing with numbers to a limelight such that, the more familiar one is with digits and what they represent, the easier it is, to see relationships that exist between them. In fact, the world has become a digital arena where coding and decoding rest solely on data and information. Hence, it is important that children learn to count and are able to identify the number of things in a group either by counting or by patterns. The ability to recall basic Mathematics facts fluently is necessary for students to attain higher-order Mathematics skills. If this fluent retrieval does not develop then the development of higher-order Mathematics skills may be severely impaired.

Besides, if consideration is not giving to technological based teaching, motivation and drilling in Mathematics, it can create a lack of self-confidence in the child and also subject her to peer ridicule in the present era. Rapid Mathematics fact retrieval is an asset to perform well in Mathematics achievement tests. Studies in cognitive science (Lindsey et.al. 2007) also support continual practice, because it develops computational automaticity, it increases retrieval speed, reduces time required for recognition, and decreases interference.

Male scholars have consistently concluded that male students perform better on Mathematics tests than females do, while some female scholars still contest this assertion. To make a refined assessment of the magnitude of gender differences in mathematics performance, teaching, motivation drill and practice have its significant influence on gender. Rodriguez (2020) submitted that boys' results could be affected by the levels of anxiety inasmuch as they tend to be confident in their abilities, motivated to stand out, and interested in mathematics. Whereas despite girls reporting high rates of anxiety, what may

have a negative impact on their results might have more to do with a higher value placed on mathematics, as their perception of control may be low. The researchers wish to examine the influence of gender in teaching, motivation, drill and practice are apply simultaneously.

**Statement of the Problem**

The researchers observed that students who are the target of classroom activities seem to find classroom environment not interesting because of its monotonous in teacher's approach. The inability of most students to establish learning habits, lack of control over the speed at which teachers teach, not being able to get thing repeated, and problem of interpreting effectively seems to give students a lot of concern. Students' poor performance in mathematics has not been commendable because of low incentive in mathematics. The difficulty which students experience may be traced to inappropriate teaching, drilling and motivation on the part of their teachers. It is therefore imperative to examine the relative effectiveness of teaching, motivation, drill and practice package on students' performance in junior secondary school Mathematics.

**Purpose of the study**

The main purpose of this study is to determine the relative effectiveness of teaching, motivation, drill and practice package on students' performance in Mathematics in junior secondary school. Specifically the study would:

1. examine the influence of teaching, motivation and drill and practice package on students performance in Mathematics;
2. investigate the integration of teaching, motivation, drill and practice package effectiveness on students performance in Mathematics;
3. Found out gender differences and performance of students when teaching, motivation, drill and practice package is utilised.

**Research Questions**

The following research questions were raised for this study:

1. What is the influence of teaching on students' performance in Mathematics?
2. What is the influence of drill and practice on students' performance in Mathematics?
3. What is the influence of motivation on students' performance in Mathematics?

**Research Hypotheses**

The following research hypotheses were formulated to guide this study:

1. There is no significant difference in the performance mean scores of students in the experimental and control groups before treatment
2. There is no significant difference in the performance mean scores of students in the experimental and control group after treatment
3. There is no significant effect of treatment on gender of students' performance mean scores when exposed to teaching, motivation drill and practice package in Mathematics.

**Methodology**

This study adopted quasi - experimental pre- test, post-test control group research design. The experimental group was assigned to treatment while control group was not taught. The population for the study consisted of all JSS II students in Ekiti State. The sample for the study consisted of intact classes of junior secondary schools drawn from two secondary schools in Ikere local Government Area using purposive sampling technique(considering the schools with computer facilities and internet for You tube and TV BASED teaching), The students were categorised into experimental and control in the selected schools.Mathematics Performance Test (MPT) was used to collect data for this study. The instrument (MPT) was validated by seasoned Mathematics educators and the

reliability of the instrument was ascertained which yielded 0.72 reliability coefficient. The pre-test was administered on the control and experimental groups by the research assistants. After the results of their pretest revealed homogenuity, then the experimental group was treated by using package on effective teaching, motivation, drill and practice. A TV based talk shows and You-tube based lecture were used to teach the experimental class for two weeks in Algebra while the control group was taught conventionally. The performance test was re-administered on the two groups at the end of the experiment. The data collected were analysed using frequency, means and standard deviation for the research questions and the hypotheses formulated were tested using ANCOVA all at 0.05 level of significance.

## Results

**Research Question 1:** What is the influence of teaching on students' performance in Mathematics?

In order to answer the question, mean scores relating to performance of students in mathematics before and after being exposed to teaching pedagogy and conventional teaching method were computed and compared. The result is presented in Table 1.

**Table 1: Mean and standard deviation of the effect of teaching on students' performance in Mathematics.**

| *Source of variation* | | *Pre-test* | | *Post-test* | | *Mean Difference* |
|---|---|---|---|---|---|---|
| ***Groups*** | ***N*** | ***Mean*** | ***SD*** | ***Mean*** | ***SD*** | |
| *TMDP²* | 69 | 41.10 | 5.232 | 45.50 | 4.007 | 4.40 |
| Control | 114 | 40.01 | 4.012 | 42.70 | 4.165 | 2.69 |

The result in Table 1 revealed that students in the experimental group and control group had performance mean scores of 41.10 and 40.01 respectively for the pre-test score with respective measure of variability of 5.232 for the experimental group and 4.012 for the control group. The mean difference for the pre-test scores (1.09) is very marginal which underscore the homogeneity of the test. The mean score of students in experimental and control groups for the post test scores are 45.50 and 42.70 respectively with respective measure of variability of 4.007 and 4.165. The mean difference between the performance mean scores of students in the experimental group before and after treatment is 4.40 while that of students in the control group is 2.69. This implies that those in the experimental group had the higher mean score than those in the conventional group. Hence, the use of teaching package has an effect on the performance of students in Mathematics.

**Research Question 2:** What is the influence of drill and practice on students' performance in Mathematics?

In order to answer the question, mean scores of students' performance in Mathematics before and after being exposed to drill and practice package and those in the conventional groups were computed and compared. The result is presented in Table 2.

**Table 2: Mean and standard deviation of the effect of drill and practice on students' performance in Mathematics**

| *Source of variation* | | *Pre-test* | | *Post-test* | | *Mean Difference* |
|---|---|---|---|---|---|---|
| ***Groups*** | ***N*** | ***Mean*** | ***SD*** | ***Mean*** | ***SD*** | |
| *TMDP²* | 69 | 21.40 | 3.239 | 42.30 | 4.855 | 20.9 |
| Control | 114 | 20.00 | 4.000 | 20.80 | 5.051 | 0.8 |

The result in Table 2 revealed that students in the experimental group and control group had performance mean scores of 21.40 and 20.00 respectively for the pre-test score with respective measure of variability of 3.239 for the experimental group and 4.000 for the control group. The mean difference for the pre-test scores (1.40) is very marginal which established the homogeneity of the test. The mean score of students in experimental and control groups for the post test scores are 42.30 and 20.80 respectively with respective measure of variability of 4.855 and 5.051. The mean difference between the performance mean scores of students in the experimental group before and after treatment is 20.9 while that of students in the control group is marginal 0.8. This implies that those in the experimental group had the higher mean score than those in the conventional group. Hence, the use of drill and practice package has an effect on the performance of students in Mathematics.

**Research Question 3**

What is the influence of motivation on students' performance in Mathematics?

In order to answer the question, mean scores of students' performance in Mathematics before and after being exposed to motivation package and those in the conventional groups were computed and compared. The result is presented in Table 3.

**Table 3: Mean and standard deviation of the effect of motivation on students' performance in Mathematics**

| | | Pre-test | | Post-test | | Mean Difference |
|---|---|---|---|---|---|---|
| **Groups** | **N** | **Mean** | **SD** | **Mean** | **SD** | |
| TMDP[2] | 69 | 21.20 | 3.490 | 41.20 | 3.327 | 20.0 |
| Control | 114 | 20.50 | 5.104 | 22.60 | 5.254 | 2.1 |

The result in Table 3 revealed that students in the experimental group and control group had performance mean scores of 21.20 and 20.50 respectively for the pre-test score with respective measure of variability of 3.490 for the experimental group and 5.104 for the control group. The mean difference for the pre-test scores (0.7) is very marginal which underline the homogeneity of the test. The mean score of students in experimental and control groups for the post test scores are 41.20 and 22.60 respectively with respective measure of variability of 3.327 and 5.254. The mean difference between the performance mean scores of students in the experimental group before and after treatment is 20.0 while that of students in the control group is marginal 2.1. This implies that those in the experimental group had the higher mean score than those in the conventional group. Hence, the use of motivation package has an effect on the performance of students in Mathematics.

**Hypotheses Testing**

**Hypothesis 1:-** There is no significant difference in the performance mean scores of students in the experimental and control groups before treatment

To test this hypothesis, the mean scores of students in the experimental and control groups were computed and compared for statistical significance using t-test at 0.05 level. The results presented as follows;

**Table 4: t-test of mean scores in the experimental and control groups**

| **Group** | **N** | **Mean** | **SD** | **Df** | **t** | **P** |
|---|---|---|---|---|---|---|
| *TMDP[2]* | 69 | 3.81 | 1.46 | | | |
| **Control group** | 114 | 4.33 | 2.00 | 181 | 1.885 | 0.061 |

Table 4 shows that t= 1.885, p>0.05. The null hypothesis was not rejected. This revealed that there was no significant difference in the performance mean score of the students in the experimental and control groups before treatment. Therefore, there was homogenuity in the performance of the two groups before treatment. Consequently, any significant effect recorded afterwards would not be ascribed to chance, but to the specific treatment applied.

**Hypothesis 2**

There is no significant difference in the performance mean scores of students in the experimental and control group after treatment

To test this hypothesis, performance mean scores of the students in the teaching, drill and practice and motivation strategies both in the experimental and control groups were computed and compared for statistical significance using a two-way Analysis of Covariance (ANCOVA) at 0.05 level. The results are presented in Table 5 as follows;

**Table 5: ANCOVA of teaching, motivation drill and practice package and students' performance in Mathematics**

| Source | SS | df | MS | F | P |
|---|---|---|---|---|---|
| Corrected model | 2136.127 | 2 | 1068.064 | 39.690 | .000 |
| Covariate (pretest) | 1085.662 | 1 | 1085.662 | 40.344 | .000 |
| Group | 1344.669 | 1 | 1344.669 | 49.969 | .000 |
| Error | 4843.786 | 180 | 26.910 | | |
| total | 29211.000 | 183 | | | |
| Corrected total | 6979.913 | 182 | | | |

*p<0.05

Table 5 shows that $F_{1, 180} = 49.969$; P< 0.05. The null hypothesis was rejected. This implies that there was a significant difference in the performance mean score of the students exposed to teaching, motivation drill and practice package and control group. In order to determine the effectiveness of the treatment at enhancing performance in Mathematics, Multiple Classification Analysis was carried out. The result is presented in Table 6.

**Table 6: Multiple Classification Analysis of Students performance in teaching, motivation, drill and practice package.**

*Grand mean = 11.02*

| Variable + category | N | Unadjusted Devn' | $Eta^2$ | Adjusted Independent + covariate | Beta |
|---|---|---|---|---|---|
| *TMDP*[2] | 69 | 3.08 | 31 | 3.46 | .33 |
| **conventional** | 114 | -1.86 | | -2.08 | |
| Multiple R | | | | 0.337 | |
| Multiple $R^2$ | | | | 0.113 | |

Table 6 reveals that students exposed to teaching, motivation, drill and practice package had higher adjusted mean score of 14.48 (11.02+ 3.46) than their counterparts taught with conventional method 8.94 (11.02+ (-2.08). This implies that teaching, motivation, drill and practice package had effect on students' performance in Mathematics. The treatment also accounted for 31% ($Eta^2$ = 0.31) of the observed variance in students' performance in teaching, motivation, drill and practice package.

**Hypotheses 3**

There is no significant effect of treatment on gender of students' performance mean scores when exposed to teaching, motivation drill and practice package in Mathematics.

In order to test the hypothesis, pre-test mean scores of male and female students in experimental group were computed and compared for statistical significance using ANCOVA at the 0.05 level of significance. The result is presented in Table 7.

**Table 7: ANCOVA Summary of gender and treatment on students' performance when exposed to teaching, motivation drill and practice package in Mathematics.**

| Source | SS | df | MS | F | P |
|---|---|---|---|---|---|
| Corrected model | 2181.133 | 4 | 545.283 | 20.226 | .000 |
| Covariate (pretest) | 1050.716 | 1 | 1050.716 | 38.974 | .000 |
| Gender | 22.760 | 1 | 22.760 | .844 | .359 |
| Group | 1343.111 | 1 | 1343.111 | 49.820 | .000 |
| Gender *Group | 11.435 | 1 | 11.453 | .425 | .515 |
| Error | 4798.780 | 178 | 26.959 | | |
| total | 29211.000 | 183 | | | |
| Corrected total | 6979.913 | 182 | | | |

Table 7 shows that $F_{1, 178} = 0.425$; $P > 0.05$. The null hypothesis is not rejected. This implies that there was no significant difference in the performance mean score between male and female students exposed to teaching, motivation drill and practice package and control group.

**Discussion**

The study revealed that the performance of students in Mathematics in both the experimental and control in pretest were relatively low and do not differ significantly, thus establishing the homogeneity of the two groups involved in the study prior to the experiment. The result revealed that teaching, motivation drill and practice package has an effect on the performance of students in Mathematics. This buttressed the study of Yeh et.al. (2019) that the conventional teacher-led instruction remains dominant in most elementary mathematics classrooms, hence no meaningful change is being recorded.

The study revealed that there was significant difference in the performance mean score of the students exposed to teaching, motivation drill and practice package and control group, in favour of the teaching, motivation and drill and practice package group. This corroborated the position of Kumar, (2010).that ingenuity to repeat teaching in various ways through drill and practice must be coupled with periodic reviews to achieve tangible results. The findings also is in line with the submission of Pintrich, (2003) that the importance of student motivation is reflected in the realm of mathematics education because of desirable outcome and a means to enhance understanding in the subject is sustained. The study revealed that teaching, motivation and drill and practice improve students' involvement in Mathematics when learning it and, grow their perceptions, principles and emotional response. Also, the study supported Odogwu (2015) who opined that motivation is the internal process which

spurs one to satisfy some need. More so, the findings of the study supported the findings of Arulmoly and Branavan (2017) who stated that motivation has a significant influence on academics performance on students.

The study revealed that there was no significant effect of gender and treatment on students' performance when exposed to teaching, motivation drill and practice package in Mathematics. This is in line with the work of Hyde et.al.(1990) that gender differences in mathematics performance are small. Nonetheless, the lower performance of women in problem solving that is evident in high school requires attention.

**Conclusion**

It was concluded that teachers should use effective teaching, motivation, drill and practice package on students when teaching Mathematics to enhance students 'performance. Also, the teacher's attention should be shifted to technology based tools in teaching Mathematics for effective teaching, motivation and drilling practice to be actualised while engaging students in Mathematics class.

**Recommendations**

It was based on the findings of this study, the teaching, motivation drill and practice package should be incorporated into the teaching of Mathematics in secondary schools in order to enhance students' better performance in the subject. Seminars should be organised for teachers on the technology based teaching package that are students friendly. Also Mathematics laboratory should be equiped with the current and relevant Mathematics teaching packages that are 21st century compliance.

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