



Effects of Number Talks Learning Strategy... Yahaya et.al. (2021)

## Effects of Number Talks Learning Strategy on Senior School Students Performance in Physics in Ilorin, Nigeria

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### Abstract

The study examined the effectiveness of number talks learning strategy on senior school students' performance in physics with gender and students' numerical ability as the moderator variables. The study was a quasi-experimental design and 45 students of non-randomized and non-equivalent Intact classes of two co-educational senior secondary school II were purposively selected and engaged in the study. Two research instruments were employed for the study: Physics Performance Test (PPT) and Numerical Ability Test (NAT). Three research questions were raised and answered and also descriptive statistics (mean and standard deviation) was used for data analysis. The findings of the study revealed that the students taught physics using number talks learning strategy performed better than those taught using conventional method and gender and students' numerical ability has no significant influence on students' performance.

**Keywords:** Number talks, Gender, and Numerical Ability



## Effects of Number Talks Learning Strategy... Yahaya et.al. (2021)

### Introduction

Science is the foundation upon which the generality of present-day technologically breakthroughs, scientific know-how, advancements, and inventions were built. Lately, nations all over the globe including Nigeria are striving hard to develop technologically and scientifically, since the world is turning scientific and all proper functioning of lives depend greatly on science and technology (Onasanya & Omosewo, 2011). Abimbola and Omosewo (2006) viewed science as a body of knowledge, a way of investigating or method and way of thinking in pursuit of an understanding of nature. Physics is one of the science subjects taught at senior secondary school level and post-secondary institutions in Nigeria and other countries of the world.

Weidner and Brown (2020) viewed physics as a science that studied the structure of matter and its interactions among the major constituents of the observable universe. It is sometimes referred to as the science of measurement and its knowledge has contributed greatly to the production of instruments and devices with tremendous benefit to the human race. The importance of physics cannot be overemphasized as it forms the basis for the technological and scientific advancement of any nation. The performance of students in physics at all levels of education is worrisome and not encouraging (Ihekweba, et al 2020). The reasons alluded to this lackluster performance ranged from teachers-related factors, students-related factors among others. One of the teacher identified factors includes the teachers' method of instructions.

Teachers teaching in this 21<sup>st</sup> century needs to adopt some innovative method of instructions like Number talks that will open the mind of students to mathematical computation and number sense. Number talks have been used as a way to improve number sense and conceptual understanding while helping students to see the relationships between numbers. Solving problems mentally and then discussing them in an open format, where the focus is on the process rather than to rely on memorized procedures (Parrish, 2010 & Parrish, 2011). Number talks give students opportunities to develop their conceptual understanding of mathematics rather than merely solve problems using memorized procedures. Students with well-developed number sense are better and able to think logically, critically, and flexibly, and they utilize more efficient problem-solving strategies, all of which are vital 21<sup>st</sup> century skills (Yang, 2002). The usefulness of Number talks include the following:

1. It ensures students autonomy in knowledge creation e.g. offering meaning choice, encouraging students to be able to justify their mathematical answering through reasoning, building of self-understanding through structuring instruction and discovery of concepts
2. It changes students believe of intelligence static to dynamic
3. It increases students' self-efficacy
4. An instructional model that enhances students access to mathematical concepts and their relationships
5. Gives chance students to develop mastery orientation towards mathematical functions and its related field and career.

Procedure for conducting Number talks class consists of the following:

1. Presentation of mathematical/mathematical related problem(s) to students;
2. The teacher would be asked the students for solution and strategies to be used for solving the problem individually;



**Effects of Number Talks Learning Strategy... Yahaya et.al. (2021)**

3. The teacher would wait and ensure that each student had sufficient time;
4. Each student would be invited to record their answered and strategies on the black/whiteboard;
5. The students would be asked to look through the answers and strategies and suggest the useful and correct strategies and answers;
6. Students would be encouraged to consider for themselves the effective and efficient strategies of methods.

Adapted from Clark (2015).

Out of the factors that influences the performance of the students is gender. Gender is the range of physical, biological, mental and behavioral characteristics pertaining to, and differentiating between masculinity and feminine which are universal (Ujiro & Oriakhi, 2015).

Physics as a numerical subject employed the use of mathematical notations, functions and formulae for its operation. Numerical ability refers to ability to explore and use numerical functions in solving problem relating to mathematics. Ezekiel and Mojeed (2015) viewed numerical ability as the capability of students to perform some arithmetical and mathematical calculations offhand or without the use of mechanical device. The scholars observed numerical abilities as a variable that determines the imagination, language, perception, concepts formation and problem solving ability of learners to a greater extent. This category of numerical ability could be high, medium and low.

Ezekiel and Mojeed (2015) carried out a study on effects of mnemonic and prior knowledge instructional strategies on students' attitude to mathematics. The study concluded that high numerical ability students were favored followed by medium and low numerical ability students' posttest was also improved. Derya and Burcu (2016) carried out a study on the effects of number talks on number sense of pre-service primary teachers. The participants of this study were 31 third grade pre-service teachers attending a teacher training program at a state university during the school year 2015-2016. The study employed the use of KayhanAtay (2010) number sense test. The data collected were analyzed using SPSS 16.0. the findings of the study showed no significant difference in test scores of the participants.

Igbudu (2015) investigated the influence of gender on students' academic achievement in government subjects in public secondary schools. The study makes use of 822 male and female students, the results shows the proportions of students with grade A as 49% for male and female for 51%, 51% for male and 49% for female in grade B and 48% for male and 52% for female in grade C. the study later concluded that there is gender difference in the academic achievement and there is no doubt that female achieve more than male counterparts.

Ezekiel and Mojeed (2015) carried out a study on the effects of mnemonic and prior knowledge instructional strategies on students' attitudes toward mathematics. The study concluded that high numerical ability students were favored followed by medium and low numerical ability students' posttest was also improved. The study adopted the pretest-posttest control group, quasi-experimental design with a 3x2x3 factorial matrix. Two hundred and eighty-eight students from six public schools selected from three local government areas in Ibadan, Oyo State, Nigeria, participated in the study. Two instruments were developed and used: Students' Mathematics Attitudinal Scale and Numerical Ability Test. The findings show that high numerical ability had

### **Effects of Number Talks Learning Strategy... Yahaya et.al. (2021)**

the higher performance ( $M=70.21$ ), followed by Low Numerical Ability ( $M=69.99$ ) and Medium Numerical Ability ( $69.32$ ).

Despite the importance of physics knowledge and its application to nation-building, scientific and technological advancement, and its immeasurable values to other fields of studies, the report made available by the evaluation agency (WAEC, 2009; 2013; 2015 & 2017) shows poor performance of students in mathematical related aspect of the subject. Some of the factors stated by the council as the causes of this abysmal performance were students' related factors which include low level of students' numerical ability, negative interest of the students to the aspect, teacher-related factors which include the methodology and instruction employed by the teachers to teach, teachers' content knowledge and government-related factors.

Instructional or learning strategy is an essential part of the teaching and learning processes. Teacher choosing inappropriate learning strategy for his/her classroom lesson shows the deficiency in the outcome of the lesson through internal and external examination reports. Over the years, it's been recommended that the classroom lesson should be student centered rather the teacher dominated classroom. Students should be avail the chance of creating their learning and make decisions with the assistance of the teacher/tutor.

The scholars (Ihekwaba, et al 2020) asserted that one of major reasons why students perceived physics difficult was as a result of its relation to mathematics and the use of mathematics functions for its operation. The use of mathematical functions determines to a larger extent the outcome of students' performance in physics and other science oriented subject make use of numbers, figures and values.

Kaigama (2020) opined that for physics students to acquire scientific and technological skills and experience for everyday life, the teacher teaching technique has to be student based. In view of the aforementioned issue, the teacher technique has to be reviewed as it's one of the determinant of students learning outcome. This study determines the effects of numbers talk learning strategy on senior school students' performance in physics.

### **Objectives of the Study**

The main purpose of this study was to determine the effects of numbers talks learning strategy on senior school students' performance in physics in Ilorin. Specifically, the study will determine:

1. the mean effect of number talks learning strategy on senior school students' performance in physics;
2. the mean gender effect of number talks learning strategy on senior school students' performance in physics;
3. the mean numerical ability's effect of number talks learning strategy on senior school students' performance in physics.

### **Research Questions**

The following research questions were raised and answered.

1. What is the mean effect of number talks learning strategy on senior school students' performance in physics and those taught using conventional method?



### Effects of Number Talks Learning Strategy... Yahaya et.al. (2021)

2. What is the mean gender effect of number talks learning strategy on senior school students' performance in physics?
3. What is the mean numerical ability's effect of number talks learning strategy on senior school students' performance in physics?

### Methodology

This study adopted a quasi-experimental of research design of pretest, posttest non-randomized control design. The study was a  $2 \times 2 \times 3$  experimental design. Number talks learning strategy was the independent variable students' gender occurs at two-level ( male and female), and students' numerical ability at three-level (high, medium and students' performance serves as dependent variable.

The population for this study comprised all senior secondary school students offering physics in Ilorin, Kwara state. Senior secondary school two (2) students constitute the target population while two coeducational senior secondary school students were purposively selected as sample base on their class population and the school previous records in senior school certificate physics examination. 25 students (48.07% of the class population) were randomly selected through balloting to constitute the experimental class while 20 students (50% of the class population) were also randomly selected for control class respectively. The selection technique was found necessary because the number talks learning strategy is time consuming and does not encourage large class size.

Two instruments were used for this study namely; a 30-item multiple-choice questions adapted from previous WASSCE from 2012-2019 tagged Physics Performance Test (PPT) and 30-item multiple-choice questions adapted from psychometric success numerical ability test tagged Numerical Ability Test (NAT). The face and construct validity of physics performance test was carried out by two experienced senior school physics teachers, and Numerical ability test was validated by two experienced senior school mathematics teachers. The construct validity index of the PPT was 0.84 and NAT was 0.76 using factor analysis statistics. Reliability of the test items was carried out using the test-retest method respectively by administering the instruments to two co-educational senior secondary school students that were not participating in the study within an interval of two weeks with a construct validity index of 0.72 and 0.68 respectively using Cronbach Alpha statistic.

The exercise lasted for four weeks. Familiarization with the students, distribution of informed consent form to the students, administration of pretest came up in the first week in the sampled schools. The treatments for both experimental and control groups came up in second and third weeks. The numerical ability test (NAT) was administered to the experimental group for classifying them to different levels. Data collected were analyzed using descriptive statistics (mean and standard deviation) to answer the research questions one to three.

### Results

#### Research Question 1:

What is the mean effect of number talks learning strategy on senior school students' performance in physics and those taught using conventional method?



**Effects of Number Talks Learning Strategy... Yahaya et.al. (2021)**

**Table 1: Analysis of the pretest and posttest mean score of students taught physics using number talk learning strategy and those taught using conventional method**

Group	N	Pretest mean	Posttest Mean	SD	Mean Difference
Experimental	25	7.95	17.55	5.266	8.50
Control	20	7.50	9.10	3.161	1.60

Source: Researchers field survey

$p < 0.05$ , Significant

The difference in the mean score of students taught physics using number talk learning strategy in pre and post test was 8.50; while the mean effect of students taught physics using the conventional method in pre and post test was 1.60.

**Research Question 2:**

What is the mean gender effect of number talks learning strategy on senior school students' performance in physics?

**Table 2: Analysis of Mean Effect of Number talk Learning Strategies on Students' gender**

Gender	N	Pretest mean	Posttest mean	SD	df	t-value	p-value
Female	11	8.38	15.0	6.408			
					2.271	.297	.017
Male	14	8.50	14.3	4.137			

Source: Researchers field survey

$p > 0.05$  not significant

Table 2 reveals that female students taught physics using the number talk learning strategy benefited most with the posttest mean score of 15.0; while the posttest mean score of male students taught physics using the same strategy was 14.3.

**Research Question 3:**

What is the mean numerical ability's effect of number talks learning strategy on senior school students' performance in physics?

**Table 3: Analysis of Mean effect of Number talk Learning Strategies on Students' Numerical Ability Levels**

Numerical Ability	N	Pretest mean	Posttest mean	SD	Mean difference
High	11	9.60	17.55	4.987	7.95
Medium	5	9.50	13.80	4.658	4.30
Low	9	10.2	13.50	7.778	3.30

Source: Researchers field survey

The three numerical abilities levels of students were discussed under this research question. High-level numerical ability students taught using number talk learning strategy achieved higher more than medium level numerical ability and followed by low-level numerical ability students





**Effects of Number Talks Learning Strategy... Yahaya et.al. (2021)**

taught using number talk learning strategy. The findings are discussed in Table 3. The High-level numerical ability students outsmarted other levels with the posttest mean of ( $M=17.55$ ,  $SD=4.987$ ) while medium-level numerical ability students follow with posttest mean ( $M=13.80$ ,  $SD=4.658$ ) and low-level numerical ability students were least performed with posttest mean ( $M=13.50$ ,  $SD=7.778$ ).

**Discussion of Findings**

The findings research question one revealed the mean gain score of students taught using number talks learning strategy and students taught using traditional method. It could be deduced from the findings of this study that the use of number talks learning strategy in teaching and learning of physics especially mathematics-related aspects of physics was found effective. The number talks learning strategy group performed significantly better than the control group in the posttest, whereas the performance of the experimental groups and control group were almost the same in the pretest. This finding of this study was in agreement with Clark (2015) that also found out that number talks learning strategy improve students number sense.

Similarly, the finding of the research question two shows the influence of gender on senior school physics students' performance when taught using number talks learning strategy. The finding shows that gender has no influence on the performance of students taught physics using number talks learning strategy though female students performed better than the male counterpart in the number talks learning strategy group.

Findings of the research question three also shows the influence of numerical abilities level of senior school physics performance when taught physics using number talks learning strategy. The study found out that there was a statistically significant difference among high, medium and low numerical abilities students as all categories of students in the number talks learning strategy group benefited.

**Conclusion**

It has been observed that the senior school students' performance in physics is not encouraging over the years and despite the importance of the subject to development of science, society, technology and Nation building, all the measures put in place by the concern stakeholders in ensuring positive performance seems not to be enough. Based on the findings of this study, it was concluded that the use of number talk learning strategy enhanced positive students' performance in physics than those that were taught using conventional method. This strategy equipped the learners the ability to learn individually and in group of their peers and class mates. Gender did not influence students' academic performance in physics as both sexes are capable of competing and collaborating in classroom activities while students' numerical ability level needs to improve on as it influences the decision making and critical thinking of students.



## Effects of Number Talks Learning Strategy... Yahaya et.al. (2021)

### Recommendations

Based on the major findings of this study, the following recommendations were made: Number talk learning strategy need to be included in teaching and learning process, has it drive the performance of students positively, improves students' skills acquisition, aid their problem-solving approach, decision making and development of cognitive skills and boost self-efficacy of students. Gender and students' numerical ability level should be considered as a factor that determine student learning outcome in other to ensure equal opportunity in physics classroom lesson competition, collaboration and experience sharing among one another in physics and any other related subjects.

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**Effects of Number Talks Learning Strategy... Yahaya et.al. (2021)**

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