# Mastery Learning Strategy and Learning Retention: Effects on Senior Secondary School Students' Achievement in Physical Geography in Ganye Educational Zone, Nigeria

# 8 ABSTRACT

### 9

1

2

3

4

5

6

7

Background: In Ganye Educational Zone, it was observed that the performance of secondary school students in Geography examinations is continuously on the decline. Studies have it that the instructional strategy adopted by teachers could influence students' achievement. The need to alleviate the difficulties of abstraction and improve students' achievement in Physical Geography informed this research.
Aim: The study investigated the Effects of Mastery Learning Strategy and Learning Retention on Senior Secondary School Students' Achievement in Physical Geography in Ganye Educational Zone, Nigeria.
Methods: The study adopted the quasi-experimental non-equivalent pre-test, post test control group design. The multi-stage sampling technique at four levels was used to select four co-educational secondary schools in Ganye Educational Zone in Nigeria. The sample for the study was 218 Senior Secondary School two (SS II) students offering Geography from four intact classes in the four selected secondary schools. The instrument used for data collection was "Physical Geography Achievement and Retention Test" (PGART). The instrument was established using Kendall tau <u>b</u> statistic. This gave a reliability index of 0.74. Data collected were analyzed using Mann-Whitney U and t-Test statistics.
Results: The results showed that Mastery Learning Strategy has the potential to improve students'

**Results:** The results showed that Mastery Learning Strategy has the potential to improve students' learning retention and achievement in all spheres of cognitive domain in Physical Geography better than the Conventional Method.

**Conclusion:** Since Mastery Learning Strategy was found efficacious in engendering students' learning outcomes, it was recommended that Geography teachers should incorporate this teaching strategy during instruction so that learners would be guided to learn meaningfully and be assisted to retain content learnt in Geography.

### 10

*Keywords:* Mastery learning strategy; learning retention; achievement; physical geography; conventional
 method.

## 14 **1. INTRODUCTION**

15

13

16 The knowledge of geography is not only important and useful to the learners, but to everyone who seeks 17 to cope with the ever-changing trends of our environment. The earth being the theatre where virtually all 18 human activities take place is the focus of geographical study. Therefore, it is plausible that man knows 19 about the nature and phenomenon on earth and the consequences of the interactions between man and 20 his physical environment. In Nigeria, Geography is an important school subject as is manifested in the 21 general objectives of teaching and learning of Geography. The study of Geography is about more than 22 just memorising places on a map. It's about understanding the complexity of our world and appreciating 23 the diversity of cultures that exist across continents. And in the end, it's about using all that knowledge to 24 help bridge divides and bring people together. The former Geography curriculum was limited to factual, 25 examination-oriented approaches, but today, there is greater emphasis on the educational and 26 experiential implications for the students.

27

In the past, some teachers were much more concerned merely with turning out students who were loaded 28 29 with theoretical facts and terminologies in Geography. Today, the curriculum had changed. It has become 30 a matter of investigation, inquiry and experiential. Emphasis is now placed on the relevance of Geography 31 to life. This is evidenced by objectives that now guide the formulation of Geography curriculum which 32 include: - To provide a vehicle for the child's development. To help the child acquire the art of using 33 knowledge or to learn something about his cultural heritage; to provide necessary background to citizenship and intimate students into a particular mode of thought. Furthermore, the teaching of 34 35 Geography should offer a unique means of furthering inquiry and high intellectual growth in students. It 36 should help man to live, place himself in the world and to learn his true position and what his duties are. It should help the students to understand and develop positive attitudes to race, culture and other people's 37 38 environments and places. From these objectives, Geography is not only taught for the learners' acquisition of knowledge but also to develop certain values and skills such as respect for others' values, 39 sound judgement, keen observation, accurate measurement and reflective thinking among others. The 40 41 acquisition of these values and skills will help the learners to cope with the challenges in their daily lives.

42

In Nigeria secondary schools, Geography instruction is broadly categorized into three foci; physical,
 human and regional Geography. This study centred on Physical Geography; because students often have
 showed some difficulties in it. Also, reports of students' performance in this aspect of Geography in
 Senior Secondary School Certificate Examinations conducted by both West African Examinations Council
 (WAEC) and National Examination Council (NECO) have not been encouraging [1].

48

49 The teaching of Geography as a science or social science subject in senior secondary schools in Ganye 50 Educational Zone is not without its problems. These problems, ranging from Government, teachers and 51 student-related problems do not differ with the problems bedeviling the entire education system in 52 Nigeria. Poor academic achievement of students in all science subjects and Geography in particular has been a source of concern to many researchers. Students' academic achievement is being used as one of 53 54 the predictors of overall quality of the education system. It may not be out of place to say that where there 55 is inadequate or poor funding of schools, there may be inadequate instructional materials, poor 56 infrastructural facilities poor teaching learning environment and poor motivation of teachers among 57 others. As such, students in this locality see Geography as a collection of mere ideas presented as facts. 58 They find geographical concepts confusing and unfamiliar [1]. Students therefore, learn geographical concepts in abstract form and are subjected to too much imagination of geographical features instead of 59 learning through active involvement [1, 2]. In addition, reports have shown that undue emphasis on 60 theoretical aspects of Geography to the detriment of scientific and experiential approach had made the 61 62 subject very abstract and uninteresting [2]. Subsequently, the subject no longer attracts young scholars due to this dull, uninspiring and stereotyped approach being adopted [2]. Filgona, Sababa and Filgona [3] 63 64 and Suwopoleme et. al. [1] identified dearth of instructional materials in Nigerian secondary schools as 65 one of the problems affecting the teaching and learning of Geography. With this, teachers would be left 66 with no option than to be glued strictly, to the chalk and talk approach of teaching and learning. This may 67 in turn impact negatively on the achievement of students.

68

69 Going by the interaction the researcher had with students prior to the study, students in secondary 70 schools of Ganye Educational Zone complained of poor choice of instructional strategies used by 71 Geography teachers while teaching. These methods, they said, was not capable of arousing and 72 sustaining their interest in the subject. The students during classes also observed some terminologies in 73 Physical Geography such as the Localith, Batholith, Dyke, Sill, Stack and Stump among others, as 74 appearing too abstract to them. And just when they are trying to assimilate the previous topics taught, the 75 teachers often come up with new ones. This has made their learning of Geography difficult thus affecting 76 their performance in both internal and external examinations. Obondo, Nabwire and Jaction [in 3] opined that prevailing poor performance by students in Geography is as a result of misconception they hold 77 78 about some topics in Geography and the instructional mode. If these observations are true, there seems 79 to be no glimmer of hope for the future of Geography in this region.

80

Underpinning the observations made by students in the study area is the fact that the choice of lecture method by Geography teachers may be due to poor motivation, dearth of instructional materials and 83 haste to cover the syllabus expediently, not necessarily paying attention whether the students understood 84 or not. Studies on underachievement of students in secondary school subjects reported inefficient 85 teaching methods by school teachers as a major factor for the underachievement of students [4-5]. 86 However, one may want to dismiss these claims made by the students with just a wave of the hand. This 87 is so because, it is a common knowledge that students claim "the success" when they have a good 88 grade; and guickly blame the teachers for their bad grades. But on a closer look, since the teacher happens to be the cynosure of all eyes in Nigeria's educational system and on whom the implementation 89 90 or otherwise of the curriculum hinges; his role in ensuring better achievement of students cannot be 91 overemphasized. More to this, studies have shown a decline in students' performance in sciences (Geography inclusive) and partly, this has been attributed to the fact that strategies used in classrooms 92 93 are not very effective [6-7]. To this end, one may say that the quality of education provided to students is intricately linked to the strategies teachers adopt in passing on knowledge to students in the classrooms. 94 95 Although the poor performance of students could be attributed to the low guality of teachers in some cases, a positive correlation between teachers' strategy and students' academic achievement in 96 97 Geography has been observed [8].

98

99 The foregoing underscores the importance of teacher pedagogical prowess in achieving guality education 100 and as correlate of students' academic achievement. Persistent use of traditional teaching methods such 101 as the lecture in Geography classrooms has been advanced as the underlying factor for students' poor 102 performance in the subject [6]. However, this is not to say that the use of lecture method in teaching and 103 learning over the years has not yielded any positive results. Clar and Wareham [9] observed that 104 Geography teachers have traditionally used lecture as teaching method more than many other subjects 105 and its usage has expanded further over the last few years. If the method a teacher adopts in teaching; and poor retention of the concepts in Geography by students are some of the major reasons for the poor 106 performance of students in Geography, then the questions are; how can we break this circle of failure? 107 What can we do as teachers to remedy the problem of students in Physical Geography in the study area? 108 109 Is there a teaching strategy that could help students to overcome learning problems in Physical 110 Geography? 111

112 Different methods and techniques for imparting instructions in a formal classroom setting have been in 113 flux over time; old ones being replaced by newer and effective ones. Educationists now believe that all 114 can learn well under a set of certain condition [3]. This change in thought has revolutionized the whole 115 concept and processes of teaching in classrooms. It provides a platform where teachers and students get 116 involved in an all-inclusive teaching and learning process; a phenomenon that allow students to feel and 117 put into practice what they are being taught thus reducing the abstraction associated with using the traditional teaching methods [6]. Mastery Learning Strategy is one of such techniques that may provide 118 remedial to students difficulties in Physical Geography. 119

120

121 Mastery Learning Strategy (MLS) is an instructional strategy where students are allowed unlimited 122 opportunities to demonstrate mastery of content taught. It is an instructional strategy in which learners are 123 provided with the opportunity to master a particular unit of lesson before proceeding to the next. Most 124 modern applications of mastery learning stem from the writings of Benjamin S. Bloom; even though the 125 idea of the instructional strategy dated back to earlier years [10]. Bloom [11] hypothesized that a classroom with a mastery learning focus as opposed to the traditional form of instruction (lecture method) 126 127 would reduce the achievement gaps between learners of varying degrees of academic abilities. Bloom's 128 theory of school learning asserts that virtually all students can learn what they are taught if given the 129 appropriate and prior conditions.

130

Mastery learning instructional strategy divides subject matter into units that have predetermined objectives or unit expectations. Students, alone or in groups, work through each unit in an organized manner. The teacher assesses and grades the students after each unit to determine who has mastered the content and who needs more help. Students must demonstrate mastery on unit tests, typically 80%, before moving on to new material [12-13]. Students who have mastered the material are given enrichment opportunities that could be in the form of projects or problem solving tasks. Students who do not achieve mastery receive remediation through tutoring, peer monitoring, small group discussions, or 138 additional assignment. Additional time for learning is prescribed for those requiring remediation. In this 139 manner, students continue the cycle of studying and testing until mastery is achieved, after which they 140 can proceed to more advanced learning tasks. The assumption here is that, if students are given 141 opportunity to learn and time allowed for learning coupled with quality of instruction that will match their 142 need and situation, at least 80% or higher, could achieve mastery in learning. Based on this, Bloom 143 developed a mastery learning model called Learning for Mastery (LFM). However, the question still 144 begging for answers in the study area is, "Would the use of Mastery Learning Strategy enhance students" 145 understanding of concepts and improve achievement in Physical Geography?'

146

147 Abakpa and Iji [14] opine that mastery learning strategy can provide quality instruction, immediate 148 feedback and remedial lessons for the attainment of lesson objectives. Studies by [14-15] all affirm that mastery learning strategy enhances students' academic achievement and retention in integrated science 149 150 and mathematics better than the conventional method. More recent works by Hussain and Suleman [16], 151 Lamidi, Ovelekan and Olorundare [17], Udo and Udofia [18] all affirm the superiority of mastery learning 152 strategy over the conventional lecture method. The findings from these works revealed that the students taught using mastery learning approaches performed better than their counterparts taught through the 153 154 conventional method. Therefore, since mastery learning strategy could improve the achievement of 155 students in the studies highlighted, there is the possibility that it could alleviate students' difficulties in 156 Physical Geography observed in the study area.

157

158 Studies have highlighted the veracity of student-centred approaches in promoting better understanding and material retention by students [6, 19]. Learning retention in respect to this study is the ability of the 159 160 students to acquire and comprehend the knowledge of Physical Geography. The retention is exhibited in the successful performance in the tests designed to measure the learner's achievement. Mastery 161 Learning Strategy takes place in an increasing order of difficulty. According to Bloom Taxonomy of 162 educational objectives, learners graduate from learning concepts in lower order (knowledge, 163 164 comprehension and application) to higher order (analyses, syntheses and evaluation) cognitive domain. A 165 poor understanding of concepts at the lower order domain of learning could deter a learner from moving 166 to the higher order domain. This is where mastery learning is crucial; by ensuring that all learners have a 167 better understanding of the concepts taught before proceeding to the next level. Studies have shown that 168 students taught using student-centred instructional strategies other than lecture method achieve greater 169 material retention [3, 20]. Further to this, Hussain and Suleman [16] conducted a study using the Bloom's 170 Mastery Learning approach to teach English Language at secondary school level in Pakistan. The 171 findings showed that Bloom's Mastery Learning approach was more effective on students' retention 172 compared to traditional learning approach.

173

While much has been done on the effect of mastery learning strategy on students' achievement in different subjects and in various localities; there is paucity of data on the extent it could impact on students' achievement with specific emphasis on Physical Geography. To this end, this study was carried out to provide empirical evidence on the effects of mastery learning strategy in conjunction with learning retention on senior secondary school students' achievement in Physical Geography.

# 180 **1.2 Purpose of the Study**

181
 182 This study investigates the effects of mastery learning strategy and learning retention on senior
 183 secondary school students' achievement in Physical Geography in Ganye educational zone, Nigeria. The
 184 specific objectives of the study were enumerated as follows:

185

(i) to determine the achievement of students taught Physical Geography using Mastery Learning Strategyand Conventional Method;

188

(ii) to examine the Learning Retention of students taught Physical Geography using Mastery Learning
 Strategy and Conventional Method;

191

192 (iii) to evaluate the achievement of students in the Lower Order (knowledge, comprehension and 193 application) and the Higher Order (analysis and synthesis) Cognitive Domains taught Physical Geography 194 using Mastery Learning Strategy; and

195 196 (iv) to evaluate the achievement of students at different levels of Cognitive Domain (i.e., knowledge, 197 comprehension, application, analysis and synthesis) taught Physical Geography using Mastery Learning 198 Strategy and Conventional Method.

199

201

213

219

#### 200 1.3 Hypotheses

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

203 204 H<sub>o1</sub>: There is no significant difference in the achievement of students taught Physical Geography using 205 Mastery Learning Strategy and Conventional Method. 206

207  $H_{02}$ : There is no significant difference in the Learning Retention of students taught Physical Geography 208 using Mastery Learning Strategy and Conventional Method. 209

H<sub>03</sub>: There is no significant difference in the achievement of students in the Lower Order (knowledge. 210 comprehension and application) and the Higher Order (analysis and synthesis) Cognitive Domains taught 211 212 Physical Geography using Mastery Learning Strategy.

214 H<sub>04</sub>: There is no significant difference in the achievement of students at different levels of Cognitive 215 Domain (i.e., knowledge, comprehension, application, analysis and synthesis) taught Physical Geography 216 using Mastery Learning Strategy and Conventional Method. 217

#### 218 2. MATERIALS AND METHODS

220 This study employed the quasi-experimental design. The non-equivalent, pre-test and post test control 221 aroup design was adopted to test the hypotheses. The design is thus represented as follows: 222

- 223  $\begin{array}{c} O_2 \\ O_4 \end{array}$  $O_1$  $X_1$
- X2 224  $O_3$ 225

226 where:

- 228 O<sub>1</sub> and O<sub>3</sub> are Pre-test Scores for the two groups
- 229 O<sub>2</sub> and O<sub>4</sub> are Post Test Scores for the two groups
- 230  $X_1$  = Experimental treatment using Mastery Learning Strategy (MLS)

231 X<sub>2</sub> = Control treatment using Conventional (Lecture) Method 232

#### 233 2.1 Sample and Sampling Technique

234

227

235 The multi-stage sampling technique at four levels was used for the study. At the first level, simple random 236 sampling technique involving the use of balloting without replacement was used in selecting two out of 237 four Local Government Areas in Ganye Educational Zone. The two LGAs that emerged after selection 238 were Toungo and Ganye. At the second level, two senior secondary schools from each of the two 239 selected LGAs were sampled using stratified random sampling technique. In each of the Local 240 Government Areas, one of the selected schools was randomly assigned the Experimental treatment and 241 the other Control treatment groups.

242

243 At the fourth level of the sampling procedure, one intact class from the four senior secondary schools 244 used in the study was selected using simple random sampling technique involving the use of balloting 245 without replacement. Therefore, the sample size for the study consisted of 218 Senior Secondary School 246 two (SS II) students offering Geography in four intact classes from four government-owned secondary schools in Ganye Educational Zone. Two of the intact classes consisting of 113 (Class A: 58, Class B: 55)
students were later clustered and assigned to the Experimental group. They were taught concepts in
Physical Geography using Mastery Learning Strategy. The remaining two intact classes consisted of 105
(Class C: 51, Class D: 54) students, clustered and assigned to the Control group and taught using
Conventional (Lecture) Method. The four schools used for the study were co-educational schools in
Ganye Educational Zone.

### 254 **2.2 Research Instrument**

255 256 A 40-item Physical Geography Achievement and Retention Test (PGART) was used. It was constructed 257 by the researcher and patterned in line with WAEC questions in Physical Geography. The Blooms Taxonomy of educational objectives was used as a guide to structuring the items in the instrument. This 258 259 was done in order to test the students' mastery of concepts in Physical Geography at all cognitive levels. 260 The PGART consisted of two sections. Section A comprised of 35 multiple choice items carrying 35 261 marks while Section B, carried 65 marks and consisted of 5 essay items from which any 3 was answered. 262 The duration set for students to answer these questions was 1hr. 30mins. 263

Items in the instrument were drawn from topics in Physical Geography as specified in the Nigeria's Geography Curriculum for Senior Secondary School two (SS II) students. The topics are: earthquake, vulcanicity, faulting and folding, weathering and mass movement. Item specification for the PGART instrument measuring five cognitive domains in the Blooms Taxonomy of educational objectives is represented on Table 1.

Table 1: Item specifications of learning objectives for the Physical Geography achievement and retention test (PGART)

Торіс	Knowledge (25%)	Cognitive Comprehension (25%)	Objectives Application (25%)	Analyses (12.5%)	Syntheses (12.5%)	Total (100)
Earthquake	2	2	2	1	1	8
Vulcanicity	2	2	2	1	1	8
Faulting and Folding	2	2	2	1	1	8
Weathering	2	2	2	1	1	8
Mass Movement	2	2	2	1	1	8
Total	10	10	10	5	5	40

Adapted from Filgona, [6].

273

274 Table 1 show that 25% of the 40 items would test knowledge (i.e., 2 items), 25% would test comprehension (i. e., 2 items), 25% would test application (2 items), 12.5% would test analyses (1 item) 275 276 and 12.5% would test syntheses (1 item). The number of week(s) each topic lasted in the Post Primary 277 Schools Management Board (PPSMB), Yola, common scheme of work for secondary schools Geography, formed the basis of weighting contents. The weighting for the cognitive objective was based on proportion 278 279 of the lower and higher order behavioural objectives in the units of the study. Lower order cognitive 280 objectives include levels of intellectual function objectives such as knowledge, comprehension and 281 application while higher order cognitive objectives include analyses and syntheses. Each unit has 2 282 questions of lower order or 75% (25% +25% + 25% = 75%) of the total percentage and 1 question of 283 higher order or 25% (12.5% + 12.5% = 25%) of the total percentage. Therefore, the sum total of lower 284 order questions is 30 (10 +10 +10) while higher order questions are 10 (5 +5). The sum total = 30 + 10 =285 40.

### 287 **2.3 Validity of the Instrument**

286

The PGART instrument was validated by three professional secondary school Geography teachers and two experts in Geography Education in the Department of Educational Foundation, Adamawa State

<sup>288</sup> 

University, Mubi. The validators looked at the suitability of the items to ascertain whether it was structured to measure the chosen topics. The validators also guided the researcher on mark allocation, duration of the study, marking scheme, lesson plans and other relevant areas. The criticisms and vetting by these experts helped in modifying and replacing some items. All criticisms and corrections proffered by the validators guided the production of the final draft of the instrument.

## 297 2.4 Reliability of the Instrument

298

296

The instrument was pilot tested using 60 SS II students offering Geography from two public senior secondary schools in Mayo Belwa Local Government Area. The scores of students obtained after pilot testing were correlated using Kendall tau <u>b</u> statistic. The statistic produced a reliability index of 0.74; which was considered satisfactory for the study.

303

# 304 2.5 Procedure for Data Collection305

306 Data collection was categorized into four phases. The four phases involved were the preliminary, pre-307 treatment, treatment and the post-treatment stages. 308

309 Phase One: This was the preliminary stage. After due permission was sought from the authorities of the 310 four selected schools, the researcher met with students to seek their consent and explained the aim of 311 the study as well as their level of involvement in the study. Permission was sought to engage two 312 geography teachers to serve as Research Assistants. Instructors were trained in the use of the manual (lesson plans). The training exercise was based on the purpose of the study, topics to be taught, 313 strategies/method to be used, use of the lesson plans, administration of PGART as well as general 314 315 conduct of the study. The research assistants were given lesson plans based on the Experimental treatment to be administered using Mastery Learning Strategy, and the Control using Conventional 316 Method. Lesson plans on the selected topics from SS II Geography curriculum were prepared and used 317 318 to teach students in the experimental and control groups. All participants were monitored, and assisted 319 while the study was in progress.

320

**Phase Two:** This was the pre-treatment stage. In order to conduct the experiment successfully, **a** pre-test was given to determine the existing knowledge of students before the experimental process. The PGART instrument was administered as pre-test to the students in the two groups (experimental and control groups). The instruments contained 35 objective items requiring students to circle the correct option from letter A-D; and 5 essay items from which students are required to write on any three comprehensively on the topics taught in Physical Geography. This was done in the first week.

**Phase Three:** This was where the proper treatment administered to the experimental and control groups began. Students in both the experimental and control groups were taught the same topics in Physical Geography but with different instructional strategies. The Experimental Groups were exposed to learning earthquake, vulcanicity, faulting and folding, weathering and mass movement in Physical Geography using Mastery Learning Strategy, while the control group was exposed to the same concepts using Conventional Method of teaching. The treatment lasted for four weeks.

335 **Experimental Treatment:** The experimental group was comprised of 113 (Class A: 58, Class B: 55) 336 students who were taught earthquake, vulcanicity, faulting and folding, weathering and mass movement 337 in Physical Geography using the Mastery Learning Strategy by instructors in the mastery learning group. 338 The Mastery Learning lesson plan was characterized by clear phases, initial instruction, formative testing, 339 remediation, and corrective and summative testing. Students were told objectives that were to be 340 mastered and the level of mastery that was expected from them (usually 80%). After initial instruction, a formative task was given to evaluate the achievement of mastery on the part of the students and 341 instruction on the part of the teacher. If mastery was not achieved by students on the formative task, 342 remediation and re-teaching of the students occurred. The remediation and re-teaching were different in 343 344 approach from the original instruction. The students who had received remediation were again tested with 345 a parallel task to the first formative task to see if mastery had been achieved. This remediation and reteaching occurred while class was in session. After students had reached mastery, instruction proceeded
 to a new set of objectives. A summative test was given at the end of the study to measure students'
 achievement over all topics covered.

349

350 **Control Treatment:** In the control group, the 105 (Class C: 51, Class D: 54) students in the two intact 351 classes were exposed to the same concepts in Physical Geography using the Conventional (Lecture) Method. This involved the teacher delivering lessons to the students using chalk and chalkboard. In this 352 353 category, the teacher directs the teaching learning process and learners just listened and took notes. The 354 focus here lies in knowledge transmission in an effort to cover the content expediently without necessarily paying attention to whether learners understood or not. The teachers in this group were the centre of 355 356 knowledge transmission and the learners, a box in which knowledge was transmitted into and expected to 357 regurgitate same when ask to do so. Very little time was given to students to contribute to the teaching 358 learning process. Moreover, teachers in this group were cautioned not to digress into any form of activity-359 based learning during lesson delivery, as they were to abide strictly to the guidelines provided in the 360 lesson plans for Conventional (Lecture) Method.

**Phase Four:** This was the post-treatment stage. After teaching the experimental and control groups using Mastery Learning Strategy and Conventional Method, the post test was administered. The post test (which was a reshuffled version of the pre-test) was administered on the Experimental and Control groups on the sixth week. The scripts of students in the two groups were collected for marking and were scored over 100, and the scores were used for further statistical analysis.

### 367

361

# 368 2.6 Method of Data Analysis369

370 Prior to statistical analysis, the data (students' test scores in the experimental and control groups) were 371 subjected to a normality test using the Shapiro-Wilk test of normality to find out the statistical tool that 372 could best be applied to test the hypotheses. The Shapiro-Wilk test revealed that the data were not 373 normally distributed for hypotheses one and two (p < 0.05) and normally distributed for hypotheses three and four (p > 0.05). Hence, the non-parametric Mann-Whitney U test was applied in testing hypotheses 374 375 one and two, the paired samples t-test statistic was used to test hypothesis three and the independent t-376 test was used for hypothesis four. Statistical Package for Social Sciences version 23 (SPSS Inc. Chicago, 377 IL, USA) was used for analysis and probability level of p < 0.05 was considered statistically significant.

# 378379 3. RESULTS

380

In order to determine the students' entry behaviour at the onset of the study; students' pre-test scores in the experimental and control groups were subjected to analysis using the Mann-Whitney U test. The result is presented in Table 2.

384

385Table 2: Summary of Mann-Whitney U test of pre-test results of students in the mastery learning strategy and386conventional method

Variable	Ν	Mean Rank	Sum of Ranks	U	Asymp. Sig. (2-tailed)
Mastery Learning Strategy	113	105.17	11884.00		
				5443.00	.292
Conventional Method	105	114.16	11987.00		
Net O'surificant a OF					

387 Not Significant, p > .05.

388

The analysis in Table 2 reveals that there is no significant difference in the achievement of students in Physical Geography in the experimental and control groups before the treatment (U = 5443.00, p = 0.292). This indicates that the students had homogenous entry behaviour before the treatment.

### 393 Hypotheses Testing

394

H<sub>01</sub>: There is no significant difference in the achievement of students taught Physical Geography using
 Mastery Learning Strategy and Conventional Method.

397

To test this hypothesis, the post test scores of students taught Physical Geography using Mastery Learning Strategy and Conventional Method was analyzed using Mann-Whitney U test statistic. The result shows that there is a significant difference in the achievement of students taught Physical Geography using Mastery Learning Strategy and Conventional Method (U = 3880.50, p = 0.000) (Table 3).

403

 404
 Table 3: Summary of Mann-Whitney U test results of post test scores of students in the mastery learning

 405
 strategy and conventional method

Ν	Mean Rank	Sum of Ranks	U	Asymp. Sig. (2-tailed)
113	127.66	14425.50		
			3880.50	.000*
105	89.96	9445.50		
	N 113 105	N         Mean Rank           113         127.66           105         89.96	N         Mean Rank         Sum of Ranks           113         127.66         14425.50           105         89.96         9445.50	N         Mean Rank         Sum of Ranks         U           113         127.66         14425.50         3880.50           105         89.96         9445.50

406 407

In other words, students post test scores of the experimental group taught by Mastery Learning Strategy
exhibited significant differences when compared to those of the control group taught with Conventional
Method. This finding indicates that the Mastery Learning approach is more effective in increasing
students' achievement in Physical Geography.

412

413 Ho<sub>2</sub>: There is no significant difference in the Learning Retention of students taught Physical Geography
 414 using Mastery Learning Strategy and Conventional Method.

415

The learning retention of students in both knowledge and comprehension items in the two groups was evaluated. Results obtained show a significant difference in the learning retention of students taught Physical Geography using Mastery Learning Strategy and Conventional Method (U = 2893.50, p = 0.000) (Table 4).

420

421Table 4: Summary of Mann-Whitney U test results of learning retention of students in the mastery learning422strategy and conventional method

Variable	Ν	Mean Rank	Sum of Ranks	U	Asymp. Sig. (2-tailed)
Mastery Learning Strategy	113	136.39	15412.50		
				2893.50	.000*
Conventional Method	105	80.56	8458.50		

423 \*Significant; p < .05.

This implies that students' retention scores in Physical Geography in the Mastery Learning Strategy group
 is significant compared to their counterparts in the control group.

427 **H**<sub>03</sub>: The achievement of students in the Lower Order (knowledge, comprehension and application) and 428 the Higher Order (analysis and synthesis) Cognitive Domain taught Physical Geography by Mastery 429 Learning Strategy were compared using the paired samples t-test. The result reveals that the difference 430 in the achievement of students in lower and higher order cognitive domain for Mastery Learning Strategy 431 is not significant (t = 1.588, df = 225; p = 0.114) (Tables 5).

432

# 433Table 5: Summary of paired t-test analysis of post scores of students in the lower order and the higher order434cognitive domain taught Physical Geography using mastery learning strategy

Variable	Order of Cognitive Domain	N	Mean	SD	df	t	Sig. (2-tailed)
Mastery Learning Strategy	Lower	113	50.05	16.39	225	1.588	.114
	Higher	113	46.73	14.99			
Not Significant: n > 05							

435 Not Significant; p > .05.

436 Despite the fact that the students in the experimental group scored higher in the lower order cognitive 437 domain (M = 50.05) compared to their mean score in the higher order cognitive domain (M = 46.73), the 438 table depicts that the difference is statistically insignificant. This implies that the Mastery Learning 439 Strategy enhanced students' achievement across all levels of cognitive domains.

H<sub>04</sub>: The achievement of students at different levels of cognitive domain (i.e., knowledge, comprehension, application, analysis and synthesis) taught Physical Geography by Mastery Learning Strategy and Conventional Method was analyzed using independent samples t-test. The results obtained reveals that there is a significant difference in the post test scores of students at different levels of cognitive domain taught Physical Geography using Mastery Learning Strategy and Conventional Method (Table 6).

446

Table 6: Summary of t-test analysis of post test scores of students at different level of cognitive domain
 taught Physical Geography using mastery learning strategy and conventional method

Cognitive Domain	Teaching Method	Ν	Mean	SD	df	t	Sig. (2-tailed)
Knowledge	Mastery Learning Strategy	113	17.12	7.07	216	8.350	.000*
	Conventional Method	105	9.03	7.23			
Comprehension	Mastery Learning Strategy	113	17.07	7.58	216	4.830	.000*
	Conventional Method	105	11.79	8.56			
Application	Mastery Learning Strategy	113	18.58	7.20			
	Conventional Method	105	10.80	7.42	216	7.797	.000*
Analyses	Mastery Learning Strategy	113	16.79	7.87			
	Conventional Method	105	10.67	7.32	216	5.935	.000*
Syntheses	Mastery Learning Strategy	113	16.21	6.27			
	Conventional Method	105	11.47	8.65	216	4.661	.000*

449 \*Significant; p < .05.

450

451 Students taught Physical Geography through Mastery Learning Strategy performed better in all spheres 452 of cognitive domain compared to their counterparts taught through the Conventional Method. This 453 scenario could further be depicted graphically (Fig. 1).

454

455

456 457

407

458

459

460

#### 461 Fig 1: A bar chart showing mean score of students at different levels of cognitive domain taught Physical 462 Geography using mastery learning strategy and conventional method

463





#### 464 465 466

#### 4. DISCUSSION 467

468

469 Mastery learning strategy offers re-teaching and re-testing procedures. It motivates students through 470 verbal and written praise and also makes sure that students master a unit before advancing to the next. In 471 this study, the homogeneity of students' achievement in the experimental and control groups prior to 472 treatment were evaluated by subjecting their pre-test scores in Physical Geography to Mann-Whitney U 473 test. The analysis revealed that there was no significant difference in the achievement of students in 474 Physical Geography in the experimental and control groups prior to treatment (U = 5443.00, p = 0.292). 475 This suggests that the two groups were guite homogenous; which implies that students engaged in the 476 study had relatively equal background knowledge of Physical Geography. 477

478 Mastery Learning Strategy could provide quality instruction, immediate feedback and remedial lessons for 479 the attainment of lesson objectives [14]. Comparing students' achievement taught Physical Geography using Mastery Learning Strategy and Conventional Method by Mann-Whitney U test, indicated that 480 students exposed to Physical Geography through mastery learning achieved remarkable results when 481 compared to their counterparts taught through the Conventional Method. This finding coincides with the 482 works of [16], [21], [17], [18], [22] and [23] who found that Mastery Learning Strategy improved students' 483 achievement better than the Conventional Teaching Method. It has been argued that conventional 484 485 teaching method is content centred in which teachers remain more active, more cognitive and less 486 effective [24]. The method is concerned with the recall of factual knowledge and largely ignores higher 487 levels of cognitive outcomes, the teacher seeks to transfer thoughts, and meanings to the learners 488 leaving little room for student-initiated questions, independent thought or interaction among students; also, it is detrimental to students' learning process [12, 24, 26, 27]. The use of this method might have 489 490 influenced the achievement of students negatively in the Conventional Method group.

491

492 It was observed that students spent more time to achieve mastery the first time instruction was given to 493 them, but on subsequent instruction, they spent less time. This could be attributed to the fact that the first lesson was a prerequisite to the next lesson. Hence, time that was lost during the first lesson was recovered in the second lesson. The strategy facilitated a better understanding of the concept as students were not allowed to learn new lessons until the previous one was properly understood. This finding agrees with [28] who pointed out that teachers should have the knowledge of how students learn and how best to teach the concepts of a particular subject. Similarly, [29] noted that the teaching strategy that a teacher adopts is one factor that may affect students' achievement and therefore the use of an appropriate teaching method is critical to successful teaching and learning.

502 Mastery Learning is characterized by clear phases, initial instruction, formative testing, remediation, and 503 corrective and summative testing [16]. In this study, better Learning Retention of students in Physical 504 Geography taught using Mastery Learning Strategy than those taught using the Conventional Lecture 505 Method was observed. A study conducted by Davis and Sorrel [30] asserts that Mastery Learning had 506 been proven to be positive and successful especially in the area of learning and retention of content. 507 Similarly, the finding of this study buttresses the works of [16], [21] and [12] on the effect of Mastery 508 Learning Strategy on students' achievement.

509

510 This study observes that Mastery Learning Strategy has the potential of leveling up the achievements of 511 learners across various cognitive domains of learning. Students taught Physical Geography using 512 Mastery Learning Strategy achieved remarkable results in the lower and higher order cognitive domains 513 tested. This finding is consistent with work of Hussain and Suleman [16] who reported that students who 514 were taught through mastery learning strategy showed better performance in each level of cognitive 515 domain. This is an indication that the learners had a better understanding of previous concepts in Physical Geography serving as a prerequisite to learning the future ones. This could have contributed to 516 the remarkable success recorded by students in the experimental group at each level of the cognitive 517 domains that were tested. In this study, peer tutoring was encouraged in and out of class time, where the 518 students checked each other for mastery. They tutored one another and verified that everyone mastered 519 520 the sub-topic and was ready for the test. Since Mastery Learning stresses need for formative assessment 521 and feedback for each unit, a variety of remediation materials were prepared. This could be advanced as 522 the reason for the result obtained in this group.

523

524 Mastery Learning has been shown to promote high cognitive learning outcomes of students [31-34]. 525 Similarly, this study also revealed that students who were exposed to Physical Geography through 526 Mastery Learning were exceptionally better in each level of cognitive domains of learning compared to 527 their counterparts in the control group. This finding corroborates other reports that found the Bloom's 528 Mastery learning approach to be more effective, successful and useful in different levels of cognitive 529 domains (i.e., knowledge, comprehension, application, analysis and synthesis) compared to the 530 traditional lecture method [16, 11].

531 532 The most important feature of Mastery Learning Strategy is that it accommodates the natural diversity in 533 learning abilities among different groups of students. It provides flexibility that accommodates all students 534 according to their respective levels of learning and understanding. This type of learning strategy does not 535 only enhance students' achievement but also stimulates students to be more actively involved in the 536 teaching learning process. This is unlike the conventional method where learners are passive during

- 537 lesson delivery.
- 538

# 539 **5. CONCLUSION**

540

The Mastery Learning Strategy had been shown to be outstanding, effective and efficient in promoting the desired learning outcomes of students in Physical Geography. It gave students the opportunity to study material unit after unit until they mastered it. Through differentiated and individualized instruction, progress monitoring, formative assessment, feedback, corrective procedures, and instructional alignment, students exposed to learning of concepts in Physical Geography using MLS retained the concepts better than their counterparts in the control group. Furthermore, the strategy enhanced students' achievement across all levels of cognitive domain, thus, establishing its efficacy in bridging the achievement gaps among learners of various abilities. Mastery Learning Strategy could therefore be used by Geography
 teachers in secondary schools to alleviate the difficulties students are faced with in Physical Geography.

550

551 6. RECOMMENDATIONS

552

553 The following are recommendations for the study:

This study provides empirical evidence on the effectiveness of MLS teaching strategy in enhancing academic achievement of students in Physical Geography. This implies that the use of MLS in the teaching of Physical Geography at secondary school level can address the poor achievement and low enrolment of students in the subject.

558

The Federal and State Ministries of Education and other educational bodies like Nigeria Educational Research and Development Council (NERDC) and the Science Teachers Association of Nigeria (STAN) should organize training/ workshops for Geography teachers. This could be done in order to update their knowledge on the use of the mastery learning instructional strategy to improve teaching and learning in Nigerian schools.

564

575

565 The curriculum developers should design curriculum based on mastery learning principles in teaching 566 Physical Geography. Teachers on the other hand should be encouraged to adopt a mastery learning 567 approach of teaching in order to enhance the cognitive learning outcome of students in Geography. 568

Teacher educators will find the study useful in developing programmes aimed at producing teachers capable of meeting up with the evolving trends in the sphere of education. In so doing, teachers would be equipped and be capable of structuring the learning environment that can equalize their interaction with learners, enabling greater learner participation, satisfaction and further academic aspirations.

## 574 7. LIMITATIONS OF THE STUDY

Some of the research assistants and students engaged in the study thought that the experiment was
 deliberately planned to expose the school's inadequacies and the students' terminal performance.
 Therefore, the possibility of some teachers aiding their students may not be completely overruled.

In one of the sampled schools assigned the experimental treatment, due to the time consuming nature of mastery learning, the teachers could not exhaust the contents within the prescribed time (6 weeks). Even though this did not impact negatively on the achievement of students in this group when compared with that of the control group, there is no doubt that pieces of information prepared for students in these content areas were obviously lost.

The study was a quasi-experimental research. Therefore, it focuses primarily on the learning of one aspect of Geography, that is, Physical Geography using the Mastery Learning Strategy. The study was limited to students offering Geography in the public senior secondary schools in Ganye educational zone, Adamawa State. Academic achievement of the students was limited to their achievement scores in the PGART (in five content areas) designed for this study from the SSCE curriculum.

# 591592 **REFERENCES**

- 593
- Suwopoleme SE, Sababa LK, Filgona J. Effect of fieldtrip strategy on senior secondary school students achievement in Geography in Numan Educational Zone, Adamawa State, Nigeria. European Journal of Education Studies. 2016;2(12):138-154.
- Sofowora OA, Egbedokun A. An empirical survey of technology application in teaching Geography
   in Nigerian secondary schools. Ethiopian Journal of Environmental Studies and Management.
   2010;3(10):46-54.
- 6003.Filgona J, Sababa LK, Filgona J. Effect of hands-on learning strategies on senior secondary school601students' academic achievement in topographical map studies in Ganye Educational Zone,

- 602 Adamawa State, Nigeria. International Journal of Social Science and Humanities Research. 603 2016;4(3):276-287.
- 4. Pepple TF. Effects of cooperative learning and programmed instructional strategies on students' learning outcomes in chemistry. An unpublished Ph.D. Thesis, Delta State University, Nigeria;
   2010.
- 5. Usman KO, Memeh E. Improving students' achievement in further Chemistry using team teaching approach. Review of Education. 2007;18(1):15-21.
- 609 6. Filgona J. Effects of hands-on learning strategies on students' achievement. Germany: Lambert 610 Academic Publishers (LAP); 2016.
- Akinniyi FE, Olalaye BO, Adewumi AA. The state of quality teaching/learning in pre-service
  chemistry teacher education programme. Nigerian Journal of Curriculum Studies. 2008;15(4):5561.
- 8. Linda D. Teachers quality and students' performance: A review of state policy in glass (Ed).
  Electronic Journal on Educational Policy Analysis Archive. 2000. Retrieved from http://www.scholar.google.com.
- 617 9. Clark G, Wareham T. Geography at University. 2003, London: SAGE Publication Ltd.
- 618 10. Eisner EW. Benjamin Bloom (1913-99). Paris, UNESCO: International Bureau of Education. 619 2000;3-56.

620 11. Bloom B. Learning for mastery. Evaluation Comment. 1968;1(2):1-5.

- Oluwatosin OB, Bello TO. Comparative effect of mastery learning and mind mapping approaches in improving secondary school students' learning outcomes in physics. Science Journal of Education. 2015;3(4):78-84.
- Anderson JR. Learning and memory: An integrated approach (2nd edition.). New York: John Wiley and Sons, Inc.; 2000.
- Abakpa BO, Iji CO. Effect of mastery learning approach on senior secondary school students' achievements in geometry. Journal of Science Technology Association, Nigeria. 2011;46(1):165-176.
- Akinsola MK. Mastery learning, cooperative mastery learning strategies and students' achievement
   in integrated science. 2007. Retrieved on September 20, 2011 from http/www.ipn.unikiel. deprojket/
   esenal /book/1132.
- Hussain I, Suleman Q. Effect of Bloom's mastery learning approach on students' academic
   achievement in English at secondary level. Journal of Literature, Languages and Linguistics.
   2016;23,35-43.
- Lamidi BT, Oyelekan OS, Olorundare AS. Effects of mastery learning instructional strategy on
   senior school students' achievement in the mole concept. Electronic Journal of Science Education.
   2015;19(5):1-20.
- 18. Udo MF, Udofia TM. Effects of mastery learning strategy on students' achievement in symbols,
   formulae and equations in chemistry. Journal of Educational Research and Reviews. 2014;2(3):28 35.
- 641 19. Obiageli EF. Influence of concept maps on achievement retention of senior secondary school students in organic chemistry. Journal of Education and Practice. 2013; 4(19):35-43.
- Filgona J, Sababa LK, Filgona J, Ndatuwong LG. Effects of concept mapping and brainstorming
  instructional strategies on junior secondary school students' achievement in social studies in Mubi
  Educational Zone, Nigeria. British Journal of Education, Society & Behavioural Science.
  2016;18(2):1-18.
- 647 21. Mitee TL, Obaitan GN. Effect of mastery learning on senior secondary school students' cognitive 648 learning outcome in quantitative Chemistry. Journal of Education and Practice. 2015;6(5):34-38.
- 649 22. Agboghoroma TE. Mastery learning approach on secondary students' integrated science 650 achievement. British Journal of Education. 2014;2(7):80-88.
- Adeyemo SA, Babajide VFT. Effects of mastery learning approach on students' achievement in physics. International Journal of Scientific & Engineering Research. 2014;5(2):910-920.
- 653 24. Singh YK. Teaching of social studies. New Delhi: APH Publishing Corporation; 2004.
- 25. Rao D. Science education in developing countries. New Delhi: Discovery Publishing House; 2001.

- Yore LD. What is meant by constructivist science teaching and will the science education community stay the course for meaningful reform? Electronic Journal of Science Education.
   2001;5(4).
- Zoller U. Teaching tomorrow's college science courses: Are we getting it right? Journal of College
   Science Teaching. 2000;29(6):409-414.
- Effandi Z, Zanaton I. Promoting cooperative learning in Science and Mathematics Education: A
   Malaysian perspective. Eurasia Journal of Mathematics, Science and Technology Education.
   2007;3(1):35-39.
- Wambugu PW, Changeiywo JM. Effects of mastery learning approach on secondary school students' Physics achievement. Eurasia Journal of Mathematics, Science & Technology Education.
   2008;4(3):293-302.
- Bavis D, Sorrell J. Mastery learning in public schools. Educational Psychology Interactive.
   Valdosta, GA: Valdosta State University. 1995. Retrieved January 3, 2013 from http://teach.valdosta.edu/whuitt/files/mastlear.html
- Ajogbeje OJ. Path-analytic model and the effect of some teaching strategies on variables affecting achievement in junior secondary school mathematics in Ondo State. Unpublished Ph.D. Thesis, Ekiti State University, Ado Ekiti, Nigeria; 2012.
- 672 32. Majid ED, Zahra SK. Effect of mastery learning method on performance and attitude of weak 673 students in chemistry. Iran: Elsevier Ltd; 2010.
- 674 33. Olufunmilayo IO. Enhanced mastery learning strategy on achievement and self-concept in senior
   675 secondary school chemistry. Humanity and Social Sciences Journal. 2010;5(1):19-24
- Atricia WW, Johnson MC. Effects of mastery learning approach on secondary school students'
  Physics achievement. Eurasia Journal of Mathematics, Science & Technology Education.
  2007;4(3):293-302.
- 679