# Effects of Digital Learning Platforms on Academic Achievement of Senior Secondary School students in Genetics in Ibadan North Local Government, Oyo State

**Damilola Jumoke IBIYEMI**
**LCU/PG/003962**

**Being a MPhil Thesis Submitted to the Department of Science Education, Faculty of Education, Lead City University, Ibadan, Oyo State, Nigeria**

**In Partial Fulfilment of the Requirements for the Award of Masters in Philosophy Degree (MPhil) in Biology Education**

**2025**

## Certification

This is to certify that Damilola Jumoke IBIYEMI with matriculation number LCU/PG/003962 carried out this research work titled "Effects of Digital Learning Platforms on Academic Achievement of secondary School Students in Genetics in Ibadan North Local Government of Oyo State "in the Department of Science Education, Faculty of Education, Lead City University, Ibadan, Oyo State, for the award of Master of Philosophy (MPhil) in Biology Education and that this has not been previously submitted.



_____ _____

Prof. P. O. Yara — Date
Supervisor

_____ _____

Prof. P. O.Yara — Date
Head of the Department

## Dedication

This research work is dedicated to God Almighty for being there with me all through the course of this study.

**Acknowledgment**

I wish to express my unreserved gratitude to the management of Lead City University, Ibadan, for the opportunity given to me to study at this renowned Institution. I appreciate them for providing a healthy academic environment for all students. I wish to acknowledge Oyo State Ministry of Education, Science and Technology for providing me relevant information to make my work easy and the support from the selected schools in Ibadan North Local Government Area, to carry-out my fieldwork.

The Researcher especially like to thank Prof. Philias O. Yara, my capable supervisor and the head of the Department of Science Education at Lead City University, Ibadan; Faculty of Education, for his immeasurable and priceless contributions. He helped me compose this thesis by providing a welcoming and supportive atmosphere. I am grateful to Prof. Donald A. Odeleye, the Dean of the Faculty of Education at Lead City University, Ibadan. I also acknowledge the contributions of Prof. Afolakemi O. Oredein, Prof. Adebo, Prof. Senimetu Ileuma, Associate Prof. Ukamaka E. Akuche, Associate Prof. Monilola D. Oyetade, Associate Prof. T.O. Oyedeji, Dr. Christianah O. Sam-Kayode, Dr. M.M. Ayantunji, Dr. B.S. Omoyajowo, Dr. O.T.P. Kilian, Dr. Sabina N. Obi, Dr. D.O. Ayeni, Dr. S. David, Dr. O. Gambo, Dr. H. Abdulai Semini, Dr. Y. Ibikunle, Dr. J Kolashi, Miss O.G. Oduali, Miss A. Awoniyi and the department administrator, Mrs E. Adams, I remain grateful to you all.

Also, during the course of my fieldwork; I specially appreciate the contributions of my research assistants Mr. Oyelade, Mr. Olaniyi Alaba and Mrs Bolarinwa from the selected schools where the research work is carried out and my data analyst Dr T. Ojo.My sincere Appreciation goes to my Husband in person of Mr Eyitayo Ibiyemi, for his support morally and financially to see me through the end of this programme.

Even though the above mentioned institutions and persons have assisted in the process of this research work, I alone stand responsible for the errors, if any, found in this work.



**Abstract**

Over the years, students struggle with Genetics topics in Biology due to their lack of interest, poor teaching methods and abstract nature of the topic. This study therefore determined the effects of digital learning platforms on senior secondary school students'

academic achievement in Genetics. Three hypotheses were formulated and tested at 0.05 level of significance. A quasi-experimental design using pretest- posttest approach was applied. Multi-stage sampling procedure was adopted. Three public secondary schools in Ibadan North Local Government Area were purposively selected based on their year of establishment. A sample size of 104 participants which comprised 50 male and 54 female participated in the study. Intact classes of SS 2 students in all the three schools were involved in the study. Genetics in Biology Achievement Test (GBAT) (KR-20 = 0.79) and instructional guides were used for data collection. Analysis of Covariance (ANCOVA) was used for data analysis. There was a significant main effect of treatment on students' academic achievement in Genetics [$F_{(2;101)=7.6,p<0.05.}$ There was a significant main effect of treatment on students' Academic Achievement in genetics ($F_{(2, 101)} = 7.60$; $p<0.05$, partial $\eta 2 = 0.14$). The students in flipped-google with collaboration group had the highest adjusted post-achievement score ($\bar{x} = 19.77$), followed by those in flipped-google without collaboration ($\bar{x} = 19.05$) and control ($\bar{x} = 17.21$) groups. There was no significant main effect of gender on academic achievement of students in Genetics. There was no significant interaction effect of treatment and gender on academic achievement in Genetics. Based on the findings, it is concluded that the digital learning platforms (flipped- google classroom with/without collaboration) were effective to teach Genetics in Biology. It is then recommended that Biology teachers should adopt the digital learning platforms in teaching as a student centered approach so as to boost their academic achievement in Genetics.

**Keywords:** Digital learning platforms, Flipped-google classroom learning approach, Genetics topics in Biology, Academic achievement in genetics.

**Word Count:** 294



**Table of Contents**

**Content** **Page**

Title Page i

Certification ii

Dedication iii

Acknowledgment iv

Abstract vi

Table of Contents vii

List of Tables ix

List of Figures x

List of Acronyms xi

**Chapter One: Introduction**

1.1 Background to the Study 1

1.2 Statement of the Problem 12

1.3 Aim and Objectives of the Study 13

1.4 Hypotheses 14

1.5 Significance of the Study 14

1.6 Scope of the Study 17

1.7 Limitation of the Study 18

1.8 Operational Definition of Terms 19

Endnotes 21

**Chapter Two: Literature Review**

2.1 Conceptual Review 25

2.1.1 Academic Achievement 25

2.1.2 Gender 39

2.1.3 Digital Learning Platform 56

2.1.2.1 Google Classroom 69

2.1.2.2 Flipped Classroom 85

2.1.4 Biology 91

2.1.5 Genetics 102

2.2 Theoretical Framework 110

2.2.3 Social Learning Theory 110

2.2.2 Active Learning Theory 116

2.3 Review of the Empirical Studies 123

2.3.1 Gender and Academic Achievement in Genetics 123

2.3.2 Google Classroom and Academic Achievement in Genetics 128

2.3.3 Flipped Classroom and Academic Achievement in Genetics 131

2.4 Conceptual Model 136

2.5 Summary of Gap in Literature Reviewed 137

Endnotes 139

**Chapter Three: Methodology**

3.1 Research Design 154

3.2 Population of the Study 155

3.3 Sample and Sampling Techniques 156

3.4 Description of the Research Instruments 157

3.4.1 Genetics in Biology Achievement Test (GBAT) 157

3.4.2 Teaching and Learning Activities Guides(TLAG) 158

3.5 Validity of Genetics in Biology Achievement Test (GBAT) 160

3.6 Reliability of Genetics in Biology Achievement Test (GBAT) 160

3.7 Method of Data Collection 161

3.7.1 Data Administration 161

3.8 Method of Data Analysis 162

Endnote 163

**Chapter Four: Results and Discussion of Findings**

4.1 Demographic Data Analysis 164

4.2 Presentation of Data 164

4.2.1 Hypotheses 164

4.3 Discussion of Findings 168

Endnotes 173

**Chapter Five: Conclusion**

5.1 Summary of Findings 174

5.2 Conclusion 174

5.3 Recommendations 175

5.4 Suggested Area for Further Research 175

Bibliography 176

Appendix I 193

Appendix II 200

Appendix III 204

Appendix IV 206

Bio-data 209

The University Compliance Certification 212

## List of Tables

**Table** **Title** **Page**

| | | |
|---|---|---|
| 3.1 | 3 × 2 Factorial Design | 154 |
| 3.2 | Schematic Representation of the 3 × 2 Factorial Matrix | 155 |
| 3.3 | Purposive Sampling for Selected Schools | 156 |
| 3.4 | Table of Specification Genetics in Biology Achievement Test for | 158 |
| 4.1.0 | Treatments and Gender Distribution | 164 |
| 4.1.1 | Main and interaction effects of treatment and gender of post Achievement in genetics | 165 |
| 4.1.2 | Mean Performance by Treatment and Control groups | 166 |
| 4.1.3 | Bonferroni comparison of Treatment and Control Groups Means by Post-Achievement in Genetics | 167 |




## List of Figure

**Figure** **Title** **Page**

2.1 Conceptual Model of Digital Learning Platforms on Senior Secondary School Students' Academic Achievement in Genetics 130



## List of Acronyms

| Abbreviation | Meaning |
|---|---|

| | |
|---|---|
| DNA | Deoxyribonucleic Acid |
| GPA | Grade Point Average |
| SAT | Standardized Achievement Tests |
| SSCE | Secondary Certificate Examination |
| SSS | Senior Secondary School |
| WAEC | West African Examination Council |
| NECO | National Examination Council |
| WASSCE | West African School Certificate Examination |
| PGH | Parental Gamete Horizontal |
| PGV | Parental Gamete Vertical |
| STEM | Science, Technology, Engineering and Mathematics |
| GAFE | Google Applications For Education |
| FCIVGC | Flipped Classroom Instruction using Google Classroom |
| GBAT | Genetics in Biology Achievement Test |
| SES | Socio-Economic Status |
| LMS | Learning Management Systems |
| OER | Open Educational Resources |
| VR | Virtual Reality |
| AR | Augmented Reality |
| WCAG | Web Content Accessibility Rules |
| RNA | Ribonucleic Acid |
| PCR | Polymerase Chain Reaction |
| GWAS | Genome-Wide Association Studies |

| | |
|---|---|
| ICT | Information Communication Technology |
| ANOVA | Analysis of Variance |
| GPT | Genetics Performance Test |
| ANCOVA | Analysis of Covariance |
| DELIM | Digital Educational Learning Initiative Malaysia |
| OSAT | Operating System Achievement Test |
| PPMC | Pearson Product Moment Correlation |
| CAT | Chemistry Achievement Test |
| FC – DGBL | Flipped Classroom – Digital Game – Based Learning |
| GCPT | Genetic Concepts Performance Test |
| KPK | Traditional Learning Approach |
| GCDK | Google Classroom Support with Collaborative Learning Approach |
| GCTK | Google Classroom Support without Collaborative Learning Approach |
| TLAG | Teaching and Learning Activities Guides |
| KR – 20 | Kuder – Richardson |
| FGWC | Flipped – Google Classroom with Collaboration |
| FGWOC | Flipped – Google Classroom without Collaboration |
| CONTS | Conventional Teachin g Strategy |