



# **Effect of Use of WAEC Syllabus on the Mathematical Achievement of WASSCE Candidates in Ghana**

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### **Author's contribution**

*The sole author designed, analyzed, interpreted and prepared the manuscript.*

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## **ABSTRACT**

Teachers in Ghana seem to have been persistent in complaining about the voluminous state of the Senior High School teaching curriculum and how impossible it is to complete it within the stipulated time of 3-years. There is yet another claim that the 3-year duration is only a cliché and that it is actually about 2 years (taking out statutory holidays, sporting activities, and vacation periods). This study, therefore, seeks to investigate the use of WAEC syllabus (which only considers the examinable components of the GES syllabus) on the mathematical achievement of WASSCE candidates in Ghana. The researcher adopted a convenience sampling technique comprising a sample of 64 WASSCE candidates in Ideal College School in Ghana. Four groups comprising of two core mathematics WASSCE private candidates' classes and two regular core mathematics WASSCE candidates' classes were used. Each category comprised of an experimental and a control group. All four classes were chosen out of six classes of final year students as they passed a homogeneity test (pretest which was their mock examination). The posttest used was the actual final WASSCE in core mathematics for private and regular candidates. A questionnaire instrument was also administered to 42 mathematics teachers in 4 different randomly sampled schools. Among the findings showed that private candidates treated with the WAEC syllabus outperformed those taught with the traditional GES syllabus. Also, regular candidates treated with the WAEC syllabus outperformed those taught with the traditional GES syllabus. Again, 91% of the mathematics teachers were oblivious to the examinable components of mathematics curriculum.

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The large class size was the greatest contributing factor to the perennial mass failure in core mathematics. It was recommended among others for Government of Ghana to as a matter of urgency set up a committee to develop a policy to regulate the class sizes acceptable in all schools of Ghana.

*Keywords: WAEC, WASSCE; GES; achievement; syllabus; curriculum.*

## 1. INTRODUCTION

Standardized intelligence and achievement tests were seen by proponents as tools which could bring efficiency to schooling by (a) providing a means of allocating a diverse population of students to educational experiences which were best suited to their "native" abilities, and (b) providing policymakers and the public with an objective and fair assessment of actual achievement [1]. Large-scale standardized testing in the United States can be traced to the First World War. At the beginning of U.S. involvement in the war, the military was overwhelmed with volunteers. American Psychological Association (APA) proposed developing an objective and scientific way for planners to allocate men to positions in the military hierarchy. Yerkes and his colleagues proposed and developed two tests designed to measure the mental ages of recruits and volunteers. The Army Alpha test was developed for examinees who could read and the Army Beta test was developed for those who could not. These examinations were administered to nearly two million young men. The military used the test results to classify examinees for various posts, ranging from those selected for officer training to those who were labeled "morons" or "imbeciles" and dismissed. The results of the Army testing project were widely considered to have been a phenomenal success. In fact, within a few decades after the war, the number and variety of standardized tests had increased exponentially and there was almost no sector of U.S. society untouched by the standardized testing movement [2]. The famous conclusion of National Commission on Excellence in Education (NCE), 1983 report [3], which pointed to poorly performing schools as a threat to national security, resonated with the public and policymakers in the early 1980s and served to place state-mandated high-stakes testing at the front of the educational agenda. Not long after this report was released, mandated standardized testing existed in nearly every state. Criterion-referenced testing (CRT) tests and minimum competency testing movements were linked to student promotions, teacher evaluations, school evaluations, and so on. The NCE report was

based on these tests. The current trend in standardized testing is toward what has been referred to as the standards movement. The idea is that not only should tests be more consistent with the ways in which people think and learn, but the content of the test and the criterion for performance should both reflect the highest standards with respect to national and international goals and norms. It should be noted that there is considerable debate on the quality and usefulness of state standards and their appropriate role in education [4]. The Elementary and Secondary Education Act of 1965 was designed to redress discrepancies in educational outcomes among students, which seemed to be linked to differences in socioeconomic background. The Title I provision of the act provided funds for schools serving large percentages of low-income students but added the caveat that schools needed to demonstrate their effectiveness using standardized tests. The impact was a dramatic increase in the use of standardized testing in schools. Standardized tests are assessment tools constructed by experts and published for use (mostly in educational settings) in many different schools. Americans first began seeing standardized tests in the classroom in the early 20<sup>th</sup> century. Standardized tests are practical and easy to administer. They tend to consume less time to administer compared to other assessments. Standardized testing results are quantifiable which helps in quantifying students' achievements and enables educators to identify proficiency levels and more easily identify students in need of remediation or advancement. Standardized tests are scored via computer, which frees up time for the educator. They are objective and not subject to educator bias or emotions. Standardized testing allows educators to compare scores of students within the same school and across schools. This information provides data on not only the individual student's abilities but also on the school as a whole. Areas of school-wide weaknesses and strengths are more easily identifiable. Standardized testing provides a longitudinal report of student progress. Over time, educators are able to see a trend of growth or decline and rapidly respond to the student's educational needs.

Development in virtually all parts of life is grounded on effective knowledge of mathematics (ministry of education, teaching syllabus for core mathematics, 2010) [5]. There simply cannot be any significant development in virtually any area of life without knowledge of mathematics. It is for this reason that the education systems of countries that are concerned about their development put great deal of emphases on the study of mathematics. The main rationale for the GES mathematics syllabus is focused on attaining one crucial goal: To enable all Ghanaian young people's to acquire the mathematical skills, insights, attitudes and values that they will need to be successful in their chosen careers and daily lives. The new syllabus is based on the premises that all students can learn mathematics and that all need to learn mathematics. The syllabus is therefore, designed to meet expected standards of mathematics in many parts of the world. Mathematics at the Senior High school (SHS) in Ghana builds on the knowledge and competencies developed at the Junior High School level. The student is expected at the SHS level to develop the required mathematical competence to be able to use his/her knowledge in solving real-life problems and secondly, be well equipped to enter into further study and associated vocations in mathematics, science, commerce, industry and a variety of other professions. The GES syllabus is structured to cover the three years of Senior High School. Each year work has been divided into units. SHS 1 has 13 units; SHS 2 has 12 units while SHS 3 has 4 units of work. The unit topics for each year have been arranged in a suggested teaching sequence. It is suggested that the students cover most of the basic math concepts in the first term of Year 1 before they begin topics in Elective mathematics. No attempt has been made to break the year's work into terms. This is deliberate because it is difficult to predict, with any degree of certainty, the rate of progress of students in each year. Moreover, the syllabus developers wish to discourage teachers from forcing the instructional pace but would rather advise teachers to ensure that students progressively acquire a good understanding and application of the material specified for each year's class work. It is hoped that no topics will be glossed over for lack of time because it is not desirable to create gaps in students' knowledge. The WASSCE Core Mathematics examination consists of two papers (Paper 1 and 2). Paper 1 is made up of 50 multiple choice questions in which candidates are expected to attempt all.

Paper 2 carries 100 marks and are in parts I and II. Part I carries 40 marks and is made up of five compulsory questions which are elementary in nature. Part II carries 60 marks and contains ten questions of greater length and difficulty. Candidates are expected to answer any five of the questions. The topics, contents and notes in the WAEC syllabus are intended to indicate the scope of the questions which will be set. The WAEC syllabus is examination biased. It is the examinable component of the GES syllabus. Whereas, the GES syllabus contains both examinable and unexaminable components [5].

The West African Senior School Certificate Examination (WASSCE) is administered to school candidates in the third year of their West African Senior School courses and to Private Candidates. The examination is for both selections to tertiary institutions and for certification. The examination is conducted in May / June for School candidates only and in October/November for Private Candidates. Results for the 2016 West Africa Senior School Certificate Examination (WASSCE). The statement said for Mathematics, 77,108 (32.83%) obtained A1-C6; 65,007 (27.68%) obtained D7-E8 whilst 89,477 (38.10%) had F9 [6].

Until 2007, senior secondary High school ended with the Senior Secondary School Certificate (SSSC). Its grading system went from A to E. In 2007, the SSSC was replaced by the West African Secondary School Certificate Examination (WASSCE). The WASSCE grading system adds numbers to the letters, offering a larger scale of evaluation. In both systems, each grade refers to a certain number of points. In order to join a Bachelor degree program, applicants are usually asked not to exceed 24 points at their WASSCE/SSS. To improve assessment and grading and also introduce uniformity in schools, it is recommended that schools adopt the following WASSCE grade structure for assigning grades on students' test results [5]. The WASSCE grading system is as follows:

Grade A1:	80 - 100%	- Excellent
Grade B2:	70 - 79%	- Very
Grade B3:	60 - 69%	- Good
Grade C4:	55 - 59%	- Credit
Grade C5:	50 - 54%	- Credit
Grade C6:	45 - 49%	- Credit
Grade D7:	40 - 44%	- Pass
Grade E8:	35 - 39%	- Pass
Grade F9:	34% and below	- Fail

## 2. STATEMENT OF THE PROBLEM

Globally, every nation agrees on the need for every citizen to have not just access but equity, inclusivity and efficiency in educational products. Standard tests provide a means of cross-school, cross-region, and cross-nation analysis. They also form the basis for a continuum in higher education such as admission into tertiary institutions and even sometimes form the basis of selection into jobs. All year round, students continue to fail in mathematics in the West African Secondary School certificate examination (WASSCE) particularly in Ghana. The doors to many students' future are often totally padlocked or put on hold until they re-sit the examinations since mathematics is one of the core subjects one is required to pass at credit level. Many, after several attempts at re-sit of the paper, get frustrated and give up on their education completely. This perennial problem has been a major concern for government and society. There have been several reasons attributed to this mass failure, some of which include (a) lack of qualified teachers (b) inability to complete the syllabus (c) lack of resources for learning (d) inadequate time spent in school (e) poor foundation of the students in mathematics. However, most of these assertions have not been scientifically verified as a contributing factor to the abysmal performance put up by the students in the WASSCE. In addition, even though each of these causes may contribute to some extent to the persisting problem, there is a pressing need to quantify their effects to know the most prevailing contributing factors. There is little or no indication or research to outline the most prevailing or contributing factors contributing to the mass failure in mathematics.

Ghana Education Service (GES) syllabus seeks to give a complete education to students by offering them examinable and non-examinable components. The non-examinable components include components that are meant to be a prerequisite to the study of higher order courses at the tertiary level. The non-examinable components are also to help give maturity and equip SHS graduates with adequate skills to do some level of computations in everyday life activities even if they choose to terminate their education. On the other side of the ledger, WAEC syllabus only focuses on the examinable component of the GES syllabus. Ghanaian politicians seem to have ceased fire on their long debate on whether SHS students should stay in school for three years or four-years. Going by the

current three-year duration, there is still a long cry by stakeholders (especially teachers) that it is impossible to complete the GES syllabus before the students write the WASSCE. It is however imperative to study whether achievements of candidates in mathematics will be improved if WAEC syllabus is incorporated in preparing candidates for WASSCE. To this end, it is also crucial to find significant factors that contribute to the mass failure in Mathematics so that teaching final year Mathematics classes or preparing private candidates can be improved.

## 3. PURPOSE OF STUDY

The main purpose of the study was to investigate the effect of the use of mathematics WAEC syllabus on the achievement of WASSCE candidates' in Ghana.

### *Research questions*

1. What is the mathematics teachers' view of the causes of mass failure in WASSCE core mathematics in Ghana?
2. Will the use of WAEC syllabus improve regular students' achievement in WASSCE Mathematics examination?
3. Will the use of WAEC syllabus improve private candidates' achievement in WASSCE Mathematics examination?
4. Is there any significant difference between the mathematical achievement of private candidates when GES is used and when WAEC syllabus is used?
5. Is there any significant difference between the mathematical achievement of regular candidates when GES syllabus is used and when WAEC syllabus is used?
6. Is there any significant difference between the mathematical achievement of regular and private candidates when GES syllabus is used?
7. What are the five greatest contributing factors to the mass failure in core mathematics in Ghana?
8. To what extent do mathematics teachers adopt the use of WAEC math syllabus?

## 4. METHODS

The researcher adopted a convenience sampling technique comprising of a sample 64 WASSCE candidates in Ideal College School in Ghana. Four groups comprising two core mathematics WASSCE private candidates' classes and two regular core mathematics WASSCE candidates

classes were used. Each category comprised of an experimental and a control group. All four classes were chosen out of six classes of final year students as they passed a homogeneity test (pretest). A recently conducted mock examination in mathematics was used to determine that the classes used are not significantly different in their scores. The posttest used was the actual final WASSCE core mathematics for private and regular candidates. The WASSCE results for the post-test were coded and analyzed. A questionnaire instrument was administered to 42 mathematics teachers in 4 different randomly sampled schools. The responses were coded and analyzed using weighted average and percentages. Four Likert Strongly Agree (SD), Agree (A), Disagree (D) and Strongly Disagree (SD) were used for the analysis of the questionnaire instrument. SPSS V23 software was used for the analysis.

**5. RESULTS AND DISCUSSION**

**Is there any significant difference between the mathematical achievement of private candidates when GES is used and when WAEC syllabus is used?**

**Table 1. Test of significance between private candidate groups taught with WAEC and GES syllabus**

	Value	df	P-value
Pearson Chi-Square	71.681	36	0.000

From Table 1, there was a significant difference between the mathematical achievement of WASSCE private candidates when they were taught using WAEC syllabus and when GES syllabus was used (P-Value, 0.000 < 0.05). We fail to reject the null hypothesis. It can be inferred from Tables 1 and 5 that private candidates treated with the WAEC syllabus outperformed those taught with the traditional GES syllabus.

**Will the use of WAEC syllabus improve the mathematical achievement of WASSCE private candidates?**

By inferring from Tables 1. and 5, private candidates treated with the WAEC syllabus outperformed those taught with the traditional GES syllabus.

**Is there any significant difference between the mathematical achievement of regular candidates when GES syllabus is used and when WAEC syllabus is used?**

**Table 2. Test of significance between regular candidate groups taught with WAEC and GES syllabus**

	Value	df	P-value
Pearson Chi-Square	128.402	42	0.000

From Table 2, there was a significant difference between the mathematical achievement of WASSCE regular candidates when they were taught using WAEC syllabus and when GES syllabus was used (P-Value, 0.000 < 0.05). We fail to reject the null hypothesis. It can be inferred from Tables 2 and 6 that regular SHS candidates treated with the WAEC syllabus outperformed those taught with the traditional GES syllabus. Candidates treated with the WAEC syllabus outperformed those taught with the traditional GES syllabus.

**Will the use of WAEC syllabus improve the mathematics achievement of WASSCE regular students?**

Form Tables 2 and 6, regular candidates treated with the WAEC syllabus outperformed those taught with the traditional GES syllabus.

**Is there any significant difference between the mathematical achievement of regular and private candidates when GES syllabus is used?**

**Table 3. Test of significance between groups taught with GES syllabus**

	Value	df	P-value
Pearson Chi-Square	44.444	42	0.369

From Table 3, there was no significant difference between the mathematical achievements of WASSCE private and regular candidates when both groups were taught with GES syllabus (P-Value, 0.369 > 0.05). We fail to reject the null hypothesis.

**Is there any significant difference between the mathematical achievement of regular and private candidates when WAEC syllabus is used?**

From Table 3, there was no significant difference between the mathematical achievements of WASSCE private and regular candidates when both groups were taught with GES syllabus (P-Value, 0.369 > 0.05). We fail to reject the null hypothesis.

**Table 4. Test of significance between groups taught with WAEC syllabus**

	Value	df	P-value
Pearson Chi-Square	32.350	36	0.643

**Table 5. Descriptive statistics of private candidate groups taught with WAEC and GES syllabus**

	N	Maximum	Mean	Std. deviation
WAEC	63	8	4.75	1.367
GES	63	7	3.65	1.346
Valid N (listwise)	63			

**What is the mathematics teachers' view of the causes of mass failure in WASSCE core mathematics in Ghana?**

Mathematics teachers (89.3% of them) were of the view that Lack of Qualified teachers is not a significant contributing factor to mass failure in core mathematics. 100% of the teachers agreed that inability of teachers to complete the mathematics syllabus is a major contributing factor to the mass failure in core mathematics. 83.3% of the teachers saw the poor foundation of students in mathematics as another contributing factor to the mass failure. Students' failure to practice mathematics is another major contributing factor (80.1% of the mathematics teachers believe so). Again, 74% of the teachers were of

the view that inadequate teaching and learning resources is another significant factor contributing to the mass failure. 94.4% of the teachers believed that SHS students require more than 3 years in school to help fight the canker of mass failure. 62.5% of the respondents were of the view that adequate workshops for mathematics teachers would improve the situation of mass failure. 100% of the mathematics teachers believed that large class size is one of the highest contributing factors of mass failure in core mathematics.

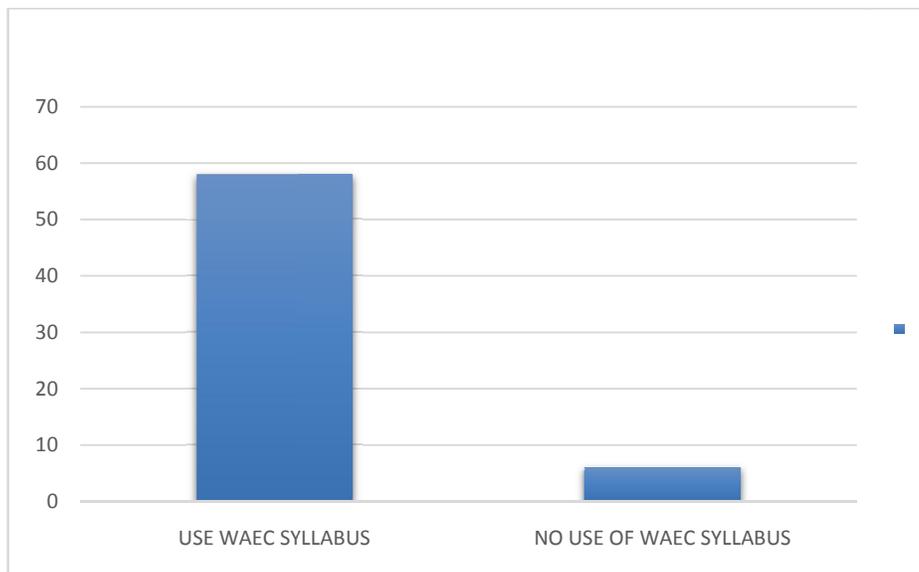
**Table 6. Descriptive statistics regular candidate groups taught with WAEC and GES syllabus**

	N	Mean	Std. deviation
WAEC	63	5.38	1.518
GES	63	4.05	1.419
Valid N (listwise)	63		

**What are the three greatest contributing factors to the mass failure in core mathematics in Ghana?**

From Table 5, the five (5) greatest contributing factors of mass failure in mathematics are respectively:

- Large class size (weighted mean of 4.00)
- Inability to complete syllabus (weighted mean of 3.95)



**Graph 1. Graph of use of WAEC syllabus in teaching of core mathematics**

**Table 7. Identification of causes of mass failure of WASSCE candidates in core mathematics**

Serial number	Reasons for failure in WASSCE	SA	A	D	SD	Weighted mean	Decision
1	Lack of qualified teachers	0 (0 %)	6 (10.7%)	20 (35.7%)	30 (53.6%)	1.33	Significantly disagree
2	Inability to complete syllabus	144 (96%)	6 (4%)	0 (0%)	0 (0%)	3.95	Significantly Agree
3	Poor foundation of students	120 (81.1%)	18 (12.2%)	8 (5.4%)	2 (1.3%)	3.52	Significantly Agree
4	Students failure to practice math	28 (43.1%)	30 (46.2%)	6 (9.2%)	1 (1.5%)	3.25	Agree
5	Inadequate resources	112 (72.3%)	3 (1.9%)	2 (1.3%)	38 (24.5%)	2.28	Significantly Agree
6	Inadequate time spent in school	96 (67.1%)	39 (27.3%)	6 (4.2%)	2 (1.4%)	3.40	Significantly Agree
7	Inadequate workshop for teachers	40 (45.5%)	15 (17.0%)	12 (13.6%)	21 (23.9%)	2.10	fairly Agree
8	Large class size	160 (96.4%)	6 (3.6 %)	0 (0 %)	0 (0 %)	4.00	Significantly Agree

[SA=Strongly Agree (weighted value =4), A= Agree (weighted value =3), D=Disagree (weighted value =2), SD=Strongly Disagree (weighted value =1)].

- Poor foundation of students in mathematics (weighted mean of 3.52)
- Inadequate time spent in school (weighted mean of 3.40), (four years duration better than 3-years)
- Students' failure to practice mathematics on their own (weighted mean of 3.25)

**To what extent do mathematics teachers adopt the use of WAEC math syllabus?**

The findings showed that 91% of teachers do not incorporate the WAEC syllabus in their teaching. By extension, 91% of the teachers do not know the examinable components of what they are teaching or they are highly likely not be very effective in revision activities towards their final examinations in core mathematics.

**6. CONCLUSION**

The findings of the study showed that private candidates treated with the WAEC syllabus outperformed those taught with the traditional GES syllabus. Also, regular candidates treated with the WAEC syllabus outperformed those taught with the traditional GES syllabus. The study found a significant difference between the mathematical achievement of WASSCE private candidates when they were taught using WAEC

syllabus and when GES syllabus was used. There was also a significant difference between the mathematical achievement of WASSCE regular candidates when they were taught using WAEC syllabus and when GES syllabus was used. There was no significant difference between the mathematical achievements of WASSCE private and regular candidates when both groups were taught with GES syllabus. In addition, there was no significant difference between the mathematical achievements of WASSCE private and regular candidates when both groups were taught with WAEC syllabus. The study identified large class size (weighted mean of 4.00), inability to complete syllabus (weighted mean of 3.95), poor foundation of students in mathematics (weighted mean of 3.52), inadequate time spent in school (weighted mean of 3.40), (four years duration better than 3-years) and students' failure to practice mathematics on their own (weighted mean of 3.25) as respectively the major factors responsible for the mass failure in mathematics in Ghana. The findings found that 91% of the mathematics teachers do not know the examinable components of what they are teaching or they are highly likely not be very effective in revision activities towards the final examinations of students in core mathematics.

## 7. RECOMMENDATIONS

Based on the findings of this study, the following recommendations are made:

1. Mathematics teachers should incorporate the WAEC mathematics syllabus in teaching final year students.
2. The government of Ghana should as a matter of urgency set up a committee to develop a policy to regulate the class sizes acceptable in all schools of Ghana.
3. Mathematics teachers should begin to intensify administering of home assignments to enable students to develop the habit of practicing mathematics on their own.
4. Circuit supervisors should intensify their supervision of Junior High School to ensure the teachers in those schools give the right foundations the students need in mathematics.
5. Heads of SHS institutions should hold meetings with their teachers to strategize and to put in measures that could enable them to complete the syllabus.
6. Politicians should give the experts the chance to research honestly into the right duration of Senior high school (3-years or 4-years) in Ghana.

## COMPETING INTERESTS

Author has declared that no competing interests exist.

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