

Training on difficult subject topics and administration of standardized achievement test to science teachers in Anambra State



Prof Uche Amazigo

Fellow, Nigerian Academy of Science (FAS)

.....
on behalf of the team, 2019

A good teacher is like a candle - it consumes itself to light the way for others."

Mustafa Kemal Atatürk, 2019

Teams

Lead Coordinator	Prof Uche Amazigo FAS, Director WHO (rtd)
Support group	Prof Angela Ekwunife Prof. Lilian-Rita Akudolu , Mr Ken Eukora, Coordinator ANSEPIP
Field Team and Peer Trainers	Mr Egbuche Chukwudi, Ezeigwe Fredrick Chinedu, Dr Ejikeme Chioma , Okafor Patrick, Mr Emma Nwagwu, Okoli Emmanuel , Nwankwo Gloria E, Mkpuluma Joyce E, Atu Chukwukelu F, Anyabolu Chika
Institutions	Nwafor Orizu College of Education, Nnamdi Azikiwe University, Odimegwu Ojukwu University, University of Nigeria, Nsukka
PPSSC, Anambra State	Post- Primary Secondary School Commission, Anambra State
Research/Study Initiator	HE, Chief (Dr) Willie Obiano, Executive Governor of Anambra State
Overall coordinator	Hon. Commissioner of Education: Prof Kate A. Omenugha
Commissioned by	Anambra State Government \$ ANSEPIP
Study team	20 MLA test Administrators, ANSEPIP staff, data analyst, data entry staff by PACIEH

How it all started

2019

Expansion of Teacher programme

2019

Capacity development of Science Teachers

2018

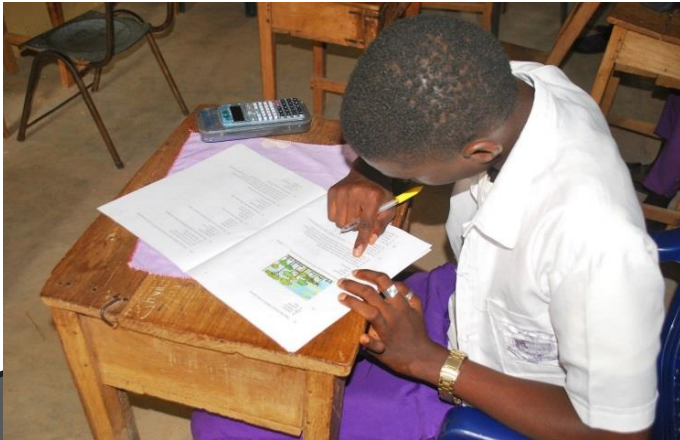
Monitoring Learning Achievement of Science Teachers

2017

MONITORING OF LEARNING ACHIEVEMENT OF STUDENTS IN PUBLIC SCHOOLS IN ANAMBRA STATE

2016

The Girl-Child Study



Overall objective of this study

To build the capacity of science teachers and improve the quality of teaching science in Public Secondary Schools in Anambra State.

❖ Focus

*Mathematics,
Biology,
Chemistry and
Physics*



What we did (1)

1. Administration of standardized achievement test (SAT) in **Biology, Chemistry, Mathematics and Physics** to 750 science teachers in 252 Public Secondary Schools in Anambra State
2. Teacher self-assessment and listing content difficult topics in subject(s) he/she is teaching students
3. Analysis of SAT and teacher self-assessment records
4. Mapping of teachers with the highest training needs in 252 secondary schools.
5. Determination of difficult topics in the four subjects.
Topics that at least 30% of the teachers do not understand and have difficulty teaching students.

What we did (2) - *Capacity development of teachers*

6. Identification of the most underperforming Education Zone in each subject.
7. Commenced as a pilot, a retraining programme in Mathematics for teachers in Otuocha education zone. (3 days intensive training) on Math difficult topics as listed in the self-assessment records by Otuocha teachers.
8. Training of Teachers using Peer teaching method.
 - a) Selection of the 8 best mathematics teachers in the State – Peer trainers
 - b) Preparatory meeting with Peer trainers
 - c) Development of lesson notes on the difficult mathematics topics by trainers.
 - d) Review of trainers' lesson notes by a Professor of Mathematics.
 - e) Printing and distribution of lesson notes to 32 mathematics teachers in Otuocha zone.
 - f) Administration of post test and Trainers' test

What we found



Public Schools and Teachers

Education Zone	Public Schools that took part in the MLA and capacity development initiatives	Teachers that sat for the MLA tests and indicated content difficult topics.
ZONE	No. of Schools	No. of Teachers
Aguata	43	117
Awka	61	178
Nnewi	52	148
Ogidi	39	90
Onitsha	29	143
Otuocha	28	74
Total	252	750

Secondary School Science Teachers that sat for Standardized Achievement Test for MLA, by zone

Education Zone	Mathematics	Biology	Chemistry	Physics	Zonal Total
Aguata	32	39	26	20	117
Awka	67	44	42	25	178
Nnewi	55	35	32	26	148
Ogidi	36	20	21	13	90
Onitsha	53	47	27	16	143
Otuocha	22	16	19	17	74
Subject Total	265	201	167	117	750

Findings from standardized MLA test (1)

❖ Biology and Chemistry teachers in Public Schools performed very well

➤ Chemistry

70.3% of 167 Chemistry teachers scored A

Overall average score of Chemistry teachers = 73%.

➤ Biology

❖ 64% of 201 Biology teachers scored A.

❖ **Overall average score of Biology teachers = >70%**

❖ 80% of the teachers in Ogidi zone scored A.

❖ 38% of the teachers in Otuocha zone scored A.

Findings from standardized MLA test (2)

❖ Teachers didn't perform well in Mathematics and Physics

❖ Mathematics

- 26% (68) of 265 teachers failed mathematics test if WAEC benchmark of 50% is applied.
 - 39% in Aguata zone and 43% in Otuocha zone failed.
 - **However, 46% of the teachers in Ogidi zone scored A in Mathematics**
-

❖ Physics

- 23% of 117 Physics teachers scored 'A' in Physics.
- 31% failed Physics - scored below the WAEC pass benchmark of 50%
- 38% of Physics teachers in Onitsha zone scored A

MLA Test: Teachers didn't perform well in Mathematics and Physics - 1



In Mathematics



26% (68) of 265 teachers **failed** mathematics test if WAEC benchmark of 50% is applied



39% in Aguata zone and 43% in Otuocha zone failed



However, 46% of the teachers in Ogidi zone **scored A** in Mathematics

MLA Test: Teachers didn't perform well in Mathematics and Physics - 2



In Physics



23% of 117 Physics teachers **scored 'A'**



31% failed Physics - scored below the WAEC pass benchmark of 50%



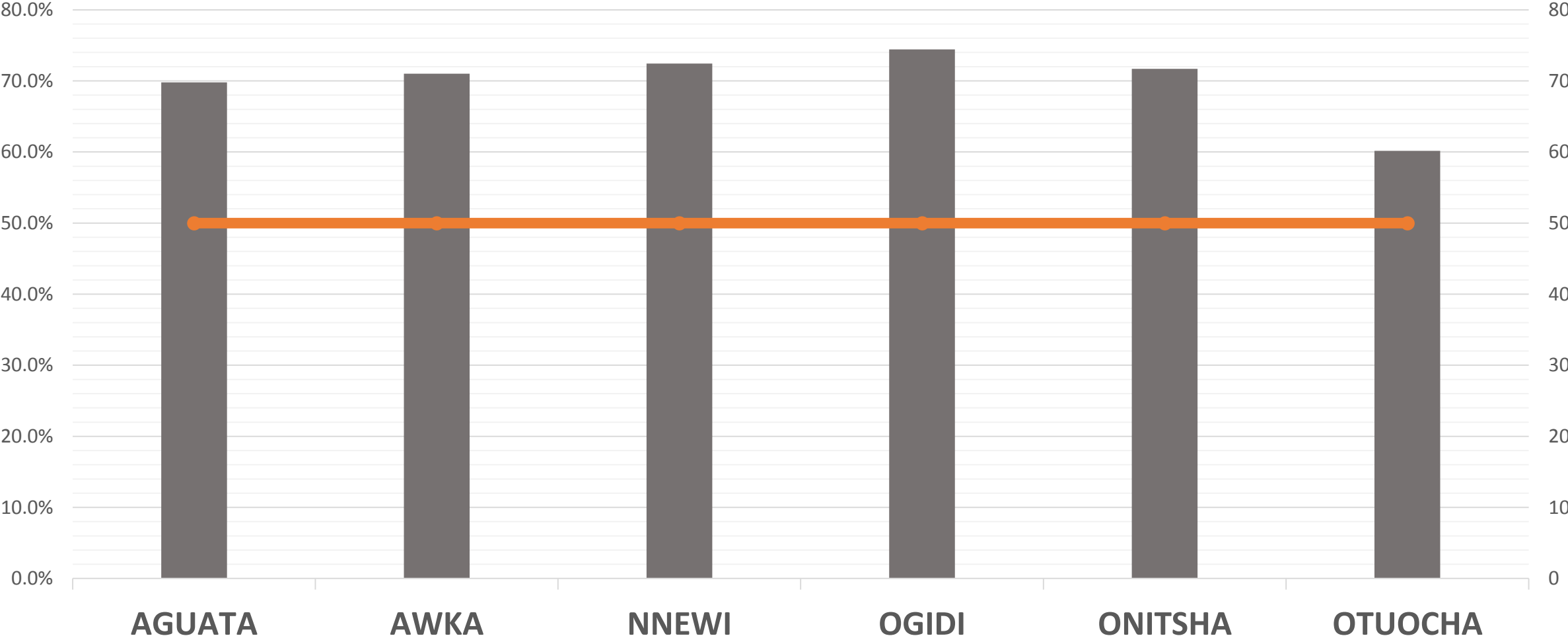
38% of Physics teachers in **Onitsha zone scored A**

Distribution of Average Score by Education Zone (%)

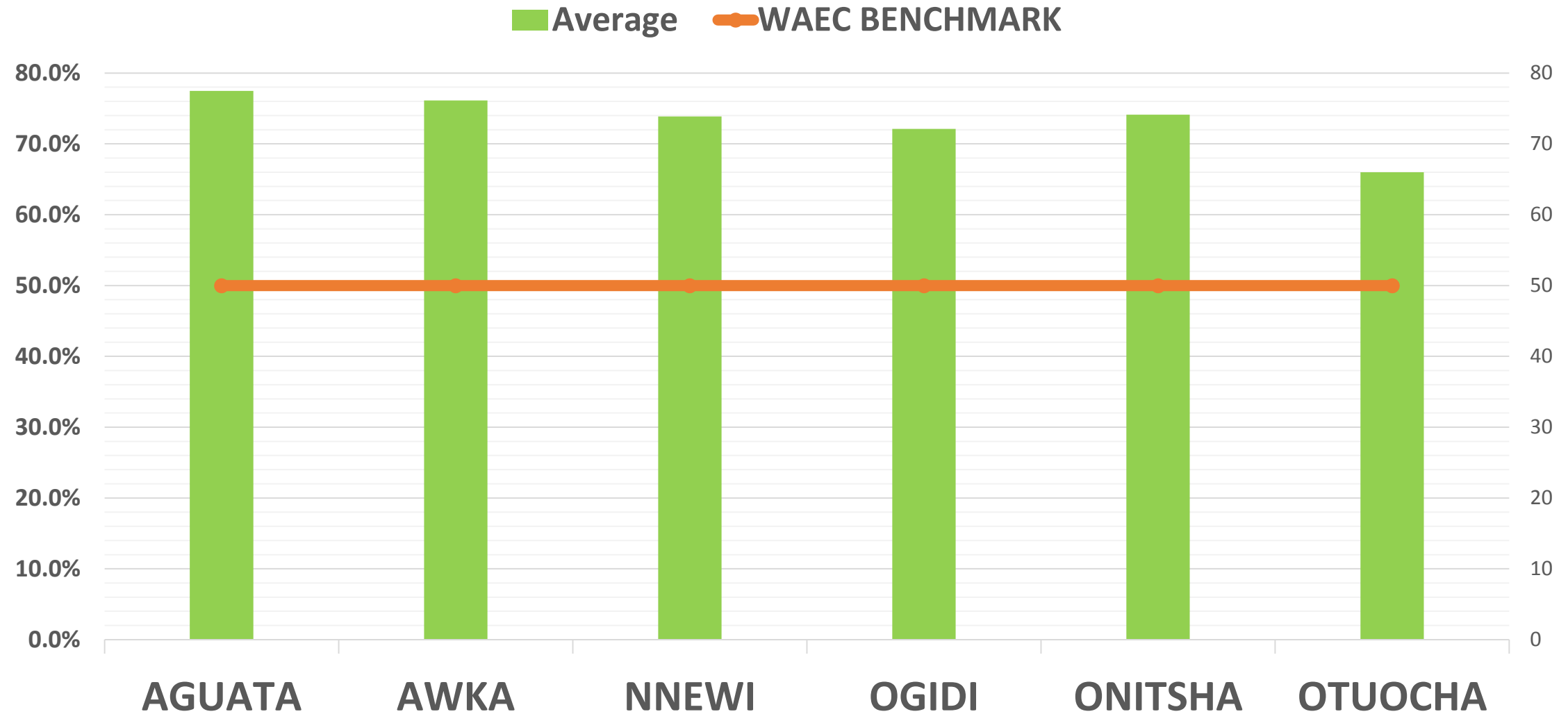
Zone	Biology (%)	Chemistry (%)	Mathematics (%)	Physics (%)
Aguata	69.8	77.5	56.1	58.1
Awka	71.0	76.1	60.8	55.4
Nnewi	72.4	73.9	60.3	59.3
Ogidi	74.4	72.1	65.8	57.3
Onitsha	71.7	74.1	60.5	60.1
Otuocha	60.1	66.0	51.6	50.9
Overall Average	69.9	73.3	59.1	56.9

Achievement of teachers in **Biology** and WAEC benchmark by Zone (%)

■ Average —●— WAEC BENCHMARK



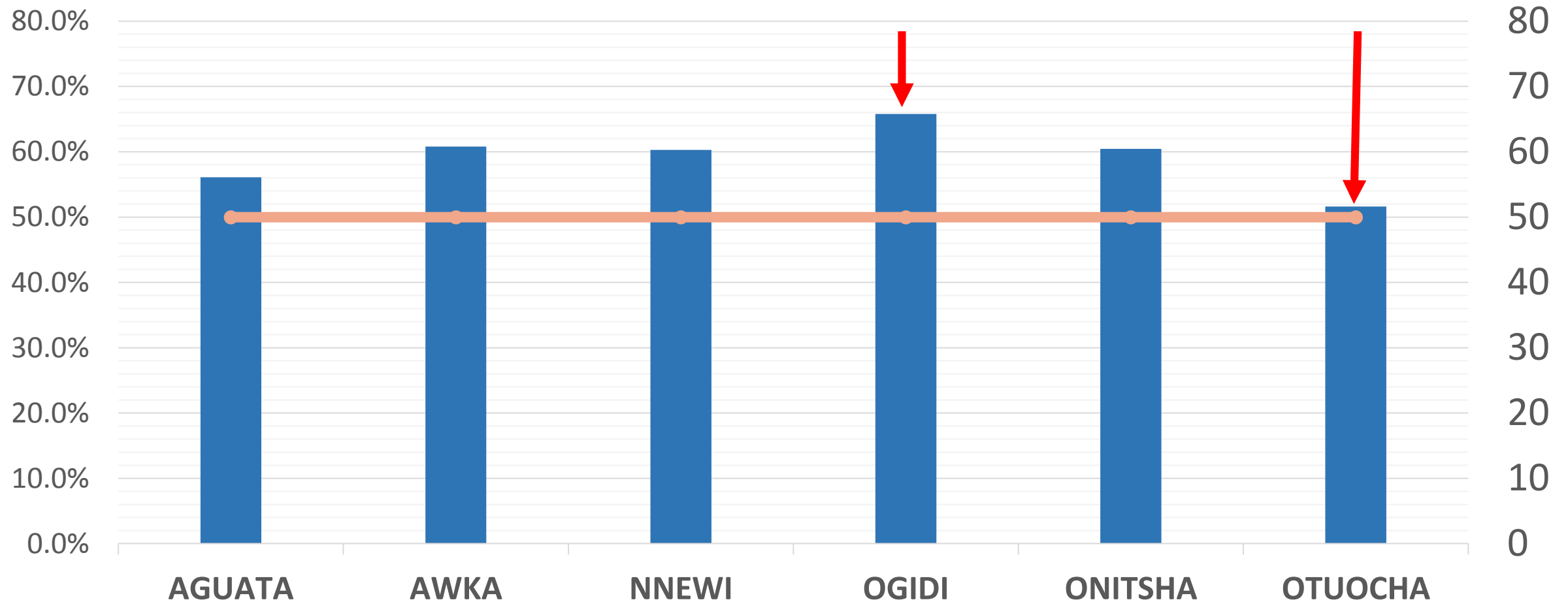
Achievement of teachers in **Chemistry** and WAEC benchmark by Zone (%)



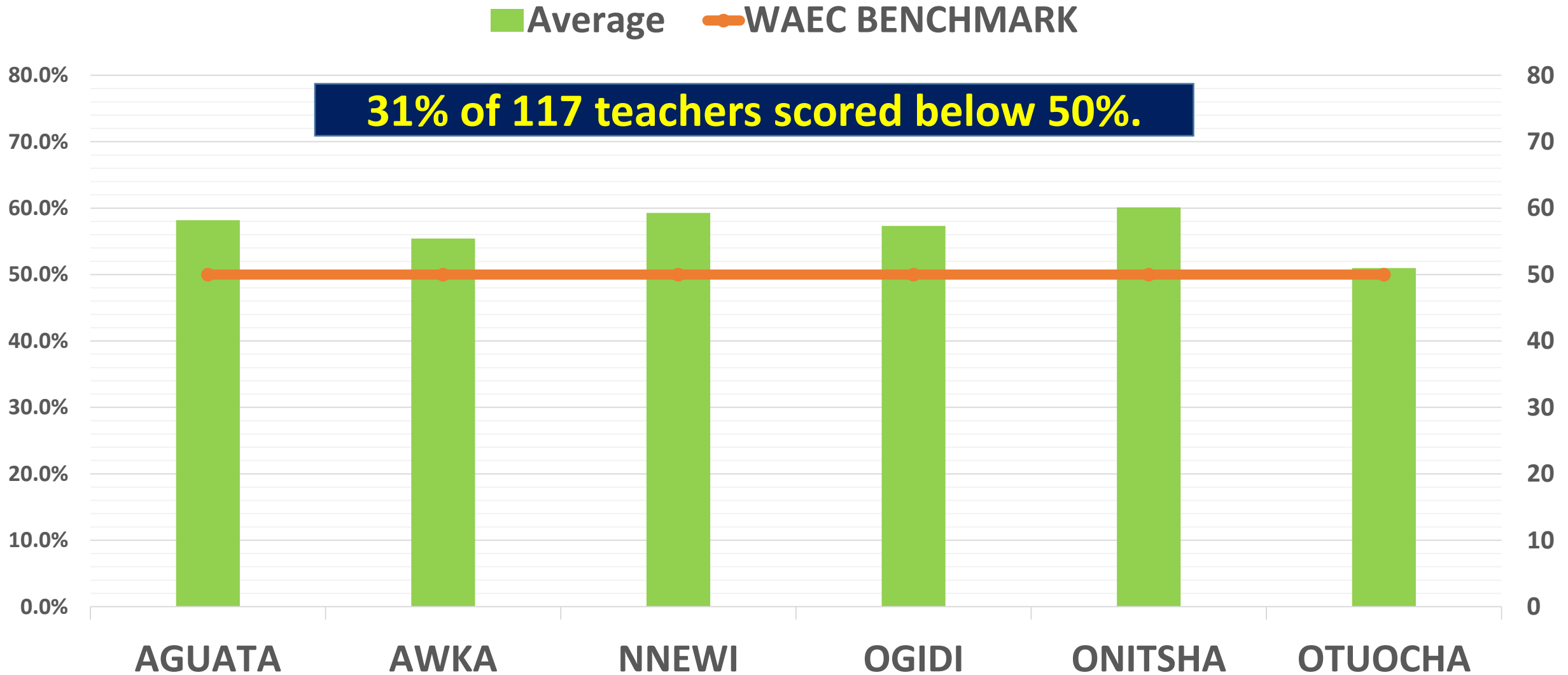
Achievement of teachers in **Mathematics** and WAEC benchmark by Zone

❖ **46% of 117 teachers in Ogidi zone scored A in mathematics**

■ Average —●— WAEC BENCHMARK



Achievement of teachers in **Physics** and WAEC benchmark by Zone (%)



Training needs of Secondary School teachers



Subject topics which more than 20% of teachers do not understand /cannot teach students

Mathematics	Sequence and series
(8)	Gradient of a curve
	Logical reasoning
	Chord Properties
	Circle Theorems
	Trigonometry
	Bearings
	Probability 1 & 2
Physics	Equilibrium of forces and bodies in liquids
(4)	Simple Harmonic Motion
	Latent Heat
	Forced Vibration
Biology	Aquatic & Estuarine Habitat
(7)	Reproduction In Earthworm, Cockroach, Housefly & Snail
	Transport System
	Excretory System In Invertebrates And Plants
	Ecological Tolerance
	Nutrient Cycles
	Reproductive System in Vertebrates – Fish, Amphibian, Reptile and Bird
Chemistry	Equilibrium
(6)	Mass Volume Relationship
	Redox Reaction
	Ionic Theory
	Electrolysis 1 & 11
	Esterification

Subject topics which more than 20% of teachers do not understand / cannot teach students

Mathematics – 8 (1)

Mathematics – 8 (2)

Physics – 4

Chemistry – 6

Biology – 7 (2)

• Aquatic & Estuarine

Biology – 7 (1)

-Reproductive System in Vertebrates – Fish, Amphibian, Reptile and Bird

Challenging modules for Mathematics teachers: 2nd term curriculum

N=265

Location	Gradient of a curve	Logical Reasoning	Linear Inequalities 1	Linear Inequality 2	Algebraic Fraction I	Algebraic Fraction 2	Chord Properties	Circle Theorem
Aguata	29.0	12.9	4.8	4.8	1.6	0.0	29.0	40.3
Awka	35.9	32.0	7.8	17.9	8.6	10.9	46.1	57.0
Nnewi	52.7	46.4	2.7	15.5	2.7	7.3	52.7	53.6
Ogidi	43.1	44.4	1.4	5.6	6.9	6.9	31.9	51.4
Onitsha	41.9	30.5	3.8	9.5	3.8	6.7	35.3	52.4
Otuocha	29.6	31.8	11.4	18.2	6.8	6.8	29.6	38.6
Overall Average	38.7	33.0	5.3	11.9	5.1	6.4	37.4	48.9

% of teachers who indicated in the self-assessment form the challenging subject topics

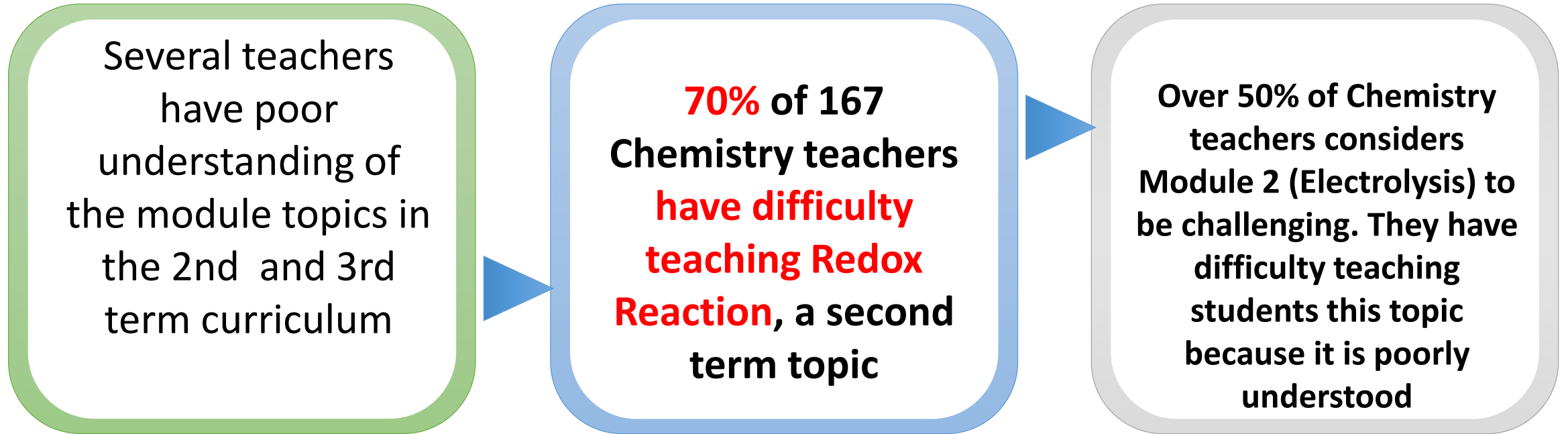
Challenging modules for Mathematics teachers: 3rd term curriculum

Education Zone	Trigonometry	Bearings	Measures Of Central Tendency I	Measures Of Dispersion	Histogram Of Grouped Data And Cumulative Frequency	Measures Of Central Tendency For Grouped Data	Probability 1	Probability 2
Aguata	14.5	24.2	3.2	8.1	11.3	3.2	6.5	12.9
Awka	19.5	65.6	1.6	13.3	4.7	5.5	10.9	32.0
Nnewi	27.3	53.6	2.7	24.6	12.7	13.6	5.5	37.3
Ogidi	19.4	44.4	8.3	11.1	8.3	6.9	8.3	25.0
Onitsha	21.0	53.3	4.8	18.1	7.6	3.8	4.8	18.1
Otuocha	27.3	47.7	2.3	11.4	4.6	11.4	6.8	27.3
Overall Average	21.5	48.2	3.8	14.4	8.2	7.4	7.1	25.4
	(57)	(128)					(19)	(67)

% of teachers who indicated in the self-assessment form the challenging subject topics

Content difficult topics based on teacher self-assessment

Chemistry



MATHEMATICS: Several subject items in the 2nd and 3rd term curriculum pose significant challenges to teachers in many of the public schools

49% and 40% of the teachers have poor understanding and cannot teach Circle Theorems and Gradient of a Curve, respectively.

Content difficult topics based on teacher self-assessment

Biology

30% of biology teachers have poor understanding of 3 to 4 topics in the curriculum

29.5% of 201 Biology teachers have poor understanding of Module 8 (Blood circulatory System).

56% of teachers in Nnewi,
48% in Ogidi,
41% in Otuocha zones
find Ecological Tolerance very challenging.

Physics

31% of Teachers have poor understanding and cannot teach Equilibrium of forces and bodies in liquids (First term Physics, Module 4)

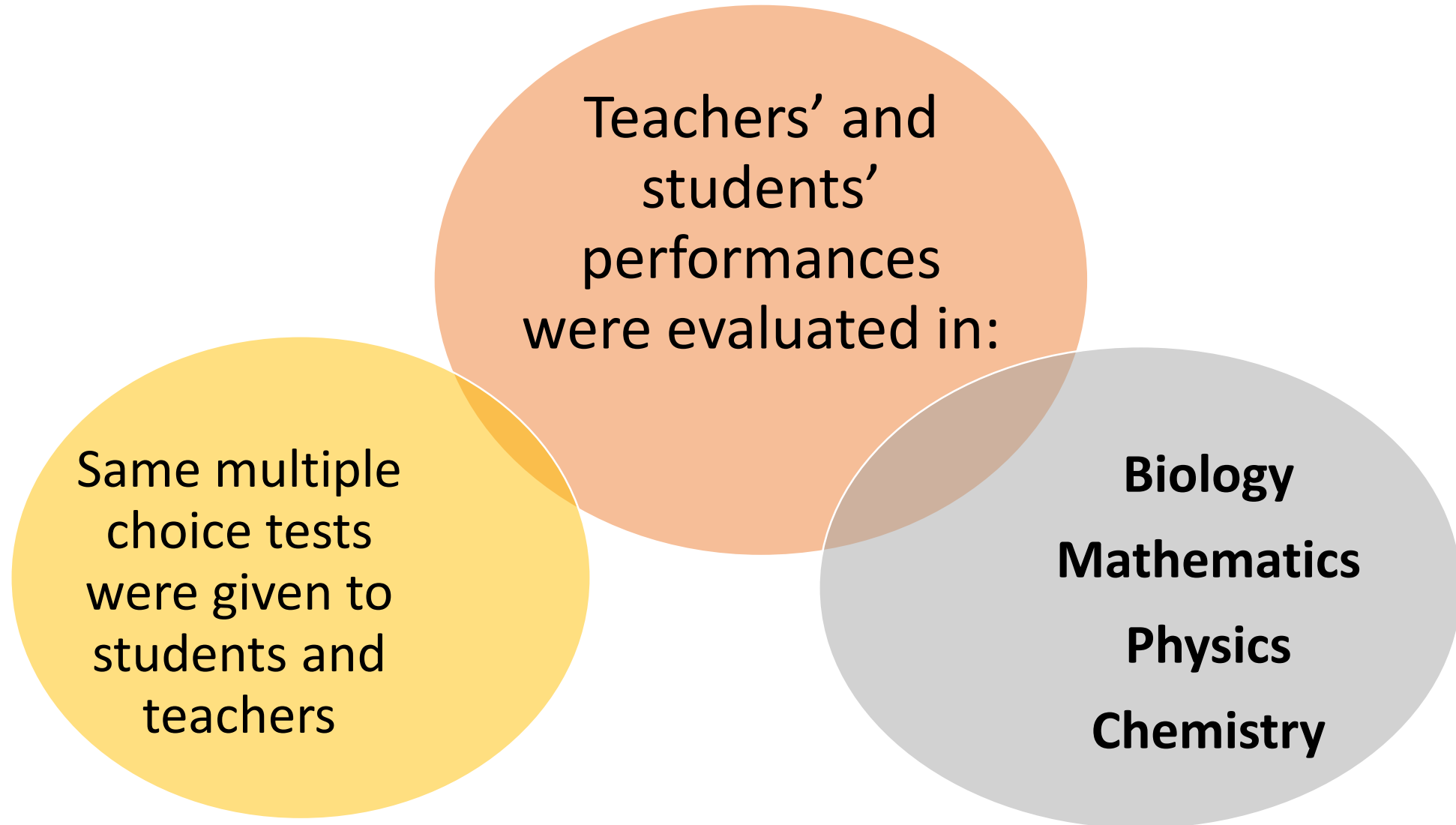
Performances at a glance

Teachers' and students' performances in

- ❖ Biology
 - ❖ Mathematics
 - ❖ Physics
 - ❖ Chemistry
- ❖ The same multiple choice tests were given to students and teachers



Methodology

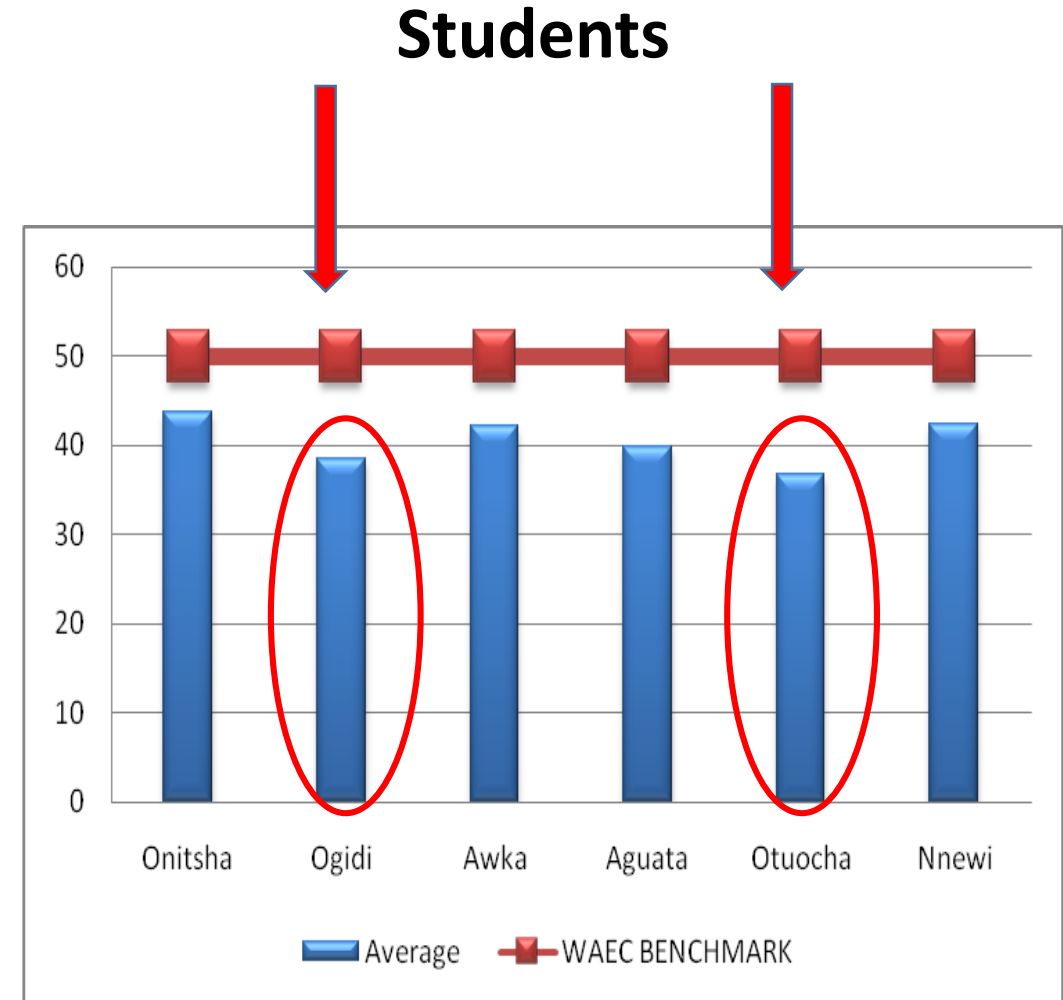
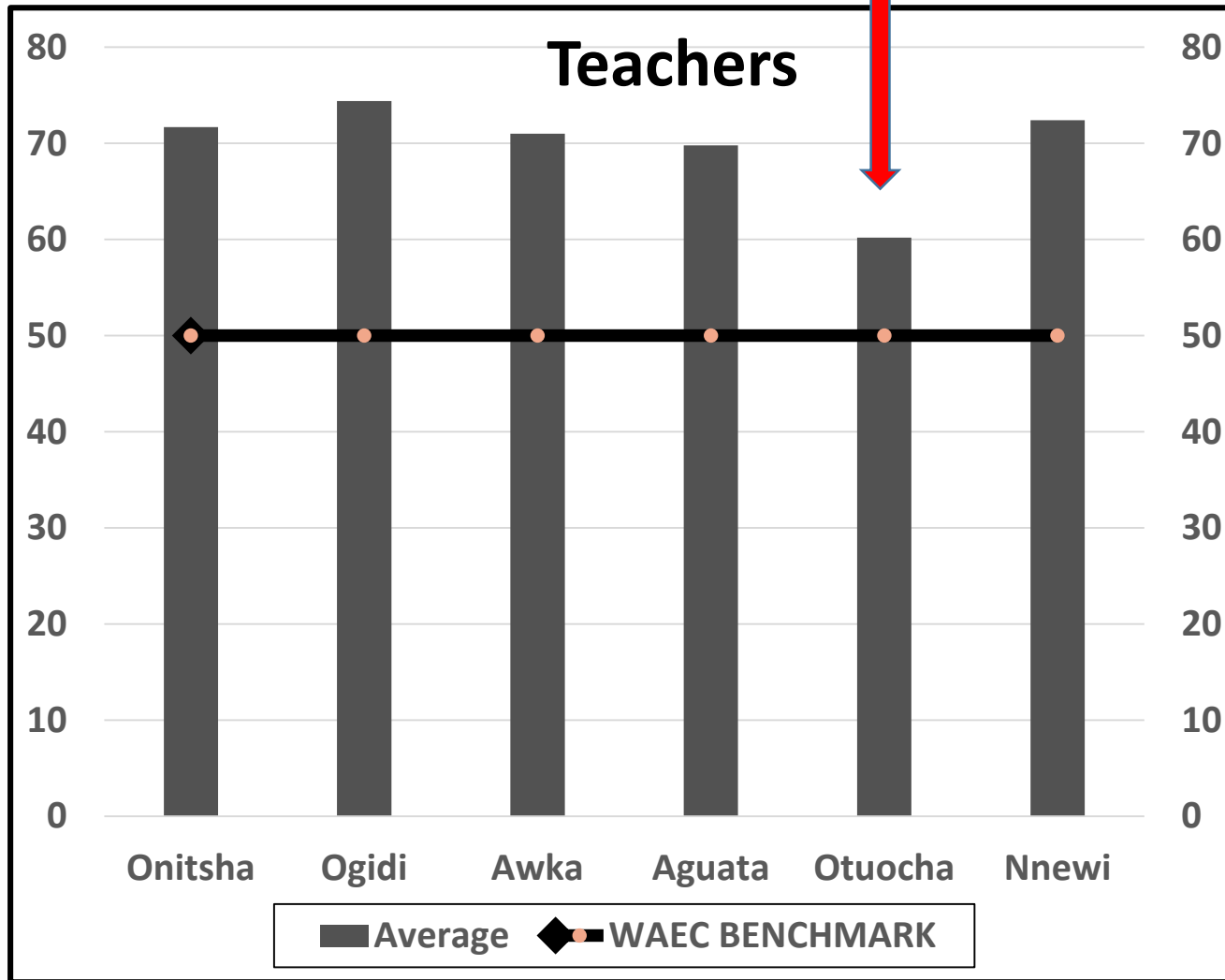


Monitoring of Learning Achievement (MLA): *Average scores of teachers and students*



Subject	Teachers' average score	Students' average score
	(%)	(%)
BIOLOGY	70.0	41.6
CHEMISTRY	73.3	40.0
MATHEMATICS	59.1	35.5
PHYSICS	56.9	36.1

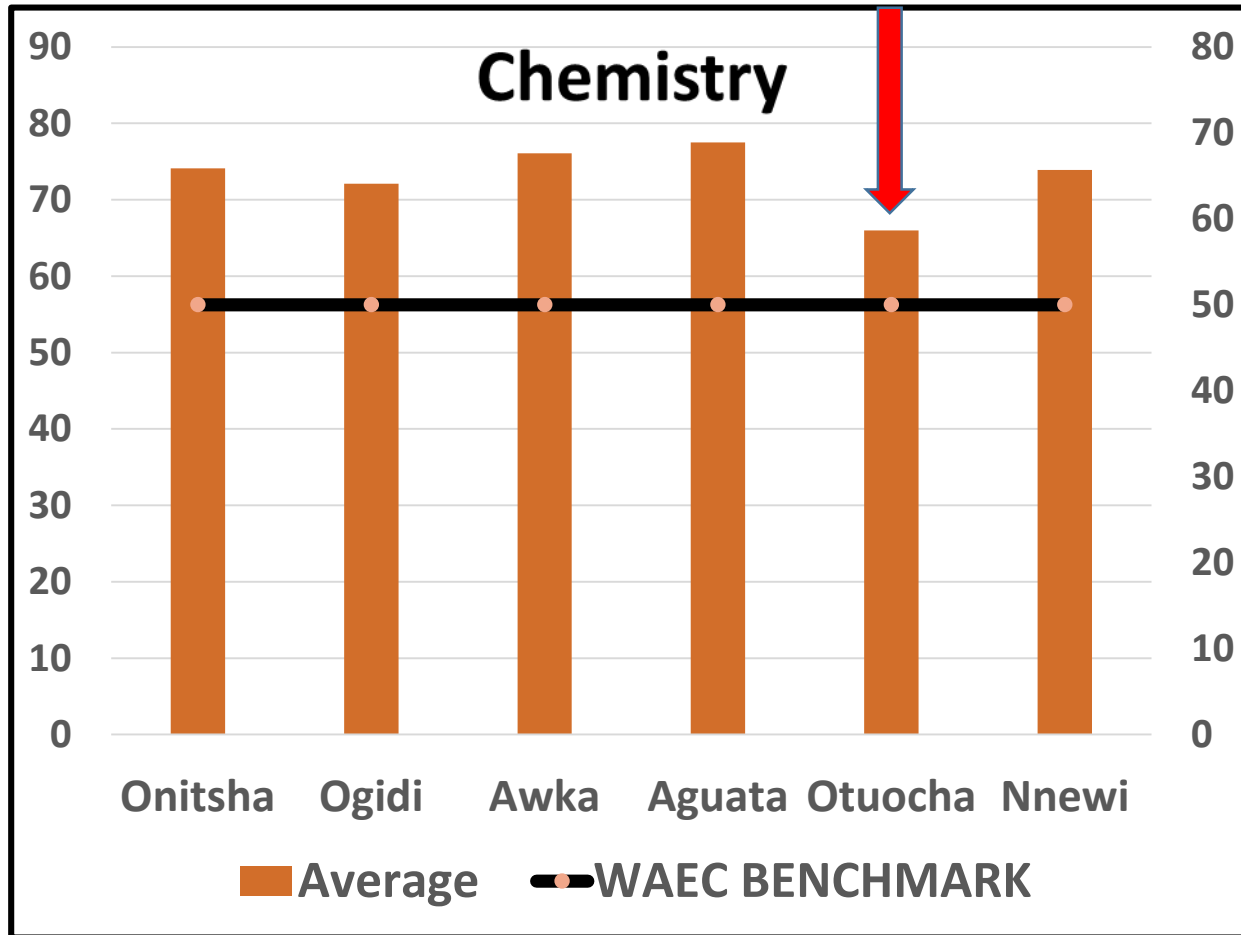
BIOLOGY: Performance of Students & Teachers by Education Zone (WAEC Benchmark)



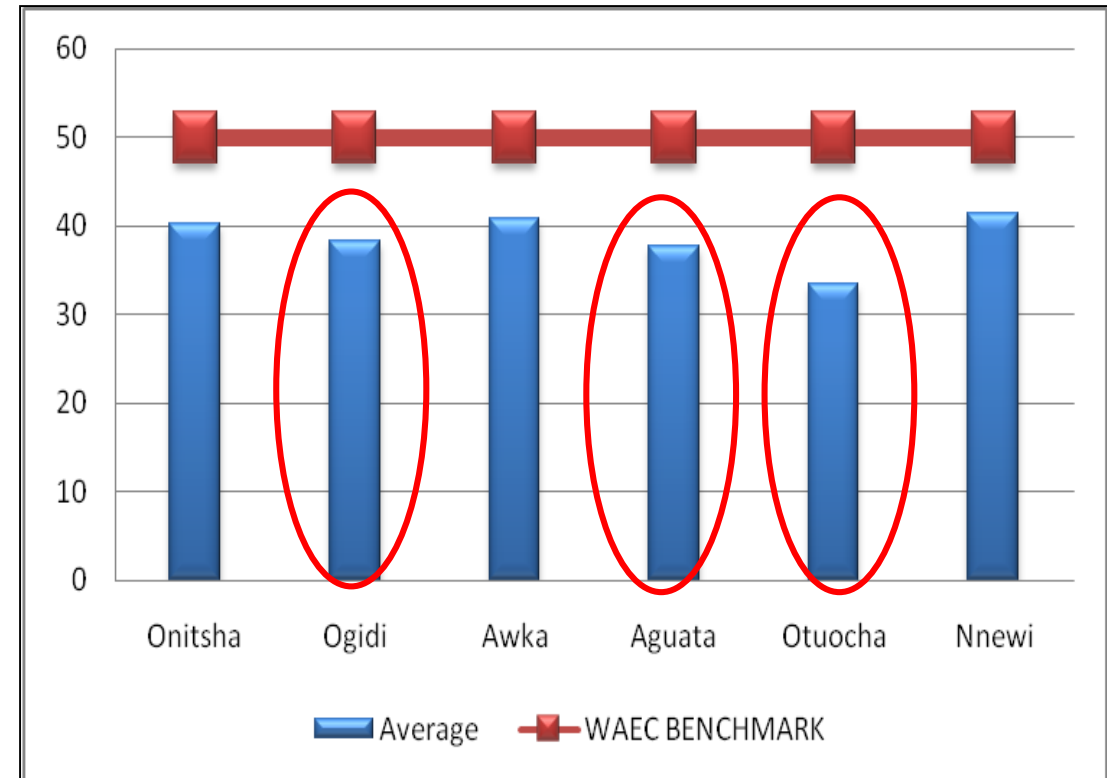
Chemistry: Performance of Students and Teachers by Education Zone (WAEC Benchmark)

Teachers

Chemistry

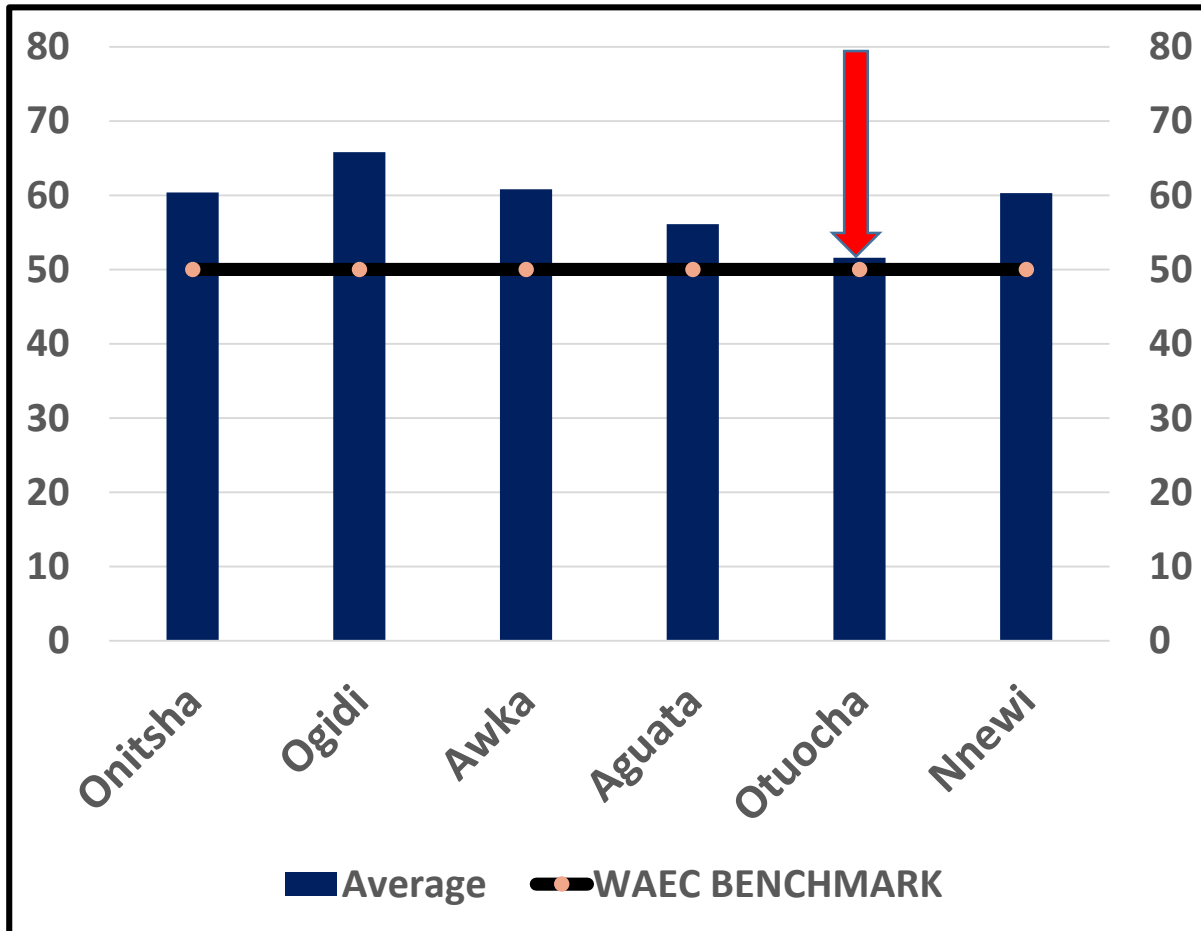


Students

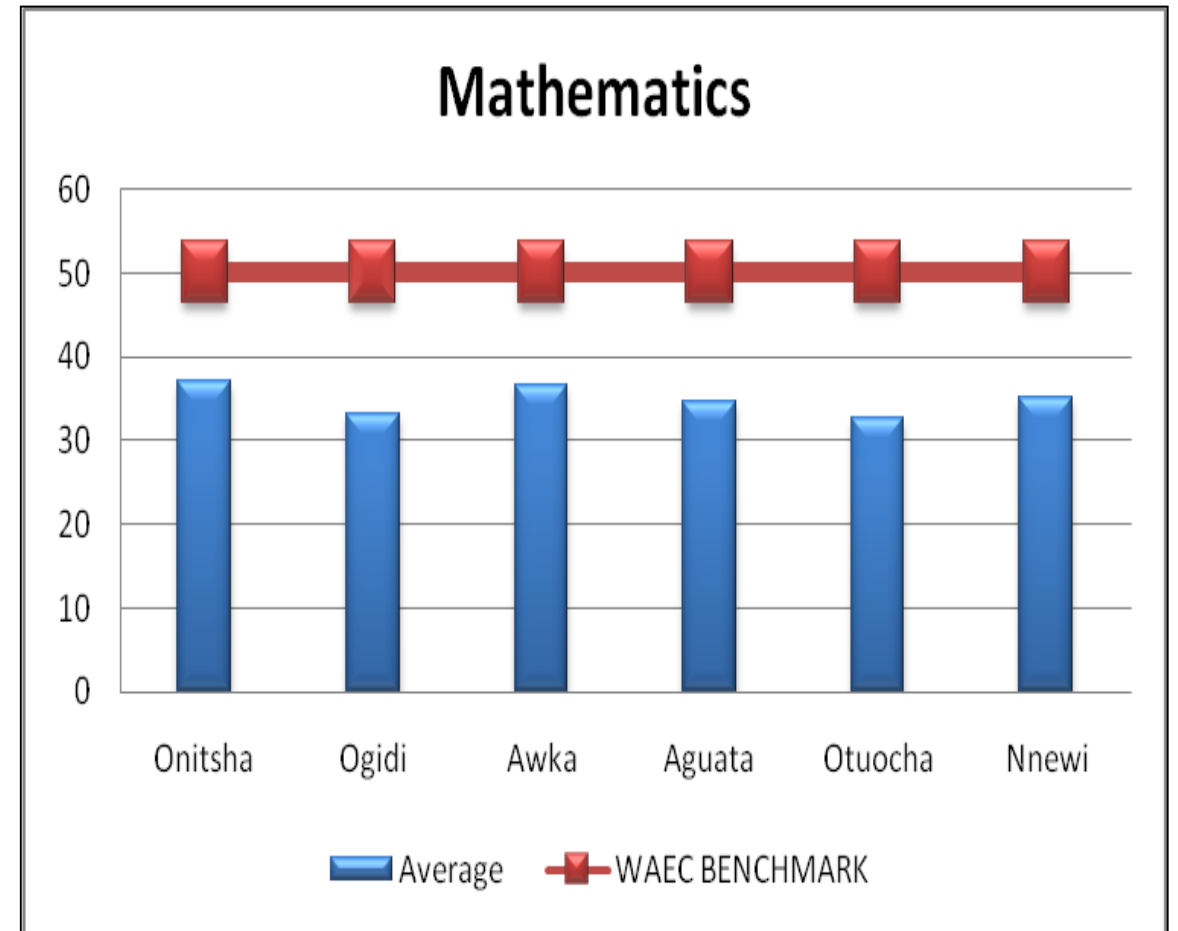


Mathematics: Performance of Students and Teachers by Education Zone (WAEC Benchmark)

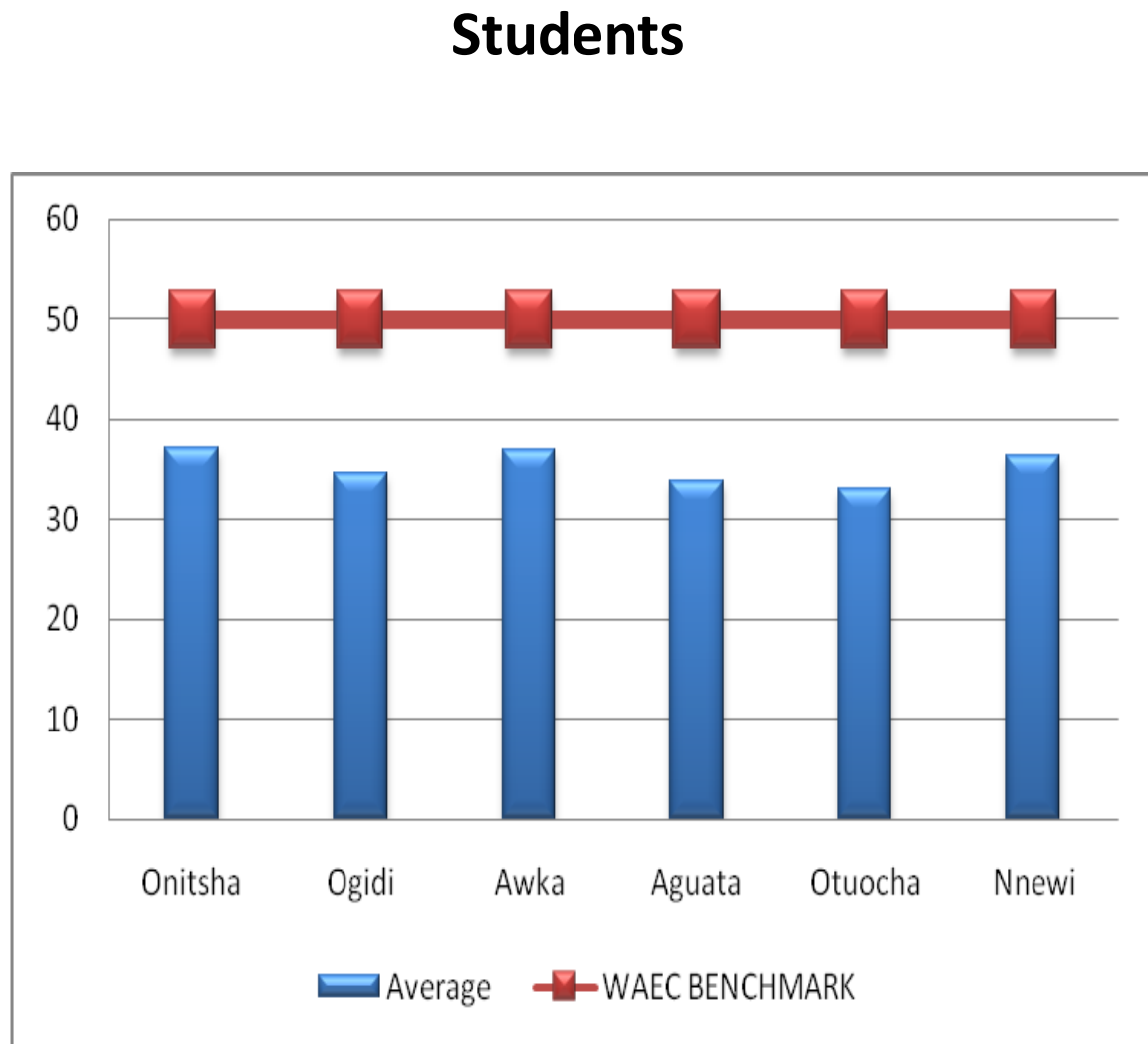
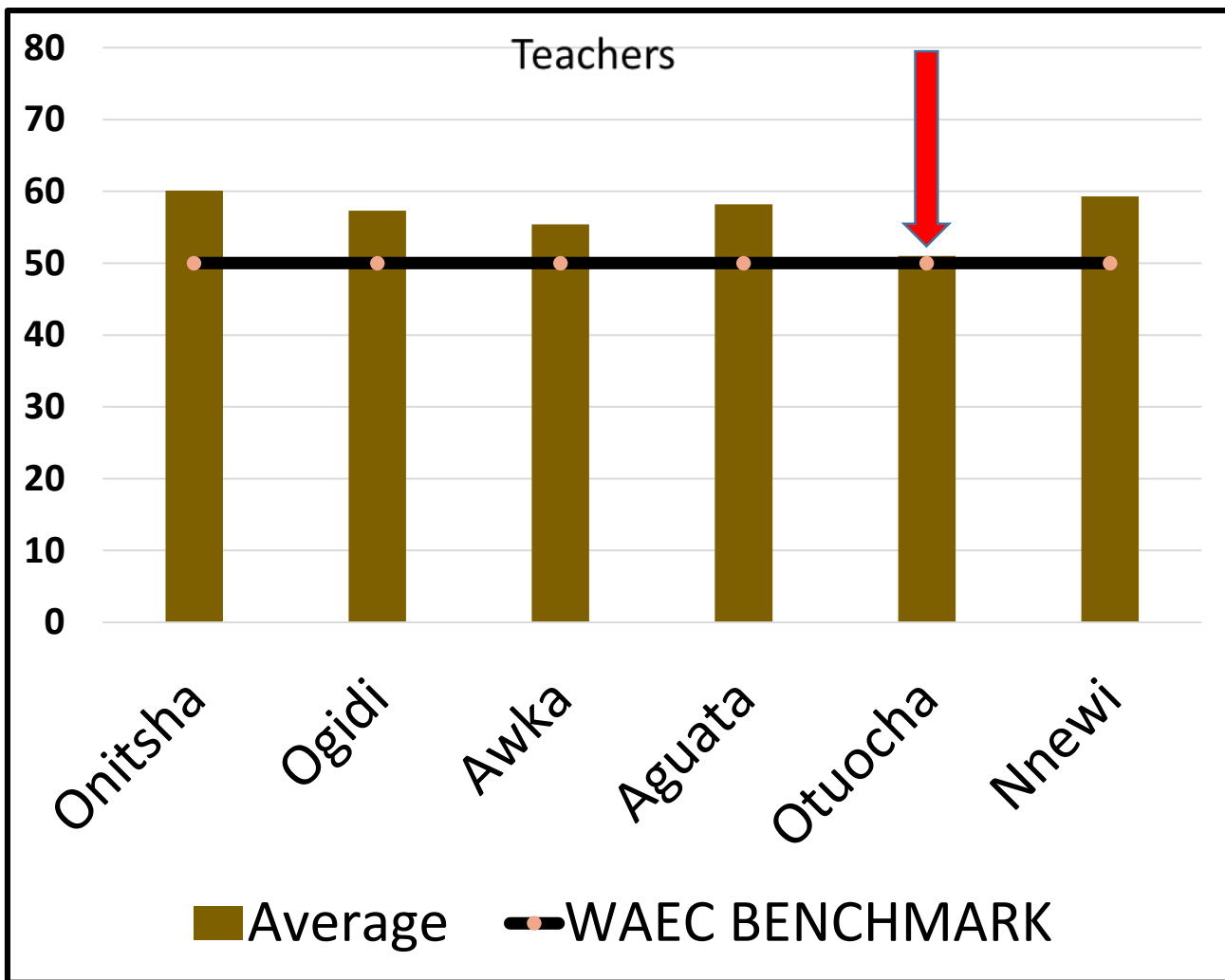
Teachers



Students



Physics: Performance of Teachers and Students by Education Zone (WAEC Benchmark)



Performance of **Mathematics** teachers by Education Zone

Zone	SCORE (%) A (70% & Above)	SCORE (%) B (60% - 69.9%)	SCORE (%) C (50% - 59.9%)	% that Failed. (scored below 50%)
AGUATA	21.0%	32.3%	8.1%	38.7%
AWKA	30.5%	28.9%	18.8%	21.9%
NNEWI	37.3%	15.5%	20.0%	27.3%
OGIDI	45.8%	15.3%	22.2%	16.7%
ONITSHA	28.3%	30.2%	21.7%	19.8%
OTUOCHA	18.2%	22.7%	15.9%	43.2%
Overall Average	31.4%	24.3%	18.6%	25.7%

Please tick subject module(s) that you either do not fully understand or have difficulty teaching students.

STANDARDISED ACHIEVEMENT TEST MODULES

FIRST TERM MATHEMATICS

MODULE 1: LOGARITHM 1

MODULE 2: LOGARITHM 2

MODULE 3: APPROXIMATION

MODULE 4: SEQUENCE AND SERIES (AP)

MODULE 5: SEQUENCE AND SERIES

MODULE 6: QUADRATIC EQUATION

MODULE 7: QUADRATIC EQUATION 2

MODULE 8: SIMULTANEOUS LINEAR AND QUADRATIC EQUATION

SECOND TERM MATHEMATICS

MODULE 1: GRADIENT OF A CURVE

MODULE 2: LOGICAL REASONING

MODULE 3: LINEAR INEQUALITIES 1

MODULE 4: LINEAR INEQUALITY 2

MODULE 5: ALGEBRAIC FRACTION I

MODULE 6: ALGEBRAIC FRACTION 2

MODULE 7: CHORD PROPERTIES

MODULE 8: CIRCLE THEOREM

THIRD TERM MATHEMATICS

MODULE 1: TRIGONOMETRY

MODULE 2: BEARINGS

MODULE 3: MEASURES OF CENTRAL TENDENCY I

MODULE 4: MEASURES OF DISPERSION

MODULE 5: HISTOGRAM OF GROUPED DATA AND CUMULATIVE FREQUENCY

MODULE 6: MEASURES OF CENTRAL TENDENCY FOR GROUPED DATA

MODULE 7: PROBABILITY 1

MODULE 8: PROBABILITY 2

Thank you

MATHEMATICS

Teacher self assessment



Objective of re-training of the Otuocha teachers

Step 1

Identify difficult topics for the mathematics teachers

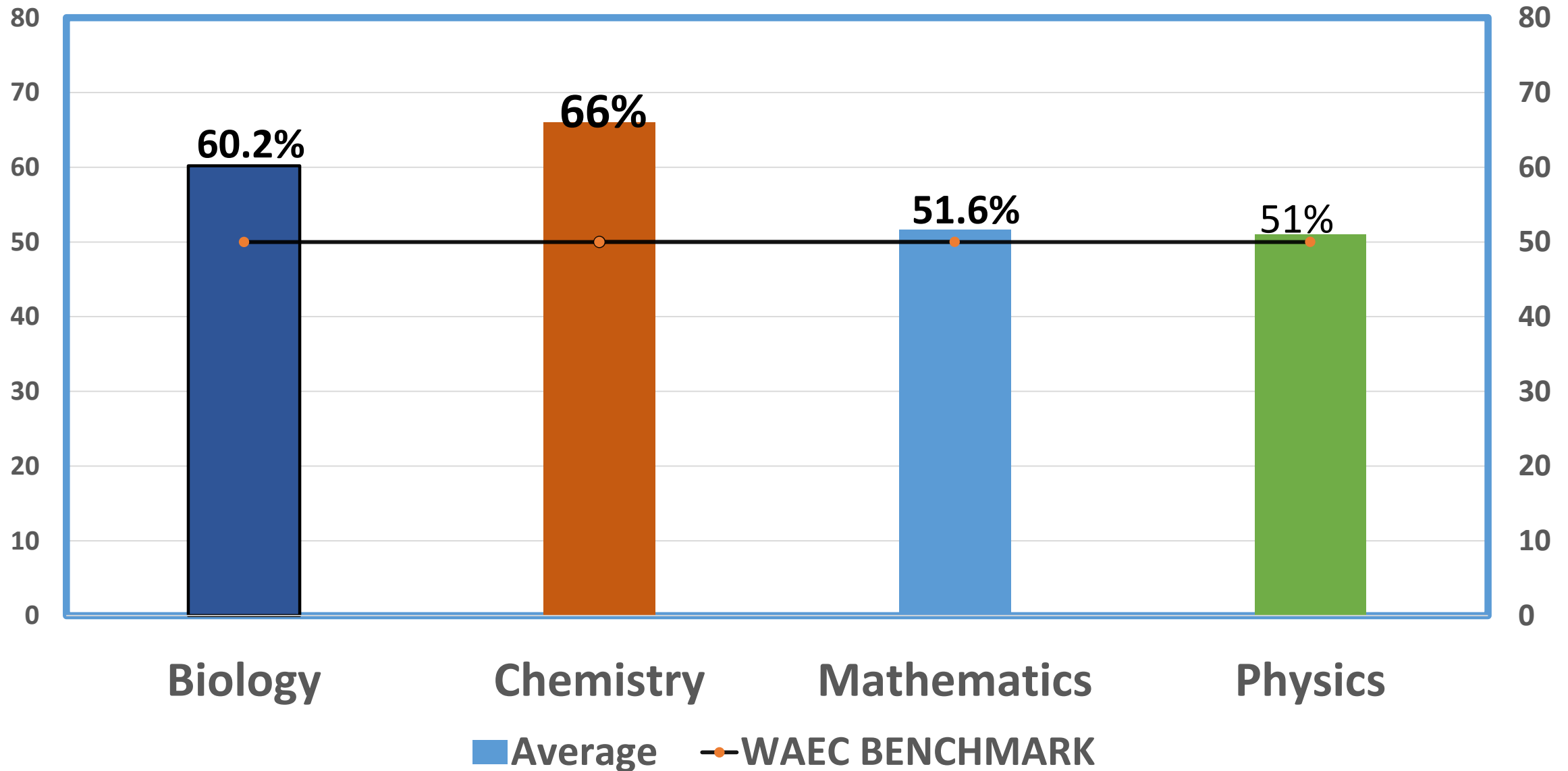
34 Mathematics teachers

Step 2

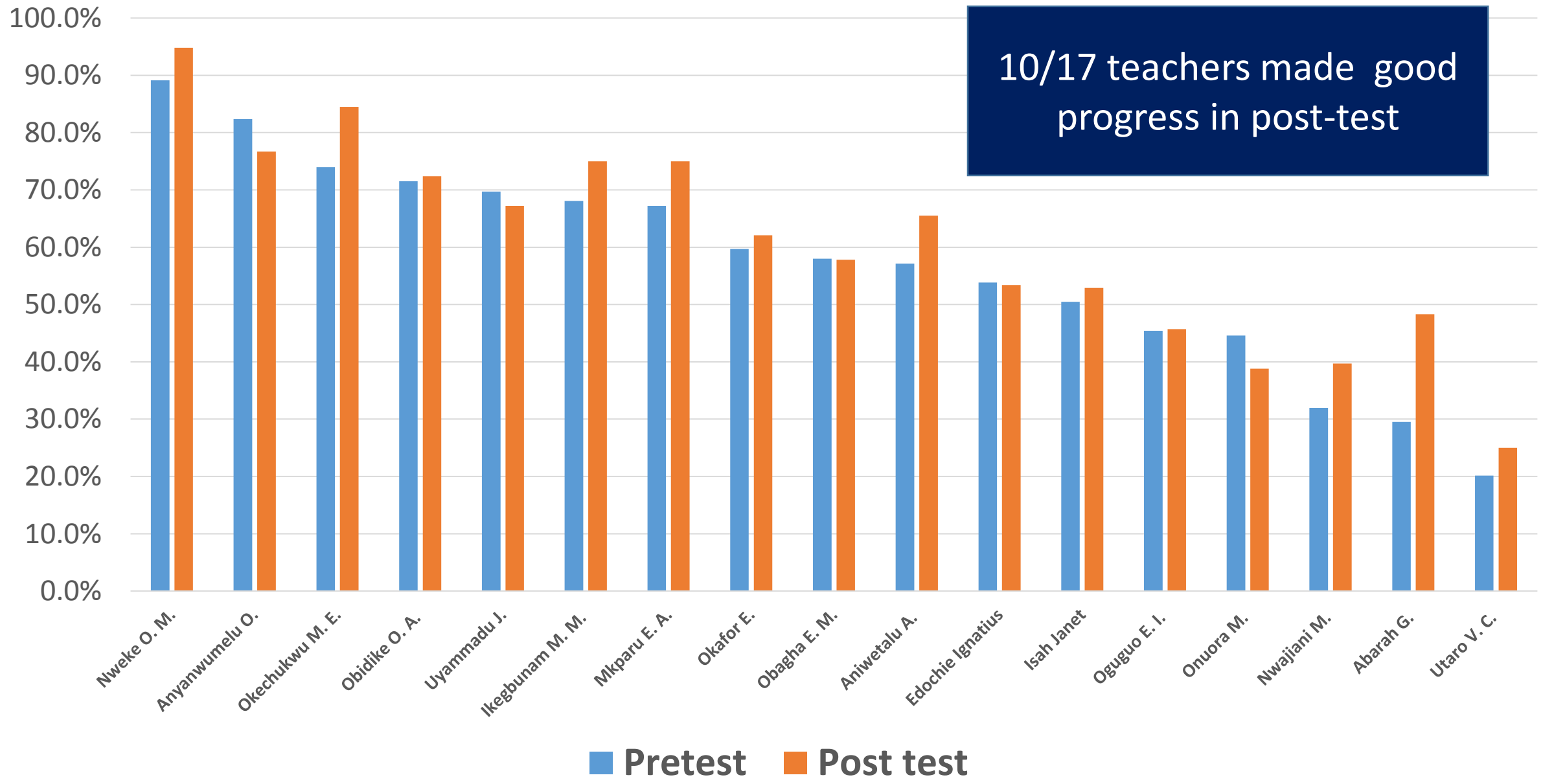
Retrain them to improve competency and quality of teaching in the Public Secondary Schools

21 - 24 March 2019

Performance of Otuocha secondary teachers



Pre and Post Test Scores of Otuocha teachers



7 Maths Teachers with the worst scores (Otuocha Zone)

NAME	Pre-test (%)	Post-test (%)	Trainers' Test (%)	Qualification(s)	Class Taught
E I	53.9	53.5	44.4		
I J	50.5	52.6	33.3	NCE -Econs/Maths Nwafor Orizu College of Education	JSS1 –JSS 3
O E I	45.4	45.7	22.2	B.Sc Maths/Statistics from Anambra State University, Uli. PGDE-National Open University	JSS1 –JSS 3
O M	44.6	38.8	22.2	B.Ed Education/ Mathematics from Madonna University	SS1 –SS3
N M	32.0	39.7	11.1	NCE-Econs/Maths ----- B.Ed Economics	JSS1-JSS2 Maths
A G	29.6	48.3	11.1 1/9 questions	OND Metallurgical Engineering ----- B.Sc Mathematics, Enugu State University	JSS1- JSS3 and SS1 –SS3 All classes
Chike Obi of this Secondary School					
U V	20.2	25.0	33.3	Maths/Biology NCE - Nwafor Orizu College of Education	JSS1 -JSS3

7 Maths Teachers with the worst scores (Otuocha Zone)

NAME	Pre-test (%)	Post-test (%)	Qualification(s)	Class Taught
E I	53.9	53.5		
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Chike Obi of this Secondary School				
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Sample of teachers with high training needs
 -----and they are teaching mathematics....

Zone	name	Name of school	ID	No of challenging modules
Otuocha	Mkparu Ebere A.	GTC Umueri	OTU001	10
	Okafor Eucharica	GTC Umueri	OTU005	9
	Ekwenze Hyacinth	Anam High School Oroma-Etiti Anam	OTU009	13
	Madubugwu Kelechi	Amikwe CSS Omor	OTU019	9

There is serious acute shortage of Science teachers in the SIX education zones

It is unacceptable for the same **unqualified** person to teach all students from JSS 1-3 and SS1-3 classes in the same school.

Recommendations
Immediate Interventions

As a matter of urgency, there is need for recruitment of adequate number of Mathematics, Physics, Biology and Chemistry teachers for Public Secondary Schools.

Retrain Science Teachers
Based on the findings of this study there is an urgent need to retrain science teachers in all four subjects beginning with Mathematics to achieve improved WAEC result for Anambra State in 2020 – (see schedule & estimate cost)

We commend the Ministry of Education for the recruitment of young teachers who are mentored by experienced retired teachers for short-term period. . This initiative is highly appreciated by students and teachers.

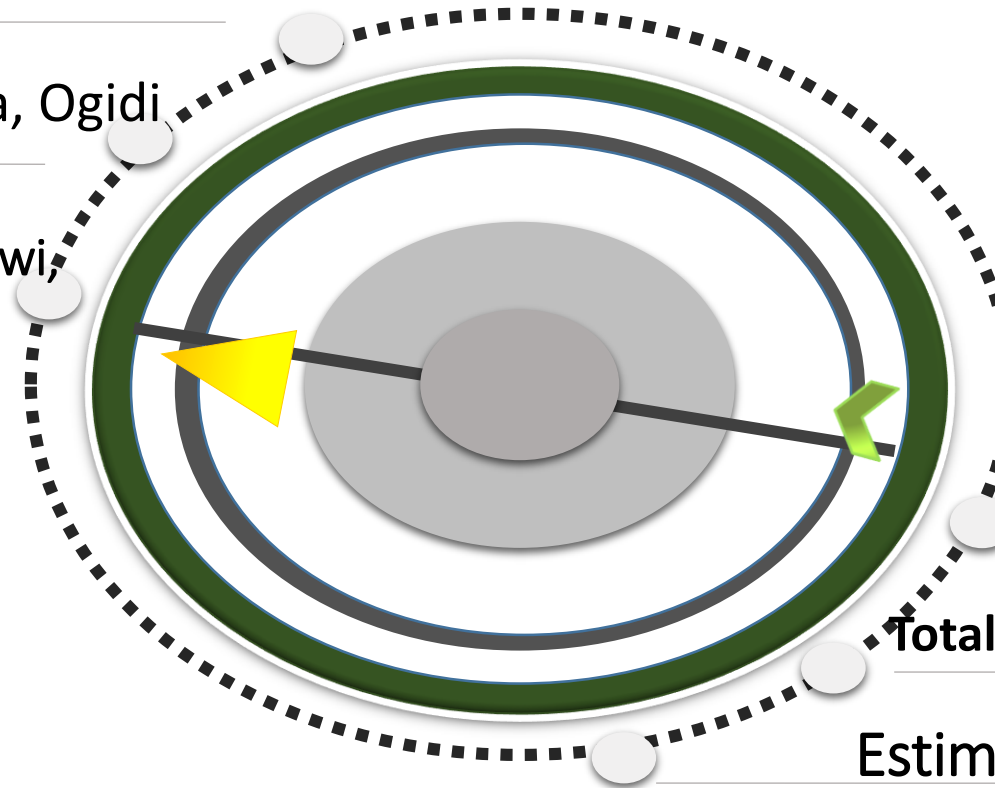
We recommend that the Ministry of Education expeditiously scale up the recruitment of young teachers

Proposed schedule of training science teachers and estimate of cost

Total number of teachers - 1500

Sept to Dec. 2019 - Onitsha, Awka, Ogidi

June to August 2019 - Aguata, Nnewi, Otuocha



Duration per training – 5 full days

Total duration of all training – 180 days

Estimate Cost - N

Estimate Cost is inclusive of VAT & includes pre and post tests

Exceptional Request

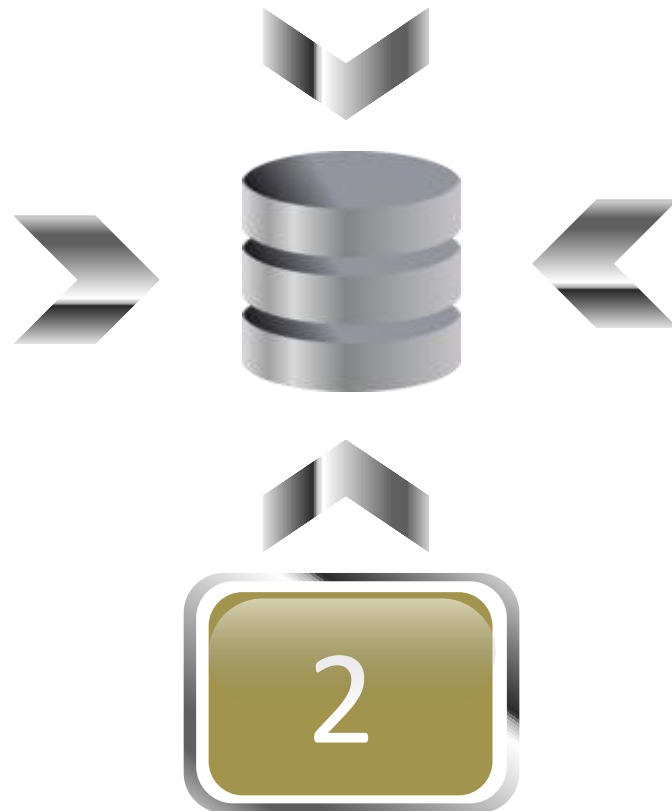
Consider exceptional financial & technical investment & incentive to promising Maths students JSS 1 to SS3



Extension of Payment

ANSEPIP should be authorized to extend the payment of Science allowance to Mathematics teachers

We Request His Excellency:



Best Buy

Mathematics is the “best buy” in science and technology



Special Allowance

Science allowance to Mathematics teachers

Anambra Certified Teacher (ACT)

Infrastructure available
at
CRS, Awka

Annual retraining programme for re-certification/
license to teach in Public Secondary Schools

Self-funded & mandatory for all
teachers/linked to annual promotion

Value: High quality teachers/Extensive
high level training / quality teaching

Strongly recommended

Value: A highly prized profession and science education
system at the top in national rankings within 2 years



Harnessing the potentials in Otuocha children

We recommend the establishment of a special education programme for promising Otuocha children from JSS1 to SS3

10
girls



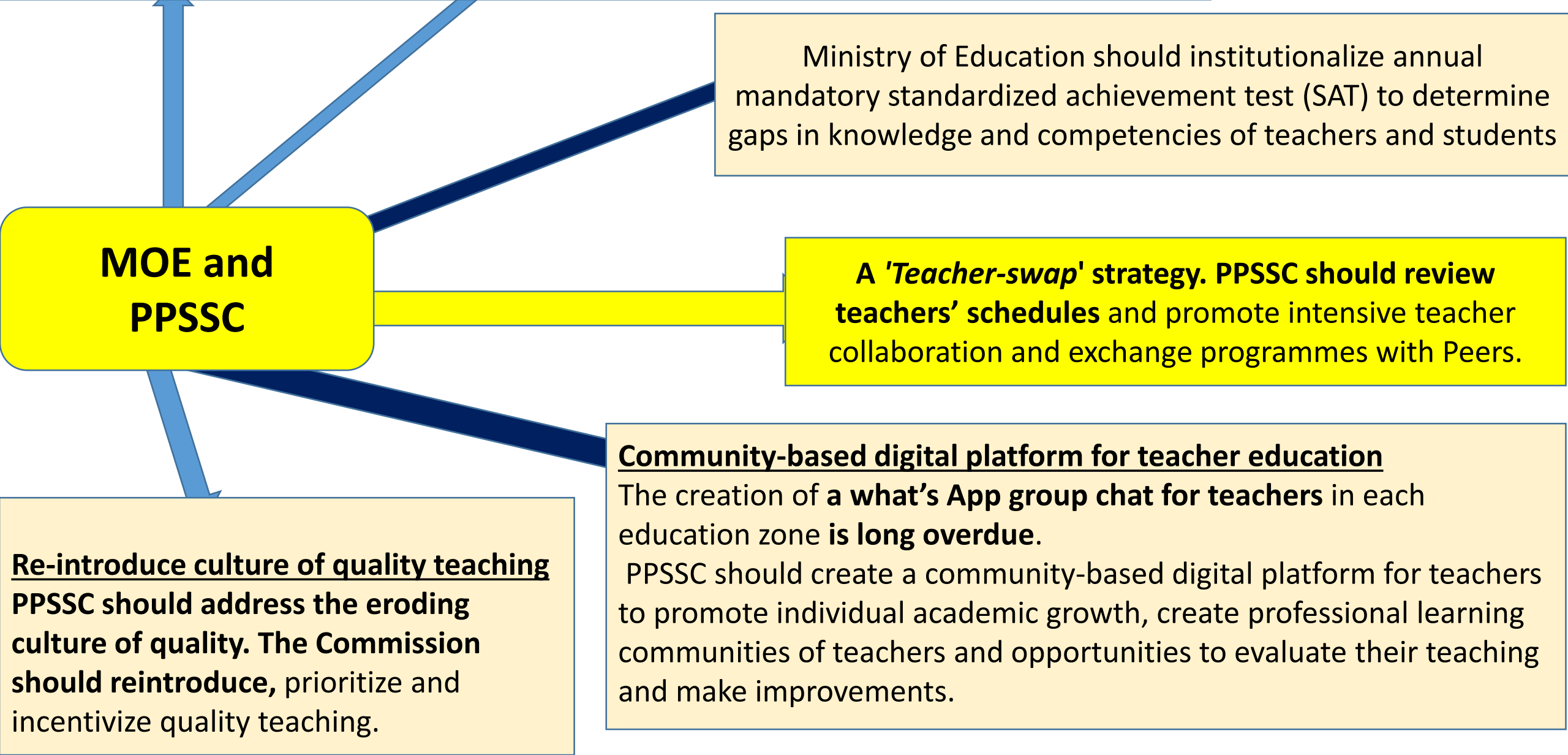
10
boys

Government to sponsor 20 students to selected Boarding Schools for 6 years with Conditional criteria

Secondary Schools with boarding facilities, good learning environment, good academic track record

“Ubuntu - I am who I am because of you.”

Re-verification of teacher qualification is inevitable and performance based promotion enforced from 2020 to improve quality of teaching.



Ministry of Education should institutionalize annual mandatory standardized achievement test (SAT) to determine gaps in knowledge and competencies of teachers and students

MOE and PPSSC

A 'Teacher-swap' strategy. PPSSC should review teachers' schedules and promote intensive teacher collaboration and exchange programmes with Peers.

Community-based digital platform for teacher education
The creation of a **what's App group chat for teachers** in each education zone **is long overdue.**
PPSSC should create a community-based digital platform for teachers to promote individual academic growth, create professional learning communities of teachers and opportunities to evaluate their teaching and make improvements.

Re-introduce culture of quality teaching
PPSSC should address the eroding culture of quality. The Commission should reintroduce, prioritize and incentivize quality teaching.

Acknowledgements

- We sincerely thank His Excellency, Chief (Dr) Willie Obiano, Executive Governor of Anambra State for initiating this study.
- We are grateful to the Honourable Commissioner of Education, Professor Kate Omenugha and staff of the Ministry of Education for their steadfast support.
- We appreciate the brain-storming sessions with ANSEPIP, in particular, the coordinator Mr Kene Eukora.
- Our thanks to the Chair and Board members of the Post-Primary Secondary School Commission (PPSSC) and Principals of 252 Secondary Schools, for their assistance in the administration of the standardized MLA tests.
- This study was funded by the World Bank Assisted State Education Programme Investment Project (ANSEPIP)

If we must “*leave no one behind*” special interventions need to be undertaken now to promote quality education.

Thank you for your kind attention

