

## Empowering Learning: The Numbered Heads Together Strategy for Inclusive Science Education

Kingsley Chukwudike Ugwoke<sup>1\*</sup>, Edna Sunday Bwankhot<sup>2</sup> and Zainab Sulaiman<sup>3</sup>

<sup>1,2,&3</sup>Department of Integrated Science, School of Secondary Education Sciences, Federal College of Education, Zaria-Nigeria

### ARTICLE INFO

#### Article history

RECEIVED: 24-Jul-24

REVISED: 22-Dec-24

ACCEPTED: 29-Dec-24

PUBLISHED: 31-Dec-24

#### \*Corresponding Author

Kingsley Chukwudike Ugwoke

E-mail: [kingsleyugwoke1978@gmail.com](mailto:kingsleyugwoke1978@gmail.com)

#### Co-Author(s):

Author 2: Edna Sunday Bwankhot

E-mail: [ednabwankhot@gmail.com](mailto:ednabwankhot@gmail.com)

Author 3: Zainab Sulaiman

E-mail: [zsulaiman2015@gmail.com](mailto:zsulaiman2015@gmail.com)

**Citation:** Kingsley Chukwudike Ugwoke, Edna Sunday Bwankhot and Zainab Sulaiman (2024). Empowering Learning: The Numbered Heads Together Strategy for Inclusive Science Education. *Horizon J. Hum. Soc. Sci. Res.* 6 (2), 1–8. <https://doi.org/10.37534/bp.jhssr.2024.v6.n2.id1270.p1>



### ABSTRACT

Inclusive education is increasingly recognized as essential in catering to the diverse needs of students, including those with learning disabilities. Effective teaching strategies that accommodate all students, regardless of their abilities, are necessary to enhance understanding and academic performance in subjects like Basic Science and Technology. This study explores the implementation of the Numbered Heads Together (NHT) strategy, a collaborative learning technique designed to actively engage all students in the classroom. The NHT strategy was applied in both inclusive and non-inclusive classrooms, focusing on its impact on the comprehension of scientific concepts among students with and without learning disabilities. The findings suggest that the NHT strategy significantly improves the teaching and learning process. It not only enhances the understanding of scientific concepts but also boosts the academic performance of students, particularly those with learning disabilities. The strategy's collaborative nature ensures that every student participates actively in the learning process, thereby fostering a more inclusive educational environment. The results underscore the importance of adapting curriculum designs to meet the needs of a diverse student population. Incorporating strategies like NHT in lesson plans can lead to better educational outcomes for all students. Teachers play a crucial role in recognizing the needs of students with learning disabilities and ensuring that their teaching methods are inclusive. This paper recommends the integration of the NHT strategy into lesson plans in inclusive classrooms. Additionally, the provision of adequate assistive devices, tools, and instructional facilities in primary, secondary, and tertiary schools is essential to support the development of necessary skills for students with and without disabilities.

**Keywords:** Academic Performance, Basic Science and Technology, Collaborative Learning, Inclusive Education, Learning Disabilities, Numbered Heads Together (NHT), Science Education, Teaching Strategies.

### 1. INTRODUCTION

In Nigeria today, Science is seen as one of the most difficult aspects of specialisation for majority of students, but seemingly appears difficult for students with learning disabilities. The ascertainment is true because of the understanding of principles that reflect conceptual relationships between concepts, and theoretical nature inherent in scientific concepts and processes. The phobia it creates among students may be due to poor teaching

method, poor classroom engagement, teacher-student relation, poor teaching facilities and study habit among others (Uwakwe, Nwajiuba & Ogunj, 2018). Umezulike and Umezulike (2024) citing Ntibi and Edoho (2017) perceived that the reason why subjects as being difficult is as a result of lack of sound knowledge at the basic level. Basically, teaching conventional teaching strategies that are predominantly used by basic science teachers' such as the normal chalkboard and talk learning approaches,

problem-solving had not fruitfully yield the expected learning outcomes to basic science students' more especially in an inclusive classroom where learning disability students' are identified. It is for this reason that this paper intends to refocus on the Numbered Head Together (NHT) strategy for the teaching of basic science and technology to elementary school pupils in Nigeria.

According to Suresh (2021), basic science is the set of fundamental ideas used in science and technology, It is an elementary school subject that infuses relevant contents from Learning about our environment, Living and non-living things, understanding basic technology as well as you and energy.

Learning of basic science concepts by disability students' encompasses a lot more of learning pedagogy that will enable the learner self evaluate what was being taught in the classroom. A more realistic and tested corporative learning pedagogy is one developed by Spencer Kagan, the Numbers-Head-Together (NHT) strategy. According to Ganiyu (2023), it includes incorporation of students to survey the illustration covered and check how they might interpret example contents through numbering, addressing, heads together and replying, NHS holds each student accountable for learning the materials. By having students work together in groups, the teacher asks question and the students' work together to answer it. Pupils are divided into groups and each pupil gives a number (from one to the maximum number in each group). The teacher poses a question and students put their heads together to figure out answer. The strategy ensures that each pupils/students knows the answer to the teacher's problem or questions by having them work together in groups. All team members are very interested, because no one knows the number/alphabet the teacher will eventually call.

### *Concept of inclusiveness education classroom for teaching and learning*

The concept of education inclusiveness can be viewed in three stages: segregation, integration and education inclusiveness (Ugwuanyi, 2024).

First, the segregation stage - This is the provision of education for children with various disabilities in separate institutions called special schools.

Second, Integrated stage - This is the provision of education in a mainstream school but for a certain number of hours when it is beneficial to them. That is to say that integrated education could take place with special units situated at the mainstream school.

Third, education inclusiveness stage - This emerged as a response to criticism of the first two.

Therefore, the concept of education inclusiveness classroom is a type of formal education classroom aimed

at accepting all children especially marginalised ones in mainstream schools irrespective of their background. However, it is believed that the school system and culture must change to accomodate the learning disabilities children through the adapting the Numbered Head Together (NHT) strategy to enhance effective teaching and learning of Basic Science and Technology in an inclusive classroom.

### *Learning Disabilities and types*

Learning disabilities (LD) are defined as a group of neurological disorders that affect a person's ability to receive, process, store and respond to information (Khobragade, 2024). The Learning Disabilities Association of Ontario (2016) sees learning disabilities as an impediment in the acquisition and use of the following essential skills such as oral language, reading, writing, and mathematics. This paper sees LD as a neural disorder that affect individual basic educational learning skills.

Murtaza (2018) pointed out that the most common are reading, writing and math disabilities. He asserted that reading disability is a language-based learning disability called dyslexia; students have difficulties with spelling and decoding skills, recognizing words, and comprehending text. Writing disability is referred to as Dysgraphia, such as forming letters or words or writing within a defined space. This also includes difficulties with spelling, semantic memory, morphological awareness, grammatical structures, organizing information, putting thoughts on paper, or working memory. Math learning disabilities are known as Dyscalculia. Peoples with dyscalculia have difficulty understanding mathematical concepts and computation. This disability is closely related to problems of working memory and problem solving (Khobragade & YeshwantMahanvidyalaya, 2024).

This three LD poses significant challenges for teachers, who are responsible for remediating the weaknesses of students with LD, and for supporting them through the use of accommodations and modifications to the curriculum.

Murtaza (2018) asserted that by adopting social model approach teachers' can help students with multiple LD by removing barriers through assistive technology and accommodations.

In the same vein, Khobragade and YeshwantMahanvidyalaya (2024) revealed that there are three main factors contributing to learning difficulty in children, namely as:

1. Genetic factors – This is an inherited LD from parents who carry certain genetic mutations or variations, such as the Down syndrome and Fragile X syndrome.

2. Environmental factors – This is as a result of prenatal exposure to drugs or alcohol, poor nutrition during pregnancy, or complications during child birth. Also, exposure to lead, mercury and certain pesticides may increase the risk of learning disabilities.
3. Brain differences – This is the differences in brain structure and function that support language processing.

### *What is the Numbered-Head-Together Learning Strategy?*

According to Ganiyu (2023) defined the Numbered-Head-Together Learning Strategy (NHT) as a strategy where learners are numbered and grouped so as to execute a task. The students engage all their efforts and skills to execute specific learning goals. NHT is one of over 100 cooperative learning structures developed by Spencer Kagan and associates (Kagan & Kagan, 2009). Kagan's structural model is based on four basic principles:

1. positive interdependence,
2. individual accountability,
3. equal participation, and
4. simultaneous interaction.

Like all Kagan structures, NHT requires teachers to break their classes into small, heterogeneous learning teams; provide students with structured opportunities to work collaboratively; and use common goal and reward structures to prompt and support positive interpersonal interactions.

Hunter, Maheady, Jasper, Williamson, Murley and Stratton (2015) categorised four primary components of NHT as: (1) small, heterogeneous learning teams; (2) structured roles within teams; (3) interdependent group contingencies; and (4) recognition for collective student effort. Specific procedural steps for using NHT with fidelity are included in Appendix 1. (For purposes of brevity, only the standard version of NHT is described here.) Initially, students are placed in small, hetero-geneous learning teams, preferably with four members. Teams are formed systematically and are heterogeneous in terms of gender, ethnicity, and achievement (Kagan & Kagan, 2009). Typically, they include at least one high-, one average-, and one low-performing student, who sit at common tables or desk "clusters" during teacher-led instruction. By having students work together in groups, the teacher asks question and the students work together to answer it. Pupils are divided into groups and each pupil gives a number (from one to the maximum number in each group). The teacher poses a question and students put their heads together to figure out answer. The strategy

ensures that each pupils/students knows the answer to the teacher's problem or questions by having them work together in groups. All team members are very interested, because no one knows the number/alphabet the teacher will eventually call. Students engaged in NHT strategy are socially and intellectually active. Within teams, students follow structured roles and responsibilities. Take for instance, first, assigned numbers from 1 to 4. Next, each student should be given a dry-erase board (i.e., response card), markers, and a cleaning cloth. When teachers' direct questions to the class (e.g., "What will happen when we combine vinegar and baking soda?") students write down their responses and "belly up" their boards (i.e., hold cards close to their stomach). When all team members have written responses, they turn over their boards, "put their heads together" (i.e., share information, tutoring if necessary), agree on the best team response, and ensure that all team members know the answer(s). Teachers then randomly call a number from 1 to 4 (e.g., spin a spinner), and all students with that number must stand or raise their hands to respond. Teachers then pick one or all of those students to respond.

Other students are then asked whether they agree with the responses (e.g., "How many number 4s agree?") and/or whether they can "add to" what was given. Teachers provide positive and/or corrective feed-back, and students give one another "team cheers" for doing a good job. Boards are wiped clean until another question is asked and the same process is repeated.

According to Hunter *et al.* (2015), that questions should not be limited to factual knowledge. That teachers can ask students to use information to solve problems, compare and contrast phenomena, provide applications, and/or analyze and summarize knowledge. NHT can be used at the beginning of class to activate students' prior knowledge, during class to maintain active student engagement and assess understanding, and/or at the end of lessons to review the most important big ideas.

### *Adapting the Numbered Head Together (NHT) strategy in teaching Basic Science and Technology for students with learning disabilities*

According to Adejoh and Sambo (2011), Basic science and technology remains an indispensable tool for scientific and technological development. And that individuals who are literate in basic science and technology and have acquired the useful skills, knowledge and attitudes can transform the society scientifically and technologically. The learning of basic science concepts by students with disabilities encompasses a broader range of pedagogical approaches, enabling learners to self-evaluate what has been taught in the classroom. A more realistic and tested corporative learning pedagogy

is one developed by Spencer Kagan, the Numbers-Head-Together (NHT) strategy. According to Ganiyu (2023), it includes incorporation of students to survey the illustration covered and check how they might interpret example content through numbering, addressing, heads together and replying. NHT strategy holds each student accountable for learning the materials. The strategy encourages interdependence because they can help each other find the right answer and explain it to each other. Additionally, individual accountability was emphasized because each member must be prepared to represent the team. Since each member has the opportunity to respond to the question, the NHT strategy ensures that everyone participates equally. It likewise improves synchronous communication since every one of the individuals set out to really concentrate to proffer answer for the inquiry. NHT strategy help students learn in a fun, dynamic, and creative way that is easy to understand. It expands rivalry and participation among students. NHS provides opportunities for practice, rehearsal, and content material discussion. Ganiyu (2023) citing Wahyudin (2017), Nuryamisi (2016), and Alifiani (2017) and Muryanti (2016) opined that NHT strategy can be utilized at any stage of the educational process, including elementary junior high and senior high school.

### *Teaching Basic Science and Technology to educable learning disability pupils*

Research indicates that pupils with educable learning disability can acquire the knowledge and skills of science (Dominica, 2012). According to Murtaza (2018), educational professionals have a responsibility in an understanding of the learning process for students with LD. This understanding will improve the opportunities for students with LDs to finish their formal science education and to be better prepared to cope with the demands of the selecting science careers. It is important to mention here that barriers to success for students with LD do not rest entirely on the shoulders of students with LD as learners but the barriers have also been created in the school environments due to the way the academic courses in general, and science courses in particular, have been taught in high schools. Despite the fact that, there has been much time and energy invested in developing better and more efficient teaching strategies to help students with LD to become competent science learners, but then again, these strategies need to be chosen or formulated in a manner that is relevant to the resources and realities of the 21<sup>st</sup> -century science learner.

## **2. Special Education Methods**

Special needs education is intended to ease the learning of those who, for some reasons, need some

support and adaptive teaching methods in order to actively participate and meet the learning goals.

Special Education methods are those modified to accommodate students with special needs or persons with learning disabilities like the blind, deaf and dumb, physically challenged or deformed. Others according to Positive Action (2021) include: difficulty in organizing information, speaking, reading, spelling and writing; also, mental health disorders such as mood, psychotic, eating or personality disorders.

Students with specific learning disabilities despite of their normal intelligence, facing basic cognitive deficits due to mainly dysfunction of working memory. This causes difficulty in the organization of information received, such as remembering and using them. Lytra & Drigas (2021). English (2018), conducted research to identify, monitor and evaluate student learning, while focusing on design, inquiry processes, reasoning, reproductive skills and Science Technology Engineering and Mathematics (STEM) - based conceptual development. The four-year study incorporated the four STEM disciplines with an emphasis on design. The research involved 34 students between the 3<sup>rd</sup> and the 6<sup>th</sup> grade. The Fancy Feet activities, as tend to be called, included activities requiring students explore first their shoe numbers by measuring their feet, as well as the sizes and characteristics of their shoes, to finally experiment with the materials built, so that they determine their properties. Following to exploring the role of shoe design, they designed and created their own pair of shoes. Research highlighted the last element of the activity, the design and construction of students' shoes. Students appeared to use design strategies, sketching their shoe designs, via testing, redesigning and improving them, to manage develop their own design goals and limitations.

### *Developing Interest of SNC Learners in the product of Basic Sciences*

The aim of science is to create interest and produce knowledge to understand and explain some aspects of the world around us. Some of the key scientific products that are used daily include electricity, transportation through automobiles or trains, soap or detergents, clean drinking water, home and other buildings. Some examples of these products include microwave ovens, welding equipment and medical supplies. A scientific product is a result of the efforts of many scientists because without those historic steps to get more complex idea could not have appeared as a product which have reduced travel time a lot and safe such as travelling in trains and so on. Again, the daily use of soaps and detergents for cleaning ourselves, clothes and instruments are common examples (Maikano, 2024).

### *Arousing Pupils attitude in Basic Science and Technology among the learning disabilities students*

Pupils with educable intellectual disability experience challenges in higher intellectual functioning like observation, thinking, decision making, analysing and problem solving which limits their general life functioning. Knowledge and skills gained from basic science and technology will most certainly develop in them scientific thinking through practice with activities involving these higher intellectual functioning skills, resulting in more productive living. Practical aspects of the subject usually focus on pupils' ability to observe, manipulate, classify, measure, recall, and to make intelligent guesses. These skills once mastered are indispensable tools for everyday life.

Some specific topics like living and non-living things teach about basic functioning in life. Practical sessions involve manipulation of specimen with an aim to identifying aspects of their life and making deductions. Basic Science and technology involve thinking, honesty, curiosity, and questioning. These activities promote a scientific attitude in pupils which can be transferred to life outside the classroom. Pupils are empowered with personal skills that they use to express and share points-of-view, solve problems, and make decisions based on evidence (Howard, 2013).

Basic science and technology emphasize a hands-on and minds-on approach to learning with active involvement of the pupils and interaction with real materials as much as possible. This enhances the pupils' ability to practice problem-solving skills, develop positive science attitudes, learn new science content, and increase their scientific literacy. Less important is the memorization of specialized terminology and technical details. Emphasis should be on understanding of important relationships, processes, mechanisms, and applications of concepts. Assessments should test pupils' ability to explain, analyze, and interpret scientific processes and phenomena more than their ability to recall specific facts. Scientifically literate pupils understand the basic concepts and processes and can apply them in real life situations which will possibly enhance independence.

Basic Science offers pupils the ability to access a wealth of knowledge and information which will contribute to an overall understanding of how and why things work like they do. They are able to use this knowledge to understand new concepts, make well-informed decisions and pursue new interests (Centre for Education in Science and Technology, 2008). It also aims at having the pupils' curiosity broadened and developing certain scientific ways of thinking in children as they work for example, being open-minded, not jumping to conclusions, curiosity, ability to think critically and so on.

With practice, pupils grow in their ability to use these tools and can apply them in daily living.

### *Implication of using NHT strategy in teaching students of learning disabilities in an inclusive classroom*

The NHT strategy might be especially useful for students with more severe physical or communication disabilities who participate in cooperative learning groups within inclusive environments. Because each group is allowed time to discuss questions as a small group and because every group member may be randomly called on to answer the teacher's question, students without disabilities or with more moderate disabilities are required to ensure that a student with more significant disabilities also understands and can present the group's answer as all group members are accountable. In addition, this group time allows students with assistive physical and/or communication needs the time necessary to record their answers on an assistive communication device, ensuring their full participation.

### **3. CONCLUSION**

Teaching Basic Science to children with disabilities alongside their able-bodied peers in the same classroom environment requires effective teaching strategies to foster collaborative learning. The Numbered Heads Together (NHT) teaching strategy has been adapted to ensure active participation and to meet the diverse learning needs of students with various disabilities in an inclusive education setting. By employing NHT, Basic Science teachers can increase student engagement, enhance interpersonal relationships, and improve learning outcomes for both students with disabilities and their peers. Ultimately, adapting NHT for special needs education can significantly enhance the teaching and learning of Basic Science and Technology concepts, promoting self-reliance and survival skills essential for the 21st century.

### *Recommendations*

The following recommendations are made:

1. The teacher should recognize the children with learning disabilities, so as to structure his NHT teaching strategies such that will stimulate interest for sustainable science and technological development.
2. There should be adequate assistive devices, tools and instructional facilities in primary, secondary and tertiary schools to enhance the quality of skills needed by students with and without disabilities.

3. The regular school teachers should be retrained for inclusion to acquire a variety of teaching strategies and know when and how to utilise them effectively in the classroom.
4. The government should match emphasis on science and technology education with adequate resource allocation and appropriate teacher motivation for sustainable development in science and technology. A reflection of this in the annual budget is expected to be the first positive step.
5. Government should intensify the retraining workshops, sponsoring basic science and technology teachers to conferences and seminars to up-date their knowledge, which will keep them informed with the changing educational reforms across the globe. This could be organized at local, state, and federal levels.

## NOTES

### Acknowledgements

The authors wish to thank the editors and reviewers of Horizon JHSSR Journal which provided us an opportunity to publish in their scholarly journal.

### Funding

The authors received no financial support for the research, authorship and/or publication of this article.

### Declaration of Conflicting Interests

The authors declare no potential conflicts of interest with respect to the research, authorship and/or publication of this article. This article is the sole work of the authors and has not been presented or published elsewhere.

## References

- Adejoh, M. J., & Sambo, M. H. (2011). Improving the quality of basic science teaching and learning through educational reforms. In O. S. Abonyi (Ed.), *STAN 52nd Annual Conference Proceedings* (pp. 182-191). Ibadan, Nigeria: HEBN Publishers Plc.
- Agogo, P. O., & Achor, E. E. (2014). Sustaining children's interest in basic science and technology in Nigerian junior secondary schools for sustainable science and technology development. *Benue Journal of Mathematics and Mathematics Education*, 1(3), 44-52.
- Alifiani. (2017). Penerapan model pembelajaran NHT-TGT untuk meningkatkan motivasi dan pemahaman konsep materi matematika SMA. *Jurnal Riset Pendidikan Matematika*, 4(1), 11-20. <https://doi.org/10.2183/jrpm.v4i1.13100>
- Ayua, G. A., & Eriba, J. O. (2023). Adapting creative-teaching of basic science in special needs education. In J. A. Ademokoya, N. Akuma, E. O. Idiodi, & S. O. A. Obih (Eds.), *Special needs education from the lens of interdisciplinary dialogue* (pp. 314-325). Owerri, Nigeria: Cithall International. ISBN: 978-978-797-684-5
- Drigas, A., & Mitsea, E. (2021). 8 pillars x 8 layers model of metacognition: Educational strategies, exercise. *International Journal of Recent Contributions from Engineering, Science & IT (IJES)*, 5(4), 4-18. <https://doi.org/10.3991/ijes.v5i4.12345>
- English, L. (2018). Learning while designing in a fourth-grade integrated STEM problem. *International Journal of Technology and Design Education*, 29, 1011-1032. <https://doi.org/10.1007/s10798-018-9482-4>
- Ganiyu, W. A. (2023). Group investigation and numbered-heads-together learning strategies, and senior secondary students' learning outcomes in mathematics word problems in Oyo North Senatorial District, Nigeria (Doctoral dissertation, Department of Science and Technology Education, University of Ibadan, Nigeria). *University of Ibadan Institutional Repository*. <https://www.repository.pgcollegeui.com>
- Howard, T. C. (2013). How does it feel to be a problem? Black male students and learning in enhancing the knowledge base to disrupt deficit frameworks. *Review of Research in Education*, 37(1), 54-86. <https://www.ojp.gov/pdffiles1/Digitization/61062NCJRS.pdf>
- Hunter, W. C., Maheady, L., Jasper, A. D., Williamson, R. L., Murley, R. C., & Stratton, E. (2015). Numbered heads together as a tier 1 instructional strategy in multitiered systems of support. *Education and Treatment of Children*, 38(3), 345-362. <https://www.researchgate.net/publication/282732072>
- Kagan, S., & Kagan, M. (2009). *Kagan's cooperative learning*. San Clemente, CA: Kagan Publishing.
- Khobragade, M. A. N., & YeshwantMahanvidyalaya, S. (2024). Understanding the psychological aspects of students with learning disabilities. *Mukt Shabd Journal*, XIII(1), 163-176. ISSN: 2347-3150.
- Learning Disabilities Association of Ontario. (2016). What are LDs? Official definition of LDs. Retrieved from <http://www.ldao.ca/introduction-to-ldsadhd/what-are-lds/official-definition-of-lds/>
- Lytra, N., & Drigas, A. (2021). STEAM education: Metacognition and specific learning disabilities. *Scientific Electronic Archives*, 14(10). <https://doi.org/10.36560/141020211442>
- Maikano, A. (2024). Science, Technology, Engineering and Mathematics Education as a Catalyst in the Transformation of Developing Nations. *Lead Paper 2 Presented at the 3rd National Conference of School of Secondary Education (Sciences)*, Kaduna State College of Education, Gidan-Waya, 01<sup>st</sup> – 05<sup>th</sup> July.
- Ministry of Education, Culture, Sports, Science and Technology - Japan. (2022). Special needs education. <https://www.mext.go.jp/en/policy/education/elsec/title02/detail02/1373858.htm>
- Murtaza, N. (2018). Perceptions of students with learning disabilities learning science: A narrative study (Doctoral dissertation, University of Ottawa). *University of Ottawa Library*.
- Ntibi, J., & Edoho, E. (2017). Influence of school location on students' attitude towards mathematics and basic science. *European Centre for Research Training and Development*, 5(10), 76-85.

**Ontario Ministry of Education.** (2016). The Education Act. <http://edu.gov.on.ca/eng/general/elemsec/speced/edact.html>

**Positive Action.** (2021). Teaching strategies for students with special needs. <https://www.positiveaction.net>

**Suresh, A.** (2021). What is basic science? *Quora*. <https://www.quora.com/What-is-basic-science>

**Ugwuanyi, L. O.** (2024). *Multidisciplinary humane perspectives on education: Educating all for all*. Cambridge Scholars Publishing. ISBN: 978-1-5275-5793-2. <https://www.cambridgescholars.com/product/978-1-5275-5793-2>

**Umezulike, F. C., & Umezulike, T. C.** (2024). Animation instructional learning strategy on students' learning interest towards acquisition of employability skills in basic science. *Journal of Educational Research and Development*, 7(1), 135-145.

**Uwakwe, R. C., Nwajiuba, C. A., & Ogunji, C. V.** (2018). Effect of jigsaw and numbered heads together on students' academic performance in mathematics. *East African Researcher*.

## Biographical Statement of Author(s)

### **Kingsley Chukwudike**

**Ugwoke** is a native of Enugu State, Nigeria, and was born in Zaria in 1978. He holds a Nigeria Certificate in Education (F.C.E., Zaria), a B.Sc. in Education (A.B.U., Zaria), and an M.Sc. in Education (A.B.U., Zaria), which he obtained in 2001, 2006, and 2016, respectively.

Ugwoke has been serving at the Federal College of Education, Zaria, since 2010. His primary areas of expertise include research, data analysis, and ICT awareness.

He is a seasoned lecturer, registered with the Teachers Registration Council of Nigeria (TRCN), and a member of the Science Teachers Association of Nigeria (STAN).

### **Kingsley Chukwudike Ugwoke**

Department of Integrated Science  
School of Secondary Education  
Federal College of Education, Zaria  
Gyellesu Zaria, Kaduna State  
Nigeria

**E-mail:** [kingsleyugwoke1978@gmail.com](mailto:kingsleyugwoke1978@gmail.com)

Watsapp: +234-8055358381



### **Bwankhot Edna Sunday,**

born in Nigeria in 1969, earned her Nigeria Certificate in Education (NCE), B.Sc. (Ed), and M.Sc. degrees from Ahmadu Bello University, Zaria, Nigeria.

She has been with the Federal College of Education, Zaria, since 2010, where she has risen to the rank of Principal Lecturer. Her primary area of interest is Integrated Science Education.

Mrs. Bwankhot is a certified lecturer, registered with the Teachers Registration Council of Nigeria (TRCN), and is an active member of the Science Teachers Association of Nigeria (STAN).

### **Mrs. Edna Sunday Bwankhot**

Department of Integrated Science  
School of Secondary Education  
Federal College of Education, Zaria  
Gyellesu Zaria, Kaduna State  
Nigeria

**E-mail:** [ednabwankhot@gmail.com](mailto:ednabwankhot@gmail.com)

Watsapp: +234-8062258584



**Zainab Sulaiman** was born in Zaria, Nigeria, in 1978. She earned her Nigeria Certificate in Education (NCE) in 1999, followed by a B.Sc. (Ed) in 2006 and an M.Sc. (Ed) in 2015.



In 2009, she joined the Federal College of Education, Zaria, where she has since served as a Senior Lecturer.

Her primary research interests focus on teaching strategies, students' academic performance, and cognitive styles.

Sulaiman is an active member of the Science Teachers Association of Nigeria (STAN) and the Science Association of Nigeria (SAN).

**Ms. Zainab Sulaiman**

Department of Integrated Science  
School of Secondary Education  
Federal College of Education, Zaria  
Gyellesu Zaria, Kaduna State  
Nigeria

**E-mail:** [zsulaiman2015@gmail.com](mailto:zsulaiman2015@gmail.com)

Watsapp: +234-9077149982