

# Priorities Of Meta-Learning Teaching Method For Effective Teaching And Learning Of Basic Electricity In Technical Colleges.

<sup>1</sup>Prof Eze, Titus Iloduba, <sup>2</sup>Dr. Akamobi, Ogochukwu Grace & <sup>3</sup>Aduhuekwe, Festus  
Ikechukwu.

<sup>1</sup>Department of Technology and Vocational Education, Faculty of education, Nnamdi Azikiwe University, Awka, Anambra State.

<sup>2,3</sup>Department of Electrical Electronics Technology Education, School of Industrial Technical Education. Federal College of Education (Technical) Umunze, Anambra State.

## Abstract.

*Effective instruction in technical subjects (basic electricity inclusive) is an active process demanding task not only from the teachers but also from the students. The more teachers involve students in their teaching the higher the expectation of the outcomes. In addition to conventional teaching method, the teaching of technical subjects requires the use of variety of teaching methods and techniques. Studies had revealed that meta-learning teaching method is more effective than conventional teaching method for teaching and learning of technical subjects in technical colleges. The study aimed at discussing the priorities of meta-learning teaching method for teaching and learning of basic electricity in technical colleges. The study also discussed extensively meta-learning teaching method, classroom application of meta-learning, teaching methods as well as Brunner's discovery theory as one of the theories that is related to the study. The study recommended amongst others that government and stakeholder in technical colleges should sensitize technical teachers on the efficacy of meta-learning through conferences, seminars and workshops, teachers should train, encourage and motivate students on how to apply meta-cognitive strategies in learning of basic electricity so as to become successful independent learners.*

**Keywords:** *Meta-learning, Teaching method, Basic electricity, Technical Colleges.*

## **Introduction**

The value and functionality of any educational system lie in its ability to actualize the goals of education. The achievement of this goal rests squarely on the learner, the environment and the teaching methods employed by the teacher. Teaching methods involves the interaction of the teacher, learners and the subject matter. Ume in Akamobi (2021) stated that teaching method is basically geared towards ensuring that learners learn well and understand the logics inherent in what is being taught

The current methods of teaching employed in Nigerian schools (technical colleges inclusive) are mainly based on teacher-centered approach. This teaching method which includes demonstration, lecture, discussion, etc, does not sufficiently give students the opportunity to participate in the classroom activities. It emphasizes teaching more than learning and pays little or no attention to the process of learning thereby dwarfing students' creative thinking which is necessary in today's workplace. This is not to indicate that teacher-centered approach is without value as it could be used to cover large content at a time and students are given the same content at the same time. It can equally be used to cover large class which is a prominent feature of most Nigerian schools. However, it is not the most effective method to help technical education students especially for basic electricity students develop and use higher order cognitive skills to solve complex real world problem. This is because it could encourage rote learning which does not lead to proper acquisition of knowledge and applied skills. Nwachukwu in Eze (2014) stated that Nigeria may not achieve the educational objectives if technical education teachers continue to rely on the teacher-centered approach for instruction.

One of the subjects being taught by technical education teachers is basic electricity. Basic electricity is a trade-related module of technical college syllabus taught in years I, II, III as stipulated by federal republic of Nigeria,(FRN),(2014). ). The objectives of basic electricity as outlined in the National Business and Technical Examination (NABTEB, 2007) are that at its completion, the students should be able to demonstrate an understanding of the following principal units of the total course contents: structure of matter and its relevance to electricity, sources of electromotive force, electric circuit analysis, basic components- resistors, capacitors, inductors, ohmic values and functions of resistors, Ohm's law and its application, principles of AC and DC generation, principles of magnetism, series and parallel connections of electrical components, operation and uses of electrical/electronics measuring instruments and principles of transformer construction/operations.

Being the only module that cuts across the entire engineering and related technical subjects, it ought to be taught well to ensure that students acquire the necessary knowledge and skills for employment after graduation. Akamobi (2021) stated that effective instruction in technical subjects is an active process demanding task not only from the teacher but also from the learner. This is in line with the views of Igboko and Ibeneme (2006) who opined that the use of conventional method like lecture and demonstration alone had proved incapable of producing the effect required for coping with the challenges of globalization and rapid technological development. In the search for effective teaching methods that could improve students acquisition of knowledge and applied skills for technical education subjects, studies conducted by Ogwo (2006), Eze, Ezenwafor and Molokwu (2016), Eze, Obidile and Akamobi (2021) on the effects of conventional teaching methods and meta-learning on students' achievement and retention in technical

subjects revealed that meta-learning teaching method is better than conventional teaching methods. Since meta-learning has been found to be more effective than traditional teaching method for improving students' achievement and retention in technical subjects, why is it that most technical education teachers have not been applying it in their instructional delivery. The study, therefore sought to simplify meta-learning teaching method for use in teaching and learning of basic electricity in technical colleges.

### **Statement of the Problem.**

It is sadly noticeable that while some teachers adhere to professional practice of using appropriate teaching method and techniques in teaching, a number of others do not. It is either that they are unaware of these methods or are deficient in their use. Teachers cannot assume to promote learning if they are ignorant of the appropriate procedures, techniques and methods to be used in teaching. While appropriate instructional methods are likely to enhance learning achievement and retention, inappropriate methods are known to stifle knowledge retention and realization of learning objectives. Since research findings have revealed that meta-learning teaching method is more effective than conventional teaching methods for teaching and learning of technical education subjects (Basic Electricity inclusive), It therefore, becomes necessary to simplify meta-learning teaching method for use by teachers in teaching and learning of basic electricity so as to ensure its utilization in other to enhance students acquisition of knowledge and applied skills for better performance.

### **Meta-Learning as a Teaching Method.**

Teaching is an interactive process through which knowledge and skills are shared with students. Through the process students understanding and ability to

manipulate the social, economic, political and physical environment are improved to enhance their survival. Teaching method is a way used by teachers to create learning environment and specify the nature of the activity in which the teacher and the learner must be involved during instructional delivery process (Ugwu, 2014). According to Amechi and Thomas (2016) teaching methods are characterized by the following:

- a. It should progress from simple activities to the more complex tasks.
- b. It should possess qualities capable of arousing the interest and enthusiasm for active participation of the students.
- c. It should be flexible to accommodate individual differences of the learners.
- d. It should be structured in such a way that will satisfy the basic needs of the students.
- e. It should be motivating for achievement without boredom
- f. It should link classroom activities with real life activities.
- g. It should be able to put into action all five senses (hearing, seeing, feeling, tasting and touching) for effective retention of knowledge and transfer of skills required.

O'Bannon in Ugwu (2014) categorized teaching methods into two; teacher-centered approach and learner-centered approach. Teacher centered approach includes all the teaching methods that see the teacher as processor of knowledge. It is a conventional and widely used teaching method where the teacher does most of the talking and intellectual work while the students are passive recipients of the information provided. These methods include lecture, demonstration, discussion.

etc. Learner-centered approach on the other hand includes all the teaching methods that do not see the teachers as decision-makers and problem solvers but rather as a guide, facilitator in the teaching and learning process. Such approach provides the students the opportunity to participate in the learning to influence the content, activities materials and pace of learning. Learning in this approach could be collaborative, co-operative, competitive and interactive. Teachers' involvement includes questioning, suggesting, guiding, validating, motivating, modeling, monitoring and clarifying. (McKenzie in Ugwu, 2014). Teaching methods in learner-centered approach includes collaborative, problem-solving, scaffolding, constructivist, cognitive apprenticeship, guided discovery, meta-learning etc.

Meta-learning according to Bigg in Lemka, Buaka and Gabrys (2013) is being aware of and taking control of one's own learning. The author went further to say that meta-learning is viewed as understanding and adaptation of learning itself on a higher level than merely acquiring subject knowledge. In the same vein Maudsley in Eze, Ezenwafor and Molokwu (2016) described meta-learning as the process by which learners becomes aware and increasingly in control of habit of perception, inquiring learning and growth that they have internalized. In other words meta-learning is an awareness, understanding and taking control of one's learning through the use of meta-cognitive strategies such as planning, execution, monitoring and evaluation. Meta-learning teaching method is a learner centered approach to instruction that trains the learner's consciousness on the use of meta-cognitive processes for learning. (Ogwo and Oranu in Akamobi, 2021) In a meta-learning environment the teacher could encourage the students to go 'meta' in their learning by telling the students what the learning contents/experiences are all about, what the specific objectives are and what tools that could be used to motivate and help students achieve the specific objectives. Jackson in Winters

(2013) stated that meta-learning is closely related to meta-cognition. Meta-cognition refers to one's ability to know what one knows and what one does not know. It is a concept in meta-learning that helps the teachers become familiar with the strategies for helping students regulate, monitor, and guide their learning. Mahdavi (2014) stated that the aim of meta-cognition is to develop the sensitivity of students to learning situation, heighten students' awareness of the cognition repertoire and the factors that affect the learning process, teach strategies for learning and develop students' capacity to regulate as well as monitor their activities. Meta-cognition is a complex structure involving cognitive knowledge and cognitive regulation. The knowledge according to Brown in Mehrdad (2016) is used to monitor and regulate cognitive processes; reasoning, comprehension and problem solving. The author further stated that cognitive knowledge is characterized by declarative knowledge, procedural knowledge and conditional knowledge.

*Declarative Knowledge:* This involves knowledge, skills and strategies essential for accomplishing a task successfully under certain conditions. (Presseley & Harris in Mahdavi, 2014). It is referred to as knowledge that a person has about his or her abilities and about the salient learning strategies that affect cognitive processing. For example, in basic electricity, students' knowledge of the formula for calculating the capacitance of a capacitor, method of calculating value of a resistor using colour coding, knowing that the symbols on a printed circuit board represent the electronics components used on the board.

*Procedural Knowledge:* This has to do with the knowledge of how to do something, how to perform steps in a process. For instance, students' ability to apply the formula in calculating capacitance of a capacitor, ability to determine

the resistance of a resistor using colour coding, ability to identify a particular electronic component using the symbols on the printed circuit board.

*Conditional Knowledge:* This is knowledge about when to use a procedure, skills or strategies and when not to use them, why a procedure works and under what conditions and why a procedure is better than another. For example, ability of basic electricity students to know that for a faulty capacitor and resistor to be replaced in a circuit board, there is need to find out the value of the particular capacitor and resistor as well as their equivalents.

### **Application of Meta-Learning in Classroom Situation.**

Meta- learning instructional method emphasizes active learning and guided discovery providing the teacher with the instructional tools to cope with the diversities of abilities and learning preferences amongst students in the classroom. Amaechi (2012) observed that learners in meta-learning classroom are the most successful students because they set goals for their performance, plan how best to use their time, focus their attention on the learning task, keep themselves motivated. Corroborating with this view Bransford, Brown and Cockry in Akamobi (2021) opined that effective teaching and learning in the classroom endorses active learning where students take control of their learning by recognizing when they understand and when they need more information. Learners who are aware and capable of taking control in learning are able to assess learning approach and adjust it according to the requirements of specific task. This is best achieved when learners are probably made aware of themselves and their learning through meta-cognition (Brazdil, Giraud-Carrier, Soares & Vilalta, 2007).

Nelson and Naren's (1990) in Akamobi (2021) indentified critical steps on how a teacher can best use meta-cognition as follows:



- (a) Make learning goals explicit and help students to plan strategies and ways of monitoring their progress towards achieving these goals.
- (b) Encourage co-operative group work where set tasks require students to discuss their understanding, evaluate their own work and work as groups and reflect on their learning.
- (c) Use self assessment in the classroom to promote meta-cognitive skills; learners can assess the quality of their work based on learning goals, and make adjustment accordingly.
- (d) Use teacher and peer-scaffolded interactions to support meta-cognitive development and gradually encourage the transition from the external supported monitoring and control to more internalised meta-cognitive processes.
- (e) Focus on developing learner's awareness of the strategies they use by encouraging the discussion of the strategies in the class. This could include when to use certain strategies, how they impact on their learning and why the strategies work.
- (f) Encourage the transfer of strategies across different domains of the school curriculum.
- (g) Support the learners' autonomy by allowing them to make choices on the level of difficulty of certain tasks. Avoid giving answers where possible, instead prompt the students to think for themselves and choose an appropriate strategy for the tasks.

In order to facilitate the use of meta-learning instructional technique for skill acquisition in technical and vocational education (basic electricity inclusive) Eze, Ezenwafor and Molokwu in Akamobi (2021) stated that the teachers should be able to:

- a) Discuss the instructional objectives with the students before starting each lesson.
- b) Outline the thinking process skills involved in every aspect of the lesson and the best technique of assisting the students to think through them.
- c) Use different attention-sustaining strategies to make students conscious of the task at hand.
- d) Specify the various process evaluation tasks and questions needed for each stage of instruction.

Eze, Ezenwafor and Molokwu in Akamobi (2021) further identified the elements in meta-learning as; planning, execution, monitoring and evaluation.

*Planning:* This involves selection of proper strategies and provision of resources effective for reaching goals. It is used to activate learners' background knowledge to get prepared for learning. The strategies associated with planning include goal setting, focusing, information gathering and organization. During this process, the teacher makes the learning goals explicit by expressing the objective orally or writing it on the chalkboard and helping the students to plan strategies as well as ways of monitoring their progress towards achieving the objectives. Students are allowed to seek clarifications on confusing concepts that proved difficult to remember. The teacher could use mnemonics to assist the students in remembering difficult concepts but students should never be spoon fed with information that they can find themselves.

*Execution:* Execution involves the teacher working with students in small groups to model them in the use of these strategies: analysing, synthesising, predicting,

elaborating. Here the teacher uses demonstration and questioning wherever possible to teach a given task pointing out attributes of the materials and allowing students to practice the demonstrated skills to discover facts themselves. Fui (2011) stated that students process information more effectively when they are actively involved in the learning process. Teachers also support learners' autonomy by allowing them to make choices on level of difficulty of certain tasks, avoid giving them answers where possible but instead prompt the students to think for themselves and choose appropriate strategy for the tasks. In other words the teacher leads the students through exploratory activities that enable them to investigate on their own, question, challenge and formulate their own ideas and conclusion.

*Monitoring:* Monitoring as used by the researcher in this study, is learners' awareness of comprehension of learning contents and task performance. The students during this process reflect on whether they understood the learning contents through self-examination. Timing, attention, style are the instructional strategies associated with monitoring elements of meta-learning teaching methods. Teachers allow sufficient time between task and on task's requirements but practicing time should be regulated based on the nature and difficulty level of tasks, tolerating students' different learning style.

*Evaluation:* Evaluation according to Mehrdad (2016) is referred to assessing the outcome of comprehension or the learning processes after accomplishing a task. It is the explanation of progress being made towards goals which could result to further planning, monitoring and execution. The strategies involved in evaluation are reviewing, revising, value determination and verifying. The teacher allows the students to mention important points of the lesson, and then revises the lesson in

order to correct and improve students' revision of the lesson. The students are also allowed to criticize one another's' work or their own work based on earlier established criteria. Take-home assignments are given to students which will center on verification of reached conclusion.

### **Relationship of Brunner's Discovery Theory to Meta-Learning Teaching Method.**

Brunner's discovery theory is one of the theories relating to the study. Brunner's theory emphasized that the purpose of education is not to impart knowledge but to facilitate a child's thinking and problem solving skills which could be transferred to a range of situations. Brunner views human brain as an information processor, thinker and creator of ideas whose cognitive development is through interaction and exploitation of the environment. Brunner believed that learning is effective when learners are given opportunities to discover facts by themselves. Brunner went on to suggest that the intellectual ability is developed in stages through step-by-step changes on how the mind is used. Brunner therefore identified three principles to guide development of instructions which include

- (a) Instructions must be concerned with the experiences and context that make the students willing and able to learn (readiness).
- (b) Instructions must be structured so that students can easily grasp it (spiral organisation).
- (c) Instructions should be designed to facilitate extrapolation and or fill in the gaps (going beyond the information given).

Bruner's theory is related to this study as it detects that teachers should expose the students to an array of learning experiences for the students to develop their mental

abilities through activities inherent in the experiences. Meta-learning teaching method appeals to the students variously, providing them with opportunities to discover ideas and facts in the real-world setting through their own effort. Brunner's theory is also considered appropriate for this study since it can be used to explain learning process when using meta-learning which provides basic electricity teachers with the instructional tools to cope with the diversities and learning preferences amongst students in the classroom.

### **Conclusion.**

The primary purpose of teaching is the promotion of learning. Teachers cannot assume to promote learning when they are ignorant of the procedures, techniques and methods to be used in teaching. Studies had revealed that meta-learning teaching method is more effective than conventional teaching method in improving students' achievement and retention in basic electricity. Meta-learning teaching method has been simplified in this study so that technical teachers could find the method easier and understandable to apply in their instructional delivery.

### **Recommendations.**

1. Government and stakeholders in technical colleges should sensitize technical teachers on the efficacy of meta-learning teaching method through conferences, seminars and workshops.

2. Teachers of basic electricity should train, encourage and motivate students on how to apply meta-cognitive strategies in learning basic electricity so as to become successful independent learners.
3. Technical teachers should adopt meta-learning teaching method in their instructional delivery as well as blend it with other teaching methods where necessary so as to improve students' knowledge and skill mastery.
4. Curriculum planners should develop a workable basic electricity curriculum that will accommodate teachers incorporating meta-learning in instructional delivery.

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## References.

- Akamobi, O.G,(2021). *Comparative effectiveness of constructivist and meta-learning teaching method on students' achievement and retention in basic electricity in technical colleges in Anambra State*. Unpublished PhD Dissertation, Faculty of Education, Nnamdi Azikiwe University, Awka.
- Akamobi, O.G (2021). Examining the Academic Achievement and Retention of Basic Electricity Concepts among Technical College Students: A Meta-cognitive Perspective *Annals of Technology Education Practitioners Association of Nigeria*. 4(5),
- Amaechi, C. (2012). Assessment of self-regulated learning as a panacea for acquisition of science process skills by chemistry students in secondary schools. *Contemporary Journal of Educational Research*, 4(1), 161-174.
- Amechi, O. J & Thomas, C.G (2016). Strategies for effective teaching and learning of practical skills in technical and vocational training programmes in Nigeria. *International Journal of Scientific Research in Engineering and Technology*, 5 (14). <http://www.ijser.org> .
- Brazdil, P., Giraud-Carrier, C., Soares, C. & Vilalta, R (2009). *Meta-Learning: applications to data minding*. Berlin: Springer.
- National Business and Technical Examination Board (2017) *May/June 2013/2017 NTC Examination Result Analysis Report*. Benin City.
- Eze,T.I ,Obidile, J.I & Akamobi,O.G (2020). Relative effectiveness of constructivism and meta-learning teaching methods on students' achievement and retention in basic electricity in technical colleges. *European Journal of Training and Development Studies*, 7(1) 55-63.
- Eze, C.P (2014). *Effects of guided-discovery on students' academic achievement and retention of concepts in block/brick laying and concreting in Technical Colleges in Anambra State*. Unpublished Ph.D Dissertation, Faculty of Education, Nnamdi Azikiwe University, Awka.
- Eze, T.I. Ezenwafor, J.I & Molokwu, L.I (2015). Effects of meta-learning teaching method on the academic performance of building trade students in technical colleges in south-east Nigeria. *International Journal of Vocational and Technical Education*, 7 (10), 101-108.
- Federal Republic of Nigeria (2014). *National Policy on Education*. Lagos: NERDC Press

- Fui, K.S (2011). Implementation of constructivists' approach among chemistry students-teachers in teaching chemistry during their teaching practice. Malaysia: in teaching chemistry during their teaching practice. Malaysia: University Technology. [www.fp.utmmmy/epusatsumer/pdfia/ptkg/hdtwp](http://www.fp.utmmmy/epusatsumer/pdfia/ptkg/hdtwp).
- Igboko, K.O & Ibeneme, O.T (2006). Effects of some cognitive constructivist instructional approaches on student's achievement and retention in the study of introductory technology in Nigeria. *Journal of Science Teachers Association of Nigeria* 41(172), 37-43
- Lemke, C., Budka, M. & Gabrys, B. (2015). Meta-Learning: A survey of trends and technologies. *Artificial Intelligence Review* 44(1), 117-130
- Mahdavi, M. (2014). An overview: meta-cognition in education. *International Journal of Multidisciplinary and Current Research*, 2, 529-534. <http://ijmcr.com>
- Mehrdad, N (2016). A Brief History of Meta-cognition and Principles of Meta-cognitive Instruction in Learning. *Journal of Humanities, Arts Medicine and Sciences* 2(2), 61-64
- Ogwo, B.A (2006). Gender differential effects of meta-learning instructional strategies on students' achievement in metal-work technology. *Journal of Vocational and Adult Education*, 5 (1), 1-10.
- Ugwu, T.U (2014). *Effect of guided inquiry methods on students' achievement and interest in basic science*. Unpublished M.Sc Thesis, Faculty of Education, University of Nigeria, Nsukka
- Winters, T. (2013). *A Framework for facilitating Meta-Learning as part of subject Teaching*. [http:// conference.pixel-online.net/166.ITL28-FB-winters-FOE2013.pdf](http://conference.pixel-online.net/166.ITL28-FB-winters-FOE2013.pdf)



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