# COMPUTER ASSISTED INSTRUCTION AS A PANACEA FOR ENHANCING PRESCHOOLERS'COGNITIVE DEVELOPMENTIN CROSS RIVER STATE

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**Abstract**

*The study examined the need for equipping preschoolars to computer assisted programmes as a sure means of enhancing cognitive development in primary schools in Cross River State. It explores the usefulness of 'information and communication technology in building the child's mental capability to undertake complex tax need When children are exposed to learning with computer, their mental ability tends to develop speedily and they are bound to perform complex task with ease. The study also pinpoints the need for cognitive development in pre-scholars using Information and Communication Technology which will assist preschoolars to learn swiftly. The emphasis of the paper was on developing cognitive domain using three levels, knowledge, comprehension and application and their practical implications on learning. Finally, the pope-provides the way forwards on how to encourage pre-scholars to develop their mental ability computer-based testing as a sure means.*

**Keywords:** Exposing, Pre-scholar Computer, Assisted Instruction, Cognitive Development.

## Introduction

Preschoolars are children between ages three to six, they should be at the "preoperational" stage of Piaget's cognitive development theory, meaning they are using their imagery and memory skills. They are usually conditioned to learning through memorizing, and their view of the world is normally very self-centred. Preschoolars usually have also developed their social interaction skills, such as playing and cooperating with other children of their own age. It is normal for preschoolers to test limits of their cognitive abilities, and they learn negative concepts and actions, such as talking back to adults, lying and bullying. Other cognitive development in preschoolers are developing an increased attention span, learning to read and developing structured routines, such as doing household chores and in most cases they find it interesting to manipulate objects around them (Basturk, 2005). This implies that there is

strong need to encourage preschoolars cognitive development to meet with the diverse need in the society.

Adeyemi (2012) informed that the preschool age is a time for rapidly independence; children learns to separate from the parent in preparation for attending school during the preschool years, they learn essential life skills, like dressing and feeding herself because children learn best when there are clear rules and expectations as well as established regular routines. The morning routine can involve going to the potty, getting dressed, and eating breakfast are skills that the child will eventually be able to do on her own.

Preschool children want to touch, taste, smell, hear, and test things for themselves. They are eager to learn, they learn by experiencing and by doing. Preschoolers learn from their play. They are busy developing skills, using language, and struggling to gain inner control. Preschoolers want to establish themselves as separate from their parents. They are more independent than toddlers. They can express their needs since they have greater command of language. Fears often develop during the preschool years Common fears include new places and experiences and separation from parents and other important people. He or she might use forbidden words and might act very silly. Preschoolers may still have trouble getting along with other children and sharing may still be difficult. Because of their developing imaginations and rich fantasy lives, they may have trouble differentiating fantasy from reality. According to Barnett (2006)preschoolers need clear and simple rules so that they know the boundaries of acceptable behaviour, the author outlined the following as key to pre scholars age, and physical and social development Thus:

**Three-year-olds**

Physical Development - They ride a tricycle they catch a ball they stand on one foot. They build towers of 6-9 blocks. They walk on tip toes. They jump horizontally. They handle small objects such as puzzles, and pegboards. They smear or daub paint, they draw or paint in circular and horizontal motions, they grow about 3 inches taller in a year.

Social and Emotional Development - They need to know clear and consistent rules and what the consequences for breaking them are. They enjoy dramatic play with other children. Their emotions are usually extreme and short-lived they need to be encouraged to express their feelings with words they begin to learn to share.

**Intellectual Development** - Preschool children learn best by doing, they need a variety of activities. They need indoor and outdoor space, they need a

balance between active and quiet play they can communicate their needs, ideas, and questions. Their attention span longer so they can participate in group activities.

**Four-Year-Olds**

Physical Development - They run on tip toes, they gallop, they pump themselves on a swing, they hop on one foot. They begin to skip. They throw a ball overhand, they have more small muscle control. They can make representational pictures (for example, pictures of flowers. people, etc.) They like unzipping, unsnapping and unbuttoning clothes. They dress themselves, they like lacing their own shoes. They can cut on a line with scissors, they can make designs and write crude letters they are very active and aggressive in their play.

Social and Emotional Development - They sometimes have imaginary friends they tend to brag and be bossy. They have very active imaginations. They need to feel important and worthwhile. They can be aggressive but want friends and enjoy being with other children they enjoy pretending to be important adults such as mom, dad, nurse, doctor, mail carrier, police officer they appreciate praise for their achievements. They need opportunities to feel more freedom and independence. They are learning to take turns andto share. Games and other activities can help preschoolers learn about taking turns.

Intellectual Development - They ask lots of questions, including "how" and "why" questions they are very talkative. Their language includes silly words and profanity. They enjoy serious discussions. They should understand some basic concepts such as number size, weight color, texture, distance, time and position. Their classification skills and reasoning ability are developing.

**Need for Computer Assisted Instruction among Pre-schoolers**

Computer-Assisted Instruction (CAI) is a programme of instructional material presented by means of a computer or computer systems. To this end, Christensen and Knezek (2001) noted mat the use of computers in education started in the 1960s. With the advent of convenient microcomputers in the 1970s, computer use in schools has become widespread from primary education through the university level and even in some preschool programs. Instructional computers are basically used in one of two ways: either they provide a straightforward presentation of data or the fill a tutorial role in which the student is tested on comprehension.

If the computer has a tutorial program, the student is asked a question by the computer, the student types in an answer and then gets an immediate response to the answer. If the answer corrects, the student is routed to more

challenging problems; if the answer is incorrect, various computer messages will indicate the flaw in procedure, and the program will bypass more complicated questions until the student show s master}' in that area.

Collier (2004) pointed that there are many advantages to using computers in educational. They provide one-to-one interaction with a student, as well as an instantaneous response to the answers elicited, and allow students to proceed at their own pace. Computers are particularly useful in subjects that require drill, freeing teacher time from some classroom tasks so that a teacher can devote more time to individual students. Acanbe used diagnostically, and once a student's problem has been identified, it can then focus on the problem area (Cuban, 2001), Finally, because of the privacy and individual attention afforded by a computer, some students are relieved of the embarrassment of giving an incorrect answer publicly or of going more slowly through lessons than other classmates

One of the more difficult aspects of instructional computers is the availability and development of software, or computer programs. Courseware can be bought as a fully developed package from a software company, but the program provided this way may not suit the particular needs of the individual class or curriculum. A courseware template may be purchased, which provides a general format for tests and (fail! instruction, with the individual particulars to be inserted *by* the individual school system or teacher (Dadebo, 2003). The disadvantage to this system is that instruction tends to be boring and repetitive, with tests and questions following the same pattern for every course. Software can be developed in-house, mat is, a school course, or teacher could provide the courseware exactly tailored to its own needs, but this is expensive, time-consuming, and may require more programming expertise than is available.

**Meaning of Computer Assisted Instruction (CAI)**

Computer Assisted Instruction (CAI) is the integrated of self-learning technique usually offline or online, involving interaction of students with programmed instructional materials CAI is an interactive instructional technique whereby, a computer is used to present the instructional material and monitor the learning that takes place. CAI uses a combination often, graphic sound and video in enhancing the learning process. CAI also bothers on the use of the computer as a tool to facilitate and improve instruction. CAI programs use tutorials, practice, simulation and problem-solving approaches to present topics and they best test the students' understanding.

According to Usun (2000), computer assisted instruction is concerned with the use of computers not only as a choice but to mediate the flow of information in the instruction process and the complementary means. CAI was

utilized in the education as an educational medium which delivers instructional activities in the late 1950s. Papert (2013: pp 5) stated that "...programming the computer to administer the kinds of exercises traditionally given by a teacher at blackboard, a textbook, or a worksheet". Although the technology has been changing rapidly over the twenty years, computer-assisted instruction is still utilized in education. Drill-and practice, Tutorial, Games, and Simulation are commonly used CAI applications for educational purposes Drill-and-practice programs lead learners through a series of examples to increase dexterity and fluency in a skill drills-and-practice is used predominantly for math drills, foreign language translation and vocabulary building in these programs the student is allowed several tries before the computer presents the correct answer.

Another type of computer application in education is simulating experimentations. In the simulation environment, students investigate simulations on the computer screen as a replacement for observing and doing something real, either in a laboratory or in the field. For instance, one program popular in the early "90s was simulated natural ecosystem. In this ecosystem simulation software, the students could change a number of characteristics of the habitat, the consequences of which were then played out for them to observe and from which they were to draw- conclusions (Setzer &Monke, 2001). In social studies, rain and volcanic formation can be simulated to promote procedural knowledge.

In the tutorial mode, computers act as the teacher by presenting information in small units to pre-scholars and then reinforcing with questions or tasks. Then computer analyx.es the student's responses and gives feedback or remedial instruction based on his or her response For example Mavis Beacon Teaches Typing is a tutorial program which guides students to learn touch-typing skills (Smaldino, Russell, Heinich, &Molenda, 2005). In computer-assisted tutorial applications that provide student different methods of answering a problem and immediate answers, exploratory software programs allow students opportunities to engage in mathematical investigations, and programming skills that develop logical reasoning in students. The final mode is games. Smaldino (2005) defines game as "…an activity in which participants follow prescribed rules that differ from those of real life as they strive to attain a challenging goal" (p. 121). Therefore, a game may or may not be instructional. If it contains academic skill practice then it is defined as an educational game. Game software provides elements of competition into learning activities. With computer games, students are competing against their own previous scores or against the designer of the game as they indicate their understanding of educational content. By so doing,

the students will be motivated to reach a higher level in the game there by exposing them to new techniques.

**Means of Enhancing Cognitive Development among Pre-schoolers.**

Cognitive development means how children think, explore and figure things out It is the development of knowledge, skills, problem solving and dispositions, which help children to think about and understand the world around them. It was once believed that infants lacked the ability to think or form complex ideas and remained without cognition until they learned language. It is now known that babies are aware of their surroundings and interested in exploration from die time they are born. From birth, babies begin to actively learn. They gather, sort, and process information from around them, using the data to develop perception and thinking skills. Cognitive development refers to how a person perceives, thinks, and gains understanding of his or her world through the interaction of genetic and learned factors. Among the areas of cognitive development are information processing, intelligence, reasoning, language development, and memory.

Historically, the cognitive development of children has been studied in a variety of ways. The oldest is through intelligence tests, such as the widely used Stanford Binet Intelligence Quotient (TQ) test first adopted for use in the United States by psychologist Lewis Terman (1877-1956) in 1916 from a French model pioneered in 1905. IQ scoring is based on the concept of "mental age," according to which the scores of a child of average intelligence match his or her age, while a gifted child's performance is comparable to that of an older child, and a slow learner's scores are similar to those of a younger child. IQ tests are widely used in the United States, but they have come under increasing criticism for defining intelligence too narrowly and for being biased with regard to race and gender.

In contrast to the emphasis placed on a child's native abilities by intelligence testing, learning theory grew out of work by behaviourist researchers such as John Watson (1878-1958) and B. F. Skinner (1904-1990), who argued that children are completely malleable. Learning theory focuses on the role of environmental factors in shaping the intelligence of children, especially) on a child's ability to learn by having certain behaviours rewarded and others discouraged.

**Levels of cognitive domain of educational objectives**

The cognitive domain involves knowledge and the development of intellectual skills (Bloom, Engelhart, Furst, Hill & Krathwohl 1956).This includes the recall or recognition of specific facts, procedural patterns, and

concepts that serve in the development of intellectual abilities and skills. There are six major categories of cognitive processes, starting from the simplest to the most complex: Knowledge, comprehension, application, analysis, synthesis and evaluation represented with the acronym (KCAASE)

1. **Knowledge:** This is defined as the remembering of previously learned material. This may involve the recall of a wide range of material, from specific facts to complete theories, but all that is required is for the student to bring to mind the appropriate information. Knowledge represents the lowest level of learning outcomes in the cognitive domain. Examples of terms used in knowledge level are; defines, describe, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states etc.

2. **Comprehension:** This has to do with the ability to grasp the meaning of material and translating the material from one form to another (words to numbers), by interpreting material (explaining or summarizing), and by estimating future trends (predicting consequences or effects). These learning outcomes go one step beyond the simple remembering of material, and represent the lowest level of understanding. Key terms used are; comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives an example, infers, interprets, paraphrases, predicts, rewrites, summarizes, translates etc.

3. **Application:** Application deals with the ability to use learned material in new and concrete situations. This may include the application of such things as rules, methods, concepts, principles, laws, and theories in explaining phenomenon. Learning outcomes in this area require a higher level of understanding man those under comprehension. Keywords used are applies, changes, computer, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts prepares, produces, relates, shows, solves, uses etc.

4. **Analysis:** This refers to the ability to break down material into its component parts so that its organizational structure may be understood. This may include the identification of the parts, analysis of the relationships between parts, and recognition of the organizational principles involved- Learning outcomes here represent a higher intellectual level than comprehension and application because they

require an understanding of both the content and the structural form of the material. The keywords used are analyzes, breaks down, compares, contrasts, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates etc.

5. **Synthesis:** This refers to the ability to put parts together to form a new whole This ma> involve the production of a unique communication (theme or speech), a plan of operations (research proposal), or a set of abstract relations (scheme for classifying information) Learning outcomes in this area stress creative behaviours, with major emphasis on the formulation of new patterns of structures. Keywords used are categorizes, combines. compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, writes etc.

6. **Evaluation:** This is concerned with the ability to judge the value of material (statement, novel, poem, research report) for a given purpose. The judgments are to be based on definite criteria. These may be internal criteria (organization) or external criteria (relevance to the purpose), and the student may determine the criteria to be given to them. Learning outcome in this area is the highest in the cognitive hierarchy because they contain elements of all of the other categories, plus conscious value judgments based on clearly defined criteria. The keywords used are appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports etc.

**Piaget's theory of cognitive development**

This study is hinged on theory of cognitive development propounded by a French psychologist, Jean Piaget (1896-1980). Piaget's theory, first published in 1952, grew out of decades of extensive observation of children, including his own, in their natural environments as opposed to the laboratory experiments of the behaviourists. Although Piaget was interested on how children reacted to their environment, he proposed amore active role for them than that suggested by learning theory. He envisioned a child's knowledge as composed of schemas basic units of knowledge used to organize past experiences and serve as a basis for understanding new ones.

Schemas are continually being modified by two complementary processes that Piaget termed assimilation and accommodation. Assimilation refers to the process of taking in new information by incorporating it into an existing schema. In other words, people assimilate new experiences by relating them to things they already know. On the other hand, accommodation is what happens when die schema itself changes to accommodate new knowledge. According to Piaget, cognitive development involves an ongoing attempt to achieve a balance assimilation and accommodation that he termed equilibration. At the center of Piaget's theory is the principle that cognitive development occurs in a series of four distinct, universal stages, each characterized by increasingly sophisticated and abstract levels of thought. These stages always occur in the same order, and each builds on what was learned in the previous stage. They are as follows:

Sensorimotor stage (infancy): In this period, which has six sub-stages, intelligence is demonstrated through motor activity without the use of symbols. Knowledge of the world is limited, but developing, because it is based on physical interactions and experiences. Children acquire object permanence at about sew months of age (memory). Physical development (mobility-) allows the child to begin developing new intellectual abilities. Some symbolic (language) abilities are developed at the end of this stage.

Pre-operational stage (toddlerhood and early childhood): In this period, which has two sub stages, intelligence is demonstrated through the use of symbols, language use matures, and memory and imagination are developed hat dunking is done in a non-logical non-reversible manner. Egocentric thinking predominates.

Concrete operational stage (elementary and early- adolescence): In this stage, characterized by seven types of conservation (number, length, liquid, mass, weight, area, and volume), intelligence is demonstrated through logical and systematic manipulation of symbols related to concrete objects. Operational thinking develops (mental actions that are reversible). Egocentric thought diminishes.

Formal operational stage (adolescence and adulthood): In this stage, intelligence is demonstrated through the logical use of symbols related to abstract concepts. Early in roe period there is a return to egocentric thought only 35 percent of high school graduates in industrialized countries obtain formal operations; many people do not think formally during adulthood. The most significant alternative to the work of Piaget has been the information-processing approach, which uses the computer as a model to provide new insight into how th*e* human mind receives, stores, retrieves, and uses information.

The implication of is theory is that using information-processing theory to study cognitive development in pre scholars will help in the improvements in children's ability to take in information and focus selectively on certain parts of it and their increasing attention spans and capacity for memory storage. For example, researchers have found that the superior memory skills of older children are due in part to memorization strategies, such as repeating items in order to memorize them or dividing them into categories.

**Dissatisfaction with the Current System**

The current educational policy in Nigeria has not been fully implemented in terms of using the computer in teaching pre scholars' policymakers, educators, industry, or parents -consider the current method of teaching technology to school-goers feel that the type of skills that are developed are outmoded, and that the workforce and innovators of the future should be acquiring skills that enable them to use technology to create and innovate. Cuban (2001) observed that in the eyes of the current system's most vocal critics, the delivery of functional 'low-level' skills is stifling children's ICT-related creativity, and is the root cause of the undersupply of suitably qualified graduates.

The use of technology is becoming increasingly integrated into an ever-widening range of activities. Its use is now crucial to how we communicate, how we access goods and services, how we inform ourselves, how we engage with government, and, importantly, how we work. Therefore, the importance of pre scholars possessing the range of digital literacy skills to effectively exploit the potential of ICT becomes increasingly relevant. If the provision of ICT to pre-scholars is focused solely on Computer Science, at the expense of digital literacy, it is likely that a large percentage of school-leavers will exit the second-level educational cycle ill-equipped to perform a range of activities that they will want to perform, and that will be expected of them.

**Incomplete Skills Acquisition - The Digital Natives Myth**

Nowhere is the ubiquity and depth of integration of technology more evident than in the lives of younger people, especially school-goers. Smartphones are indispensable, connectivity is assumed, and content is continuously consumed and created. This has led to the widely-held belief that simply because one is young, and therefore is extremely comfortable with certain devices and applications, that he or she possesses a complete set of digital skills. Many of those who advocate for the removal of digital literacy skills development from school curricula feel that these types of skills

development measures have now become redundant because younger people acquire them informally in their daily lives, due to their continuous engagement with technology (Cuban, 2001). Obviously, pre scholars are inherently more adept in the use of technology, merely because they have grown up with it. This fallacy ignores the fact that the ICT skill set that will be developed in this informal manner is likely to be incomplete, on account of the younger user's predominant use of only certain applications, pre scholars will be highly adept in certain functions, such as uploading content, or multimedia consumption, but unlikely to acquire proficiency in less intuitive applications, such as spreadsheets, word processing, or presentation.

**Delivery of ICT in Schools: Practical Considerations**

The ability to effectively and safely use ICT is but one in a set of competences that any pre scholars should possess for meaningful participation in society. Delivery of ICT in Schools: Practical Considerations Despite calls for ICT school curricula to undergo a radical overhaul, and for it to focus almost solely on Computer Science, rather than the provision of the broader skill base developed through digital literacy, some practical considerations present themselves in relation to delivery. Computer Science is a rigorous academic discipline that requires highly trained teachers to teach it. Given the growth trends in the commercial IT sector, and the career progression and earning opportunities resulting from that growth, it is becoming increasingly difficult to attract Computer Science graduates into teaching. If ICT education in schools is to focus solely on Computer Science as a subject, who is going to teach it? Perhaps a more practical approach would be to initially ensure that all teachers possess the skills to effectively incorporate technology into their current teaching practices, and in this way unlock the multiple benefits that ICT offers to learners.

Another broader educational issue that is likely to arise if ICT in education is to focus solely on Computer Science is that, as a rigorous academic discipline, Computer Science is perhaps not required for all children. However, once every school-goers ICT skills needs have initially been addressed through the development of their digital literacy, and successive digital competence, men the specific competences relating to Computer Science should be made available to those who wish to pursue these further.

**Summary/Conclusion**

An increased emphasis on ICT learning in schools is important because it will drive innovation and allow individuals to participate in a sector that is crucial for the economy and society. However, this does not mean that digital

literacy and digital competence at a user level should be ignored in schools. The provision of ICT in education need not be a "zero sum game" wherethe success of one direction requires the complete demise of the other. The approaches should be complementary: it is vital that digital literacy skills are delivered to all learners (and perhaps integrated into the core curriculum), whereas Computer Science should be offered as an elective subject for learners who display an interest in it and/or display an aptitude for its often-challenging concepts. This more holistic approach is more in keeping with the heterogeneous complexity of the modern skills development landscape. On the basis of the present study the following conclusions are drawn:

1. The introduction and full implementation of computer assisted instruction in primary schools is likely to improve the quality of teaching and learning and promote high academic achievement and skills development among pre scholars
2. Pre scholars like learning through concrete materials such as computer assisted instruction medium, which arouse their interest and get them more actively involved in lessons delivery.
3. Learning all subjects in school through CAI will make the subject matter real and understandable to students which will later reflect positively in their academic performance among pre scholars.

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