Impact of Hands-On Activities on Students' Academic Achievement in Science and Technical Education in College of Education, Ikere-Ekiti, Ekiti State, Nigeria

[1]Adebisi O. AWODUN (Ph.D) & [2]Edward O.OSUNTUYI (Ph.D)

[1]Department of Science Education, Bamidele Olumilua University of Education, Science and Technology, Ikere-Ekiti, Ekiti State, Nigeria. [1]E-mail: bisawoideas@yahoo.com
[2]Department of Industrial Technology Education, Bamidele Olumilua University of Education, Science and Technology, Ikere-Ekiti, Ekiti State, Nigeria.
E-Mail: osunkenny@yahoo.com , Phone No: +2349064088155

Abstract

This study investigated the Impact of Hands-On Activities on Students' Academic Achievement in Science and Technical Education in College of Education, Ikere-Ekiti, Ekiti State, Nigeria. The study adopted descriptive survey research method. The target population for the study was all the science subject combinations and technical Education Students of College of Education, Ikere Ekiti, Ekiti State, Nigeria. A sample of one hundred NCE students was selected for the study. The only instrument used for data collection was a structured questionnaire. 100 copies of the questionnaire were administered on the NCE Science subjects combination and Technical Education Students. Frequency and simple percentage were used to analyse the demographic data of the respondents collected from the questionnaire while the hypotheses were tested using Pearson Correlation Analysis. It was concluded that hands-on activities has strong impact on classroom concentration of science and technical Education Student of College of Education Students, hands-on activities influenced and catalysed knowledge retention of science and technical education students, hands-on activities had impact on creativity ability of of science and technical education students, and hands-on activities enhanced and improved problem solving skills of science and technical education students. Based of the findings, appropriate recommendations were made.

Keywords: Hands-On, Academic Achievement, Science, Technical Education

Introduction

Education has made man useful to himself, his generation, his society and the whole existence of mankind. Education can be described as an agent of development. It is highly valued by every nations of the world since it initiates total liberation to man. Education has transformed the nature of man from being ignorant and expression of unhappiness to great level of knowledge and happiness. Through education, individual is able to develop in terms of physical, mental, moral, spiritual and emotional being by providing suitable environment, teaching him new knowledge, attitudes and skills that will enable him to be useful to himself and his society. The implication of this is that education strengthens every learner to be able to move up to the educational ladder and to the zenith of academic attainment through a good foundation of education.

Education in Nigeria is divided into three major level which are primary, secondary and tertiary institution. Meanwhile, it is one step before another and the most very vital, essential and foundational base of education is primary school education. The school is an organization where everything: lessons, tasks are planned. Moving from the curriculum to the classroom is a structure-process scenario in which it is admissible that nothing is so carefully planned that everything and every moment go exactly according to plan. The unexpected or surprising occurrences should lead to exploration and innovation in spite of earlier plans and improvisations.

Hands-on activities can be described as a method of instruction in which learners are guided or directed to gain knowledge through experience. This implies that it is kind of teaching and learning process in which the primary school pupils have the opportunity to manipulate the objects they are studying or being used for learning, for instance, plants, water, rulers, shapes among others. The hand-on activities is a process of learning by doing and pupils become active participants in the classroom teaching and learning activities. According to Haury & Rillero (2015), hands-on activities involves the College of Education students in a total learning experience that gives the opportunity to learn base on his or her ability and to make use of his or her ability to think critically. Hands-on learning through activities is a form of education in which students learn by doing, instead of simply listening to a teacher or instructor lecture about a given subject. The pupils engages with the subject matter to solve a problem.

Teaching and learning experiences that take place within the confines of the classroom walls have a range of benefits for both learners and instructors. When students are asked to put into practice in the real world what they are being taught by teacher, the result is a learner-centric learning experience that enhances learning and fosters personal and social development. However, College of education students that engage in learning experiences within the classroom with more of activities based learning are likely have higher levels of motivation to learning, recall what they have learnt more vividly, and have improved academic performance in the class (Ryan & Deci, 2017).

According to Hussain & Akhtar (2013), creativity and higher order learning may be achieved by the use of hands-on activities which will eventually lead to achieve the aforesaid objectives of College of Education. Since, College of education is designed to build the foundational education of students towards the advance educational aspiration, there is need for more of hands-on activities teaching process that can stimulate, motivate and enhance pupils' school readiness for optimizing potential for effective academic performance. Barring severe shyness or anxiety, hands-on activities is uniquely positioned to support or elevate any type of learner. Everyone has their own specific needs when it comes to their personal learning style. Pupils that prefer to listen to their lesson can hear the instructor as they follow along, and those that do well with visuals can watch the instructor, duplicating his or her steps after they are finished. Rather than a learning style alone, hands-on learning should be a

functional part of every lesson plan, if only to familiarize students with the models and materials they will use later in either secondary school, professional and advance educational progress.

Especially at the primary level these activities may prove an effective supplement for the teachers. It is obvious therefore, that any teaching strategy that is skilled towards this direction can be seen as an activity-oriented teaching method (Hands-on activities). Hands-on activities have been proposed as a means to increase students' academic achievement and understanding of some concepts that could be looking abstract to the pupils through manipulation of objects which may make abstract knowledge more concrete and clearer. Through hands-on activities, students are able to engage in real life illustrations and observe the effects of changes in different variables. It offers concrete illustrations of lesson and ideas. This method is learner-centered in nature which gives the primary school pupils the opportunity to see, touch and manipulate objects while learning "do it yourself".

According to Adirika (2014), while learners can score high or low in tests, it may be difficult to predict what their skills, knowledge, motivation, and goal outcomes are. It would not be very easy to correctly predict what the learners will know, want to do next, what their goals, dreams and ambitions will be or even where their learning may take them. All education does, to this extent, is to successfully make the behavioural outcomes of students unpredictable. This stance may not go down well with standards of accountability, testing, and measurement advocates who want everything to be predictable, testable and precise. Meanwhile, evaluation process is not complete if all learners are expected of to achieve is based on score and not about manipulation skills, skills acquisition, transfer of knowledge which leads to academic performance.

Beyond simply to better engagement, hands-on activities allows pupils to practice the skills or learned information can attest to, the more practice they get. Children by their nature like exploiting their environment and always want to see for themselves what they can receive in terms of learning and knowledge gained. Hands-on activities are not a new concept or method of teaching in secondary schools but it is not pronounceable in primary school education system. The researcher was of opinion that many primary school teachers will not want to make use of this teaching approach as they will feel that it is time wasting considering the number of pupils they have to attend to at a time, the age of the pupils and learners' individual differences. Meanwhile, if hands-on activities are adopted as teaching approach among College of Education students, the benefits are numerous such include alternative way of learning (changing learning from abstract to concrete), encourages self-learning, make learning real, enhance creativity, and above all leads to improved academic performance of students in school subject. Thus, if a beautiful and resources approach like this is not being used among College of Education science and technical students, then the pupils would have been denied the access to good level of academic exposure and the capacities to have good academic performance.

Hence, this study investigated the impact of hands-on activities on Science and Technical Education students' academic achievement of Science and Technical Education of College of Education, Ikere-Ekiti, Ekiti State students.

Research Hypotheses

These formulated null hypotheses were tested in this study:

1. There is no significant impact of hands-on activities on lecture room concentration of Science and Technical Education in College of Education, Ikere-Ekiti.
2. There is no significant impact of hands-on activities on knowledge retention of Science and Technical Education in College of Education, Ikere-Ekiti.
3. There is no significant impact of hands-on activities on creativity ability of Science and Technical Education in College of Education, Ikere-Ekiti.
4. There is no significant effect of hands-on activities on problem solving skills of Science and Technical Education in College of Education, Ikere-Ekiti.

Hands-on activities learning is a pedagogy which enables students experience the processes of knowledge creation and the key attribute is learning stimulated by an enquiry a student centered approach, a more to self-directed learning and an active approach to learning (Spronken-Smith, 2007). Educators play an active role throughout the process by establishing a culture where ideas are respectfully challenged, tested, redefined and viewed as improvable, moving students from a position of wondering to a position of enacted understanding and further questioning (Scardamalia, 2002). Once students are challenged, they are expected to engage in creating conjecture, analyzing conjecture, communicating, working collaboratively, and engaging in mathematical argument (Stonewater, 2005).

Through the hands-on activities students can achieve relational understanding of scientifically and mathematical concepts since the meaning of 'knowing' has shifted from being able to remember and repeat information to being able to find and use it (National Research Council, 2007). According to Crombie (2009), in hands-on activities, the teacher acts as the facilitator of the students learning rather than the provider of information. As well as having an excellent understanding of the content the teacher needs to carefully plan their learning units. This planning will involve the teacher developing an open ended question or devising a topic based on the curriculum for the pupils to determine their own questions. It also involves exploration type activities to activate prior knowledge and also engage the pupils. Typically, the lesson will start with an open ended question devised by the teacher, pupil or sometimes both, through the use of carefully planned activities the teacher will encourage the pupils to discuss the question and search for their own answers. Proponents of hands-on activities methods suggested that there needs to be some sort of declaration of real world idea and learning experience before any elementary skill sets are committed to memory (Thompson, 2006).

It is during this process that students gather resources, do their own research and synthesize their information. They then present and share their findings with their peers and will finally need to be given the opportunity to reflect on their learning. Through this process pupils build their own knowledge. Naturally, every class is different and the approach of the teacher varies according to the ability of the class and the topic to be taught. Teachers are able to utilize different levels of hands-on activities.

Hands-on activities are effective learning experiences. Research has evidenced that hands-on approach in science improves understanding of concepts resulting in better achievement score and success in science subject area (Hussain & Akhtar, 2013). Hands-on activities is a process of teaching and learning where instructors engage with learners in direct experience and focused reflection to enhance student' knowledge, skill set and values. Hands-on activity allows students to learn through experiencing something and can give them an opportunity to immerse themselves in a learning environment, while putting their acquired skills to use and building new skills. Hands-on-learning means learning by doing. This type of learning is best suited for kinesthetic learners, who learn from examples. Hands-on activity

is another term for experiential learning, where individuals immerse themselves in a subject to learn. Primary school pupils learn from partaking in activities rather than passively reading a book or attending a traditional model of learning (Daniel, 2020).

Merriam-Webster Dictionary (2020) defined hands-on as relating to, being, or providing direct practical experience in the operation or function of something; involving or allowing use of or touching with the hands; characterized by active personal involvement; gained by actually doing something rather than learning about it from books, lectures, etc. Hands-on activities can happen in a multitude of ways, with many materials, in a variety of spaces, and through various activities. And students are natural hands-on learners (Parkland, 2017). Tile (2013) described hands-on activities as a situation whereby a learner uses his/her hands in carrying out activities that could enhance his/her experiences. By implication, concrete activities experiences are activities which involve doing using apparatus or objects.

Daniel (2021) defined hands-on activities is an educational method that directly involves the learner, by actively encouraging them to do something in order to learn about it. In short, it is hand-on activities is learning by doing. It is clear that there are certain situations in which hands-on activity is the only way to teach something. For example, there is no use trying to teach a child to ride a bicycle in a traditional classroom but such a child need to get outside to try out a bike. Many people argued that doing something is the best way to learn about it, rather than attempting to learn about it from a book. No matter how many books pupils read about cycling, they are still sure to fall off the first time they try.

Hands-on activity is the process of learning by actually doing and experiencing something, rather than just being told about it. The term “hands-on” is used because these activities usually involve the physical use of the hands. For example children might use manipulative such as counting cubes and sorting objects to understand mathematical concepts, rather than just being taught the theory via books or pencil and paper exercises (The Apple Tree [TAT], 2020). Hands-on learning is particularly important for young children, as this is how they are programmed to learn. Students learn from observing, copying, and experimenting with their hands and body as soon as they are born, and play continues to be the most important way of learning new skills until they reach school age and beyond (TAT, 2020).

Academic Achievement represents measures of outcomes that indicate the extent to which a person has accomplished specific goals that were the focus of activities in instructional environments, specifically in school, college, and university (Steinmayr, MeiBner, Weldinger & Wirthwein, 2017). School systems mostly define cognitive goals that either apply across multiple subject areas (e.g., critical thinking) or include the acquisition of knowledge and understanding in a specific intellectual domain (e.g., numeracy, literacy, science, history). Therefore, academic performance should be considered to be a multifaceted construct that comprises different domains of learning. Because the field of academic performance is very wide-ranging and covers a broad variety of educational outcomes, the definition of academic achievement depends on the indicators used to measure it.

Steinmayr *et al* (2017), averred that among the many criteria that indicate academic performance, there are very general indicators such as procedural and declarative knowledge acquired in an educational system, more curricular-based criteria such as grades or performance on an educational achievement test, and cumulative indicators of academic performance such as educational degrees and certificates. All criteria have in common that they represent intellectual endeavours and thus, more or less, mirror the intellectual capacity of a person.

Tuckman (2018) defined academic performance as the apparent demonstration of understanding, concepts, skills, ideas and knowledge by a person. It refers to how pupils deal with their studies and how they cope with or accomplish different tasks given to them by their

teachers in a fixed time or academic year (Adane, 2013). Academic performance is the hallmark and determinant of a pupil's success and future. It plays an important role in producing the best quality graduates who will become great leaders and manpower for the country; those who would be responsible for the country's economic and social developments. Academic performance defined whether one can take part in higher education, and based on the educational degrees one attains, influences one's vocational career after education. Besides the relevance for an individual, academic performance is of utmost importance for the wealth of a nation and its prosperity.

Salvation & Adzharuddin (2014), while conceding that students' achievement is a multidimensional construct, opined that it consists of three dimensions: students' characteristics, teacher/lecturers' competencies and academic environment. Students' characteristics dimension concerns how pupils deal with their studies and how they cope with or accomplish different tasks given to them by their teachers. The determinants of this dimension are students' intelligence, personality and socio-economic status (Salvation & Adzharuddin, 2014). Within the academic context, for example, students' ability to study and remember facts and being able to communicate their knowledge verbally or down on paper enhances academic performance.

Hands-on activities provide consistent, positive interactions between teacher and pupils and other pupils and this allows a child to develop a positive, more relevant perception of the world around them and develop the act of concentration in the classroom (Hart, 2019). With teachers and pupils engaging in hands-on activities, whole parts of the child's brain are engaged, which helps develop crucial connections that lead to positive development concentration. Anwer (2019) stated that activity-based learning is the baseline for creative and critical thinking skills enhancement. Hands-on learning environments allow students to be free to experience learning through the senses and devote their attention towards learning. Hart (2019) further stated that children thrive when surrounded by supportive, interactive teaching strategies that focus on their mental and physical development. Not only is hands-on activity an excellent way to help primary school students develop better social and motor skills, it is also easy to get them involved.

Teachers are known to be the backbone of education for all ages of pupils and they play a vital role in the classroom by bringing a variety of learning methods and techniques. They bear the light for all students and aid them in better understanding and developing a unique skill set for every pupil in the classroom. Anwer (2019) stated that it comes under the teacher to educate students and motivate them to learn in a classroom and outside it. The emphasis of effective learning in a classroom has vital importance in knowledge retention. The teachers are required to be adaptive to the changing classroom and pupils needs' such that the students enjoy the course and establish goals.

Learning by doing is a common theme in an experiential educational environment. This is because when pupils are engaged with their hands and their minds, they actually are more focused and motivated to learn. The hands-on learning benefits that pupils experience in the classroom helps students of all ages retain knowledge and grow. Children in all stages, from preschool age through their primary school age, are continuously developing and growing. During these extremely critical periods of growth, the more that children can immerse themselves in, and engage with, their education, the more they will be motivated and take pride in all that they learn (Goodwin University [GU], 2019). This is where hands-on learning truly comes into play.

Research Method

The study was designed to investigate the impact of Hands-On activities on Students' Academic Achievement in Science and Technical Education in College of Education, Ikere-Ekiti, Ekiti State, Nigeria. This study adopted a descriptive survey design.

The population of the study consisted of all Science subject combinations and Technical Education in College of Education, Ikere-Ekiti, Ekiti State, Nigeria.

The sample size of one hundred (100) Science and Technical Education in College of Education, Ikere-Ekiti, Ekiti. A simple random sampling technique was used to select the sample. Four (4) hypotheses were formulated to guide the study.

The instruments that were used for the purpose of this study was self-structured questionnaire. The instrument (questionnaire) was divided into two sections (section A and B). Section A was used to elicit information on the personal data of the respondents which include name of school, age, gender, subject combination/course of study. While section B was made up of the variables on the research question raised for the study.

The instrument was subjected to validity and reliability mechanism by the experts.

The questionnaire was administered on Science subject combinations and Technical Education in College of Education, Ikere-Ekiti, Ekiti State, Nigeria. The administration was conducted by the researchers with the aid of one (1) trained research assistant.

In analyzing the collected data, the researchers used descriptive statistics of frequency counts and percentage to analyse respondents' demographic data, to answer the research questions while inferential statistics of Pearson Correlation was used to test the formulated hypotheses.

Results

Hypothesis 1: There is no significant impact of hands-on activities on lecture room concentration of Science and Technical Education in College of Education, Ikere-Ekiti.

Table 1: Correlation analysis of hands-on activities and classroom concentration

		Hands-on Activities	Classroom Concentration
Spearman's rho Hands-on Activities	Correlation Coefficient	1.000	0.687*
	Sig. (2-tailed)		0.043
	N	100	100
Classroom Concentration	Correlation Coefficient	0.687*	1.000
	Sig. (2-tailed)	0.043	
	N	100	100

* = significant at the 0.05 level.

The result in table 1 shows the correlation analysis between hands-on activities and classroom concentration of Science and Technical Education of College of Education students. The table indicates that there was a significant positive correlation between hands-on activities and classroom concentration of Science and Technical Education of College of Education students ($r = 0.687$, $N = 100$, $p < 0.05$). Hence, the null hypothesis was not upheld.

Hypothesis 2: There is no significant impact of hands-on activities on knowledge retention of Science and Technical Education in College of Education, Ikere-Ekiti.

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Table 2: Correlation analysis of hands-on activities and knowledge retention

			Hands-on Activities	Knowledge Retention
Spearman's rho	Hands-on Activities	Correlation Coefficient Sig. (2-tailed) N	1.000 100	0.634* 0.032 100
Knowledge	Retention	Correlation Coefficient Sig. (2-tailed) N	0.634* 0.032 100	1.000 100

* = significant at the 0.05 level.

The result in table 2 shows the correlation between hands-on activities and knowledge retention of Science and Technical Education of College of Education students. The table indicates that there was a significant positive correlation between hands-on activities and knowledge retention of Science and Technical Education of College of Education students ($r = 0.634$, $N = 100$, $p < 0.05$). Hence, the null hypothesis was not upheld.

Hypothesis 3: There is no significant impact of hands-on activities on creativity ability of Science and Technical Education in College of Education, Ikere-Ekiti.

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Table 3:Correlation analysis of hands-on activities and creativity ability

			Hands-on Activities	Creativity Ability
Spearman's rho	Hands-on Activities	Correlation Coefficient Sig. (2-tailed) N	1.000 100	0.523* 0.052 100
Creativity	Ability	Correlation Coefficient Sig. (2-tailed) N	0.523* 0.052 100	1.000 100

* = significant at the 0.05 level.

The result in table 3 shows the correlation between hands-on activities and creativity ability of Science and Technical Education of College of Education students. The table indicates that there was a significant positive correlation between hands-on activities and creativity ability of Science and Technical Education of College of Education students ($r = 0.523$, $N = 100$, $p < 0.05$). Hence, the null hypothesis was not upheld.

Hypothesis 4: There is no significant effect of hands-on activities on problem solving skills of Science and Technical Education in College of Education, Ikere-Ekiti.

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Table 4:Correlation analysis of hands-on activities and problem solving skills

			Hands-on Activities	Problem Solving Skills
Spearman's rho	Hands-on Activities	Correlation Coefficient Sig. (2-tailed) N	1.000 100	0.612* 0.031 100
Problem	Solving Skills	Correlation Coefficient Sig. (2-tailed) N	0.612* 0.031 100	1.000 100

* = significant at the 0.05 level.

The result in table 4 shows the correlation between hands-on activities and problem solving skills of Science and Technical Education of College of Education students. The table indicates that there was a significant positive correlation between hands-on activities and problem solving skills of Science and Technical Education of College of Education students ($r = 0.612$, $N = 100$, $p < 0.05$). Hence the null hypothesis was not upheld.

Conclusions

Based on the findings of the study, the following conclusions were made:

Hands-on activities has strong impacts and influence on classroom concentration of Science and Technical Education of College of Education students. Hands-on activities influenced and catalysed knowledge retention of Science and Technical Education of College of Education students. Hands-on activities had effects on creativity ability of Science and Technical Education of College of Education students. Hands-on activities enhanced and improved problem solving skills of Science and Technical Education of College of Education students.

Recommendations

Based on the findings, the following recommendations were made:

1. Colleges of Education teachers/lecturers should endeavour to adopt students' oriented method like hands-on activities in creating conducive classroom environment that will bring about steady and rapid communication skills development of students.
2. The teachers/lecturers should also be encouraged by the management to provide the necessary equipment and materials to actualize this task effectively.
3. Teachers/lecturers should select and execute hands-on activities that may enhance students' interest and understanding in College of Education subjects which will eventually result in higher motivation and achievement.
4. Teacher/lecturers should always adopt learner' centred method as the only method of communication, interaction and decision making in the classroom so as to cater for individual difference and ability of students for improving students' classroom participation.

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