

# Effect of the Activity-Based Learning on Basic Science and Technology Students' Non-Cognitive Skills in South-South Nigeria

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## ABSTRACT

This study investigated the Basic Science and Technology (BST) students' reaction to the use of the Activity-Based Learning (ABL) approach, recently introduced by the Nigeria Universal Basic Education Commission (UBEC) in Primary schools; and the influence of the ABL approach has on the BST students' non-cognitive outcomes. The study used a survey and posttest only quasi-experimental design. Three research questions and two hypotheses guided it. The study population was 2,800 BST students of the 56 teachers who participated in the ABL teaching workshop. Three hundred and eighty students of twenty proportionately selected teachers from the state's three districts who used the ABL approach formed the experimental group. Another one hundred and fifty students who were not exposed to ABL were used as the control group. The ABL students answered the "Basic Science and Technology Students' Non-Cognitive Outcome Questionnaire" (BSTSNCOQ), which elicited students' responses on their learning experiences and non-cognitive outcomes based on the ABL approach. The students were highly satisfied with the ABL approach; there is a significant advancement in the non-cognitive outcomes/skills of the students, especially in meta cognitive strategies. The study concluded that using the ABL approach in teaching BST subjects can engender advancement in students' non-cognitive outcomes/skills. The BST teachers in the state are recommended to be continuously trained, retrained, mentored and monitored in applying the ABL approach. The study has revealed the underlying, un-measured gains in using effective instructional techniques such as the ABL approach.

**Key Words:** Activity-Based Learning (ABL) approach, Basic Science and Technology, Non-Cognitive Outcomes/ Skills, Upper Basic Students.

**Published Online:** September 27, 2022

**ISSN:** 2736-4534

**DOI :** 10.24018/ejedu.2022.3.5.440

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## I. INTRODUCTION

The ultimate aim of any instructional process is that the learners achieve the desired learning outcomes. The evidence being the student/learner manifests desired behaviors and acquires the content knowledge, skills or attitudes taught. Science, learning requires that students develop a variety of skills from logical thinking to problem-solving to critical thinking (Ahmad *et al.*, 2019) to deal with real-life situations and real-world problems.

Society today demands learners develop these skills for a productive life. The foundation for acquiring and learning these skills is laid in elementary science. In Nigeria, it is the foundation of science. It is divided into Basic science for elementary one to six pupils and Upper Basic Science for Secondary Schools classes years seven to nine. Having encountered science at the elementary level, these students should be able to consolidate their scientific process skills before studying it at the Senior Secondary level, ages ten to twelve. The Nigeria National Policy on Education has stated that an objective of Junior Secondary Education is "to provide the child with diverse basic knowledge and skills for

entrepreneurship and educational advancement" (FRN 2013, p.12). To achieve the goal, teachers must pay attention to the achievement of not only the learning outcomes of their instruction but also the underlying non-cognitive outcomes.

Cognitive learning outcomes are particular knowledge, or skills students are expected to display due to instructions. At the same time, the non-cognitive outcomes refer to attitudes or conduct that define an individual's success in school or life, such as self-esteem, motivation, and perseverance (Mahajan & Singh, 2017). Although non-cognitive learning outcomes are harder to ascertain they are important in determining academic, economic, and life outcomes (Gutman & Schoon, 2013; Mahajan & Singh, 2017). They can be linked to individual earnings, economic growth, and success in later life (Mahajan & Singh, 2017).

Educational goals are shifting from instilling content /knowledge and skills in today's learners to enhancing their social and soft skills to equip them for the demands and challenges of the 21<sup>st</sup>-century workforce. For an all-around successful adolescent to emerge from the schooling process, stakeholders, policymakers, and educators need to broaden the educational focus to include non-cognitive outcomes and cognitive outcomes (achievement) in the assessment of

school success (Bertling *et al.* 2016). Research is increasingly turning to non-cognitive factors to explain differences in academic performance. Thus, educators must determine ways to develop non-cognitive skills, traits, attitudes, and strategies and develop content knowledge and cognitive skills.

Researchers and National governments have recognized that pedagogical methods can enhance learning through various mental processes. Subsequently, wide research-based, innovative varieties of pedagogical techniques and approaches have emerged, and most advocate for students' engagement and participation in lessons. Student engagement can be considered "a condition of emotional, social and intellectual readiness to learn, characterized by curiosity, participation, and the drive to learn more" (Martin & Tores, 2016, p. 2). The ABL approach, with its vigorous student engagement and social interactivity practices, could prove to engender the advancement of non-cognitive outcomes/skills of students.

## II. THEORETICAL PERSPECTIVE

### A. Constructivist Theories

The Activity-based Learning approach is primarily supported by the cognitive and constructivist learning theories of Brunner (1960;1966) and Vygotsky (1978). The Brunner constructivist theory purposes that learners are better off discovering learning for themselves by forming new ideas based on their prior and current knowledge. Vygotsky further describes learning as a social process according to him, social interaction (such as employed in ABL) plays a fundamental role in the development of higher mental functions/cognition. The tenants of these theories form the underlying principles behind ABL. The learners through activities discover new knowledge as they are exposed to curricular content and as they interact with one another they acquire higher mental function or cognition. As stated by Hien (1991 *as cited in* Hawkins, 1994). The theories advance that knowledge is not passively received but actively built up by cognition; that learning involves the construction of knowledge from experience, implying that learners generate knowledge and meaning from an interaction between their experience and their ideas.

Also, Brunner's Constructivism and Vygotsky's Social Learning theories, as they support the ABL approach also support the development of non-cognitive skills through the use of ABL approach. Brunner's (1960) theory supports non-cognitive advancement due to the underlying positive psychological effects of learners constructing knowledge as they engage with the lesson content, on their self-efficacy, self-esteem, perseverance, peer relationship and metacognitive strategies. Vygotsky (1962, p. 1978) supports non-cognitive advancement as the social interaction between students as they mingle, bond, and exchange ideas with one another engenders the development of these non-cognitive skills (Shunk & Pajares, 2002; Farrington *et al.*, 2012).

### B. Social Constructivism

The activity-based learning is also supported by the Communal or Social Constructivism perspective of learning which is closely associated with the theories of Vygotsky, Brunner, and Bandura's Cognitive learning theories (Kim, 2001). The theory explains learning and teaching as a complex interactive social phenomenon between teachers and

students. The teacher provides a social environment where the learner can assemble or construct with others the knowledge necessary to solve problems. (Picciano, 2017). The theory also explains learning as entailing a series of practical social experiences in which learners learn by doing, collaborating, and reflecting with others. The social constructivist perspective stresses instructional models that encourage collaboration among learners and practitioners in society (Lave & Wegner, 1991); thus, it includes instructional approaches such as reciprocal teaching, peer collaboration, problem-based instruction, and other methods that involve learning with others (Pajares & Shunk, 2002) and Field trips. The theory is relevant to the Activity-based Learning approach in which learning is expected to occur as the teacher provides the learners with the necessary cooperative and collaborative social environment and class activities with problem-solving opportunities. This social environment engenders the development and advancement of non-cognitive skills.

## III. CONCEPTUAL REVIEW

The independent and dependent variables in the study are described here. The expected interrelationship between these variables and gender as the intervening variable is illustrated in Fig. 1.

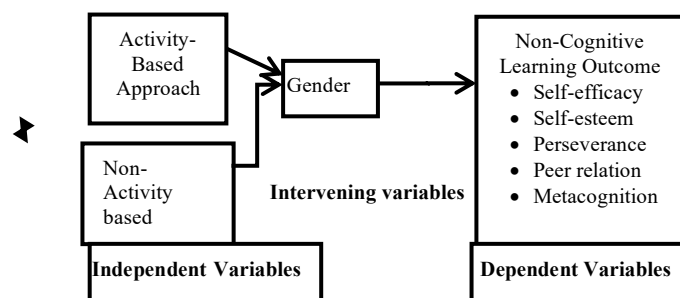


Fig. 1. Conceptual Framework of the Relationship Between Dependent, Independent, and Intervening Variables.  
(Source: Authors)

### A. Activity-Based (ABL) Approach

The Activity-Based learning (ABL) approach is a child-centered technique that engages the learner and gets them involved in the instructional process. ABL is described as a teacher's technique to emphasize their teaching method through activities in which students participate rigorously to bring about efficient learning experiences (E-portfolio, 2012). The approach supports differentiated learning (individual differences) and allows teachers to deal with mixed-ability classes. It supports situations with high teacher-pupil ratios and poor teacher continuous professional development (Little, 2012).

To use the ABL approach, the teachers in this study were trained to include in their teaching; critical thinking and problem-solving activities to be tackled interactively, in groups, and in pairs; reflection of content, and brainstorming activities. The ABL students were also engaged with production and learning with resources, experimentation, and exploration of their environment.

### B. Basic Science and Technology Subjects

In 2014 the Nigeria Education Research and Development Council (NERDC), taking cognizance of local needs and

existing subject overload and in line with global best practices, reduced the number of subjects in the Basic Education Curriculum (BEC) of Nigeria. The new BEC grouped four Science and Technology subjects (Basic Science, Basic Technology, Physical and Health Education, and Computer Studies /Information Technology) into one conglomerate subject, "Basic Science and Technology." This is to advance science and technology learning in the foundation classes (Premium Times, 2014).

### C. Non-Cognitive Outcomes/Skills

In addition to knowledge of content and academic skills, students develop behaviors, soft skills, attitudes, and strategies that are essential to academic performance but may not be reflected in the scores on cognitive tests. They are non-cognitive factors (Farrington, *et al.*, 2012). Non-cognitive skills or outcomes is a term that contrasts a variety of behaviors, attitudes, personality characteristics, and academic skills -aptitudes, and attainment. The concept focuses on factors other than those measured by cognitive test scores (Gutman & Schoon, 2013). According to Farrington *et al.* (2012), learning is an interaction between cognitive and non-cognitive factors, and intelligence is embedded in both environment and social-cultural processes.

Hughes (2012) listed the outcomes of student engagement to include: academic outcomes- tasks competition, academic ability, academic performance, and report card grades. The non-cognitive outcomes include; motivation, metacognition, interpersonal relationship, perseverance, aspiration, school retention (not dropping out of school), post-secondary enrollment, socio-emotional functioning, self-esteem, anxiety, delinquency and depression. There is a wide range of skills that could be effective (e.g., growth mindset) and behavioral (e.g., regular attendance to school) that fall into the broad category of non-cognitive skills (Bjorklund-Young, 2016). According to researchers (Farrington *et al.*, 2012; Gutman & Schoon, 2013; Gabriel *et al.*, 2015; Dutta & Singh, 2017), non-cognitive skills are major contributors to academic success. Students with stronger non-cognitive skills have demonstrated higher academic achievement throughout their schooling (Gabriel *et al.*, 2015).

Gutman and Schoon (2013) identify traits such as self-perception (self-efficacy, self-concept of ability), motivation, perseverance, self-control, metacognitive strategies, social competencies, resilience and coping, and creativity as non-cognitive skills which could promise to have an impact on positive learning outcomes of young people. However, evidence on long-term outcomes is still limited. However, this study will delimit the non-cognitive skills to self-efficacy, self-esteem, perseverance, peer relationship, and metacognitive strategies, as discussed here.

### D. Self-Efficacy

Self-efficacy is a construct introduced by Bandura (1989); it concerns the learners' perceived ability to produce results and achieve specified types of performance outcomes interpreted as successful. Self-efficacy is an individual's belief that they can succeed at a particular task in the future, Bandura (2001). It measures an individual's expectation about whether or not they can successfully perform a specific task later in time (Gutman & Schoon, 2013). According to Bandura (1986), mastery is the most influential source of self-efficacy. Thus, the school educational efforts should be geared towards raising students' competence and confidence

by providing successful experiences with academic tasks and authentic mastery as provided in the ABL approach. Self-efficacy can also be influenced by models who help direct self-belief through social comparison or peer models a student can judge as having comparable abilities or superior capabilities (Shunk & Pajares, 2002). Promoting a sense of agency can influence people's lives and build them as they want. With a strong sense of self-efficacy, people successfully approach the most challenging tasks (Bandura, 2001).

### E. Self-Esteem

Self-esteem is a sense of an individual's value or worth and the extent to which his /her worth or value is approved or appreciated (Cheema & Bhardwaj, 2021). It relates to how the learners participate in-class activities and how they value themselves to interact confidently and successfully with their peers It can indirectly influence self-efficacy, perseverance, and soft skills, which affect learning (Gutman & Schoon, 2013). People. with high self-esteem are likely to enjoy doing multiple activities. They are full of positive enthusiasm and work to find solutions to problems. Such students will be highly participatory in an ABL classroom.

With low self-esteem, students will lack confidence and will resist change. They will likely be non-participatory in an ABL classroom. Thus, learners' effective participation in ABL classrooms could build self-esteem.

### F. Perseverance

It involves steadfastness in mastering a skill or completing a task (Gutman & Schoon, 2013). Perseverance is the tendency to stick with a task irrespective of its challenges. It can also be defined as continuing to work on a task after failing to find the solution or achieving the desired goal (Silvervarg *et al.*, 2018). It is also the commitment and resilience necessary to achieve desired results in the face of challenges or setbacks (Erickson & Noah, 2016). Perseverance may not guarantee success, but non-perseverance guarantees non-success (Silvervarg *et al.*, 2018). In order to grow and progress in a task or knowledge or achieve mastery, a learner must engage in increasingly more complex and difficult tasks. This attribute is essential for students to achieve higher levels of cognitive outcomes.

### G. Peer Relationship

Peer relationship is related to the social skills the learners' exhibit as they interact with their peers in class. According to Gutman and Schoon (2013), social skills include cooperation, sharing, helping, communication, exhibiting empathy, providing vocal support or encouragement, and general friendliness or kindness. It has been found to be indirectly and positively associated with academic engagement and thus academic success (Shoa & Kang, 2022).

### H. Metacognitive strategies

Students' goal-oriented efforts influence their learning behaviors and processes by focusing on thinking, selecting, monitoring, and planning strategies most conducive to learning (Zimmerman, 1990). There is considerable correlational research indicating a positive association between metacognitive strategies and academic outcomes. A vital role of the teacher in helping students develop non-cognitive skills is to assist them in moving from passive recipients of academic content to active learners who can, among other things, persist in difficult tasks and develop a

reliable set of strategies to master complex academic content. (Farrington *et al.*, 2012).

Although scholars are not in consensus on how best non-cognitive skills or outcomes can be measured, Duckworth and Yeager (2015); Kautz, *et al.*, (2015) maintain that a feasible measure of non-cognitive skills is by eliciting students' response through self-report questionnaires.

#### IV. EMPIRICAL REVIEW

##### A. Effect of Activity-based Approach on Non-Cognitive Outcomes

Studies have revealed an influence of ABL on both cognitive and non-cognitive outcomes. Singal, *et al.*, (2017) studied the effect of the use of ABL on the cognitive learning outcomes of male and female students in mathematics and reading skills in Tamil Nadu and general improvement in those subjects and students' non-cognitive outcomes such as leadership, persistence, motivation, interpersonal relationships, and metacognitive strategies. Using 5-25 school children from ages 5-16 to test non-cognitive skills and the Annual Status of Education Report (ASER) and 930,000 children survey data from 2005 to 2011 to measure cognitive skills. The study also compared the learning outcomes for children exposed to and not exposed to ABL. The study found that the students exposed to ABL were less reliant on their teacher; in non-cognitive outcomes, children exposed to ABL were more reliant on their peers, and they were also more confident in their ability to cope with examination and school work than the non-ABL children. However, ABL children exhibited lower self-esteem and motivation but higher academic and occupational aspirations; furthermore, there was no improvement in numeracy and literacy outcomes of the children after using ABL. It was attributed to being possibly due to insufficient resources supplied to schools and a lack of proper training of teachers.

##### B. Non-Cognitive Outcomes and Academic Performance

Studies have revealed that non-cognitive skills can influence academic performance. Oluremi (2014), using a sample of 200 Senior Secondary School students in Western Nigeria and a correlational survey design, found that academically engaged students are most likely to persevere in whatever task or assignment he/she is doing. However, Vialle and Heaven (2015) found no correlation between self-esteem and academic achievement among gifted secondary school students in Wollongong, Australia. Nevertheless, Bairagya and Mkerji (2019), studying elementary school pupils in India, found a significant positive correlation between non-cognitive skills of perseverance, growth mindset, conscientiousness, and consistency and students' Mathematics performance

Onoshakpokaiye (2020) studied the relationship between self-efficacy and Mathematics performance of 500 senior secondary Mathematics students in Delta State, Nigeria, and found that high self-efficacy increases the students' performance in Math and concluded that self-efficacy predicts students' ability to do well in Mathematics. This is corroborated by Cheema, and Bhardwaj (2021), who in a study using 200 adolescent students, found that high self-esteem will likely lead to better academic achievement; but high self-esteem must be achieved through good home environment.

In a study by Xu (2021) using OECD PISA 200 data and 15-year-old students from six East Asian and English-speaking Western countries, measuring perseverance using a four-point rating scale instrument, it was found that perseverance had a more positive association with achievement in East Asian country students than Western culture students. Similarly, Shoa and Kang (2022) studying the relationship between peer relationships and academic engagement among 250 middle school adolescents in Eastern China found that peer relationships had an indirect, positive association with academic engagement through self-efficacy and academic resilience respectively.

Wang and Fredricks (2013) studied the relationship between school engagement as a multidimensional construct consisting of behavioral, emotional, and cognitive engagement and problem behaviors among 12-17 years youths in 7th grade; collecting data from 1,272 ethnically diverse youths. He found that adolescents who had declines in behavioral and emotional engagement with school tended to have increased delinquency and substance use over time, which eventually may lead to school dropout.

The upper Basic Science and Technology students in Akwa Ibom State, Nigeria, have been exposed to the ABL techniques in teaching Science and Technology subjects. What has been their reaction to the approach? How has the application of the approach influenced their non-cognitive skills?

#### V. STATEMENT OF THE PROBLEM

The global focus on education is broadening to include cognitive and non-cognitive outcomes. The demand for effective education in the 21st century requires that learners in the process of schooling develop and advance the soft skills that are required for successful living. Thus, educators and teachers should engage in instructional techniques and approaches that engender the development of these lifelong skills. With robust student engagement and social interactivity methods, can ABL influence students' non-cognitive skills advancement?

#### VI. OBJECTIVES OF THE STUDY

The following objectives directed the study.

- i. To determine the students' response to their teachers' use of an Activity-based approach.
- ii. To determine the difference in students' non-cognitive learning outcomes based on teachers' use of an Activity-based approach?
- iii. To determine the influence of gender on AB students' non-cognitive outcomes.

#### VII. RESEARCH QUESTIONS

- iv. What is students' reaction to their learning experiences based on teachers' using the ABL approach?
- v. What is the difference in students' non-cognitive learning outcomes based on teachers' use of the ABL approach?
- vi. How does What is the difference in male and female BST students' non-cognitive outcomes based on the use of ABA?

## VIII. RESEARCH HYPOTHESES

The following null hypothesis was tested at a 0.05 level of significance.

- vii. There is no significant difference in students' non-cognitive learning outcomes based on teachers' use of the ABL approach.
- viii. There are no significant differences in male and female BST students' non-cognitive outcomes based on the use of ABL.

## IX. METHODS

The study uses the survey design to achieve the objective of gathering information on the non-cognitive learning outcome of a sample of students of teachers who applied the Activity-based strategies taught to them in the Teacher Professional Development Workshop organized by the government in their Basic Science Technology lessons. The student sample results are generalized to the entire population of students subjected to Activity – Based Learning. The study used the posttest only quasi-experimental design to determine and test the difference in the non-cognitive outcome of ABL and non-ABL students.

The population of the study used 2,800 basic Science and Technology students of the 56 teachers who participated in the Activity-Based Teaching workshop organized by the Nigeria Universal Basic Education Commission (UBEC) in conjunction with the state branch of the commission, State Universal Basic Education Board (SUBEB) in Akwa Ibom State, Nigeria.

The sample used for the study is 400 Basic Science and Technology students of the Activity-Based Learning workshop attendees. These students were selected through purposive and multistage proportionate random sampling techniques. First, 20 teachers who adequately implemented the Activity-based approach taught during the workshop were selected for the study. These teachers and their students were further chosen according to the three geopolitical districts in the state; this was done proportionately based on the number of participants/teachers who attended the workshop from the three districts. Thus, 10 teachers (six urban and four rural) were selected from the highest attending district; six teachers (four urban and two rural) from the second-largest attending district, and four teachers (two rural and two urban) were selected from the district with the least teacher attendance. Within each school, 20 students of the Basic Science and Technology teachers were randomly selected from their various classes. Consequently, 200, 120, and 80 students were selected from the Uyo, Ikot Ekpene, and Eket, respectively.

A questionnaire was used to collect data for the study “Basic Science and Technology Students Non-Cognitive Learning Outcome Questionnaire” (BSTSCNCOQ). It consists of three, section A, demographic information, and section B consisting of 7 items that elicited the student's

opinion of the ALB approach. Section C consists of 18 items elicited responses from the students on their levels of agreement with statements on their acquisition of the non-cognitive learning outcomes of self-efficacy, self-esteem, perseverance, peer relations, and meta-cognitive strategies as they learn BST subjects using the ABL. The students were asked to tick the box corresponding to their opinions on the statements on a scale of 1-4: 4 – Strongly Agree, 3 – Agree, 2 – Disagree, and 1 – Strongly Disagree. The instrument, BSTSNCOQ, was adapted from Little (2012) and Mahajan *et al.* (2017).

The face and content validity of the BSTSNCOQ were ascertained by giving them to three faculty members to compare the items with the study objectives and the non-cognitive outcomes measured.

The instrument's reliability was established using the Cronbach Alpha statistic, which was applied to thirty questionnaires filled by thirty ALB students who were not part of the study group. The overall 'r' value obtained from the procedures was .78. It was acceptable to use the instrument (Downe & Heath, 1974).

The data were duly collected from the subjects with research assistants (Postgraduate students from the Faculty of Education). The teachers whose students were used for the study were contacted, the researchers had the contacts of the participants of the Activity-based workshop before data collection, and their consent and consent of the school and students to be part of the study was given to the researchers before the researchers, and their assistants accessed the students. A total of 380 questionnaires were completed and retrieved from the students.

The data collected were subjected to statistical analysis using means and standard deviation and an independent t-test. Mean, and standard deviation was used to assess these students' satisfaction with the ABL approach; an independent t-test was used to determine the difference in non-cognitive outcomes of the ABL in BST and non-ABL students and the influence of gender on the ABL student's non-cognitive outcome.

## X. RESULTS

Table I presents the mean and standard deviation scores of students' responses to their learning experiences in BST, ABL classes, and non-classes. It reveals that ABA students were highly satisfied with their learning experiences, as indicated by the overall highly satisfactory mean experience ratings of the ABL group as compared to the moderate to poor satisfaction learning experience ratings of the non-ABL students. The students liked being involved in the lessons most (mean 3.95). They thus brought resources to lessons against their counterparts who did not bring resources for class activities (mean 1.97) since they were not exposed to Activity Based pedagogy. Furthermore, ABL students enjoyed sharing ideas with classmates and would like their teachers to continue to use the approach.

TABLE I: MEAN AND STANDARD DEVIATION OF STUDENTS' RESPONSES TO THEIR LEARNING; EXPERIENCE SATISFACTION BASED ON TEACHERS' USE AND NON-USE OF THE ACTIVITY-BASED APPROACH

S/N	Students' learning experiences	ABL Students			Non-ABL Students		
		Mean	STD	Result	Mean	STD	Result
1	I enjoy the group activities during lessons	3.84	0.37	Highly Satisfied	2.12	0.95	Moderately Satisfied
2	I like making contributions to the lessons in the class	3.89	0.31	Highly Satisfied	2.30	0.61	Moderately Satisfied

3	I like sharing ideas and knowledge with my classmates	3.92	0.27	Highly Satisfied	2.45	0.63	Moderately Satisfied
4	I like being involved in-class lessons	3.95	0.22	Highly Satisfied	2.68	0.61	Moderately Satisfied
5	I always bring resources to the lessons as the teacher directs	3.65	0.48	Highly Satisfied	1.97	0.96	Poor Satisfied
6	I would like my teacher to continue with this new approach to teaching	3.92	0.27	Highly Satisfied	2.51	0.75	Moderately Satisfied
7	I would like to be involved in the lessons	3.89	0.31	Highly Satisfied	2.91	0.48	Moderately Satisfied
	Overall mean	3.87	0.1	Highly Satisfied	2.42	0.32	Moderately Satisfied

TABLE II: ANALYSIS OF THE DIFFERENCE IN STUDENTS' NON-COGNITIVE LEARNING OUTCOMES BASED ON TEACHERS' USE OF THE ACTIVITY-BASED LEARNING APPROACH

Students' non-Cognitive outcome	ABL students		Non- ABL students		Mean differences
	Mean	SD	Mean	SD	
Self -Efficacy	11.09	0.99	7.09	2.09	4.0
Self- Esteem	15.25	1.19	12.79	1.51	2.46
Perseverance	14.49	1.67	10.35	2.98	4.14
Peer Relationship	10.97	1.03	6.86	1.59	4.11
Meta Cognition	15.36	1.04	10.91	3.4	4.45

TABLE III: DIFFERENCES IN NON-COGNITIVE OUTCOMES OF MALE AND FEMALE BASIC SCIENCE AND TECHNOLOGY STUDENTS EXPOSED TO ACTIVITY-BASED TEACHING TECHNIQUES

Students' non-Cognitive outcome	Exposed to Activity-based					Mean differences
	Female		Male			
	Mean	STD	Mean	STD		
Self-Efficacy	11.39	0.64	10.56	1.24	0.83	
Self Esteem	15.78	0.51	14.36	1.46	1.42	
Perseverance	14.91	1.41	13.83	1.81	1.08	
Peer Relationship	11.26	0.85	10.65	1.19	0.6	
Meta Cognition	15.78	0.51	14.64	1.29	1.14	

TABLE IV: INDEPENDENT T-TEST ANALYSIS OF THE DIFFERENCE IN ABL AND NON-ABL STUDENTS' NON-COGNITIVE LEARNING OUTCOMES

Students Non- Cognitive learning outcome	ABLStds N=380		Non-ABL Stds N=150		P-value	Result at 0.05 alpha level
	Mean	STD	Mean	STD		
Self-Efficacy	11.09	0.99	7.09	2.09	0.001	Significant
Self Esteem	15.25	1.19	12.79	1.51	0.001	Significant
Perseverance	14.49	1.67	10.35	2.98	0.001	Significant
Peer Relationship	10.97	1.03	6.86	1.59	0.001	Significant
Meta Cognition	15.36	1.04	10.91	3.4	0.001	Significant

TABLE V: INDEPENDENT T-TEST ANALYSIS OF THE MEAN DIFFERENCE IN MALE AND FEMALE ABL, BST STUDENTS' NON-COGNITIVE OUTCOMES

Students' Non-Cognitive outcome	Exposed to Activity-based				P-value	Result at 0.05 alpha level
	Female N=230		Male N=150			
	Mean	STD	Mean	STD		
Self-Efficacy	11.39	0.64	10.56	1.24	0.001	Significant
Self Esteem	15.78	0.51	14.36	1.46	0.001	Significant
Perseverance	14.91	1.41	13.83	1.81	0.019	Significant
Peer Relationship	11.26	0.85	10.65	1.19	0.001	Significant
Meta Cognition	15.78	0.51	14.64	1.29	0.001	Significant

As shown in Table II, the ABL also improved the students non -cognitive outcomes as shown by the higher mean rating of these outcome variables by students exposed to the ABL approach as against the lower mean ratings of these non-cognitive variables recorded by students not exposed to the ABL.

As shown in Table III, exposing students to the ABL approach improved their non-cognitive outcomes, with the female students having higher mean outcomes than their male counterparts in all the non-cognitive attributes, as shown by the mean differences in favor of the female gender.

The t-test analysis of mean differences in the non-cognitive learning outcomes of ABL and non-ABL students in table IV shows a significant influence on all of the 5 non-cognitive attributes measured ( $P = 0.001 \leq 0.05$ ). Therefore, we reject the null hypothesis; and now state that there is a significant influence in teachers' use of ABL on students' non-cognitive learning outcomes.

Analysis of mean differences of non-cognitive outcomes of male and female ABL, BST showed significant mean differences in all the non-cognitive outcomes measured ( $P \leq 0.019 \leq 0.05$ ). Therefore, we reject the null hypothesis and state that the non-cognitive outcomes of male and female BST ALB students do significantly differ.

### XI. DISCUSSION OF FINDINGS

The students exposed to the ABL approach indicated they were highly satisfied with their learning experiences and preferred their teachers to use this approach. This finding agrees with Anwer (2019), who also found that the students taught using the Activity-based methods found the method more engaging for them and preferred it to the traditional method.

The study found an influence of the ABL approach on the student's non-cognitive learning outcomes. As revealed in the study, there is a significant difference in the students' responses to their feelings of self-efficacy, self-esteem, ability to persevere in academic pursuit, relationship with their peers, and study on their own (meta cognitive strategies); with metacognitive strategies activity exhibiting the highest difference. This implies the students that have been exposed to the ALB based approach will likely be able to study and learn better on their own than their counterparts who are taught with the traditional expository method. The study also reveals that the female students advanced more in their non-cognitive skills than their male counterparts. The acquisition of these non-cognitive traits helps students become more successful academically (Shoa & Kang, 2022) and responsible citizens and that adolescent who had declines in behavioral and emotional engagement with school, unlike in the use of ABL approach which keeps students occupied, tended to have increased delinquency and substance use over time, which eventually may lead to school dropout (Wang & Fredricks, 2013). The gain experienced in these learners' non-cognitive skills can be attributed to the confidence they developed due to their social interactions and the contribution they are allowed to make in the class lessons. These findings give evidence to the vital contribution to of non-cognitive skills to academic and life success and have led to the advocacy by researchers (Kautz *et al.*, 2014) for incorporation of non-cognitive skills into educational curriculum, policy and practice. This may be possible through adequate structuring and mentoring of teachers in implementing Activity-Based teaching and learning.

## XII. CONCLUSION

The study reveals that the ABL approach has a positive influence on the student's non-cognitive learning outcomes, especially in their metacognitive strategies and also in self-efficacy, self-esteem, ability to persevere in academic pursuit and relationship with their peers; with the female students showing greater advancement. The study thus concludes that the ABL approach introduced to Upper Basic classes by the Universal Basic Education Commission (UBEC) and State Universal Basic Education Commission (SUBEB) of Nigeria has contributed to improvement in the non-cognitive learning outcomes of the BST students in the state with the female gender benefiting more. This could contribute to helping the learners become successful and more responsible individuals. The approach has also further improved the students' learning experiences in the Basic Science and Technology classes. The ABL should be introduced to all upper basic schools in the Nigerian States. Teachers should be further retrained, mentored, and monitored in implementing the approach to ensure sustenance.

## ACKNOWLEDGMENT

S. N. Nwosu, R. U. Etiubon and I. B. Ofem, thanks the Universal Basic Education Commission of Nigeria (UBEC) and the Akwa Ibom State Universal Basic Education Board (SUBEB) who conducted the Teachers Professional Development training, for their contribution, support and encouragement in the conduct of this research.

## FUNDING

The training of the of the Upper Basic Science and Technology teachers in the Activity-based learning was entirely funded by the Universal Basic Education Commission in conjunction with the Akwa Ibom State Universal Basic Education Board of Nigeria.

## CONFLICT OF INTEREST

We declare that there is no conflict of interest in the conduct of this research.

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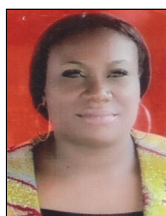
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