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Learning-By-Doing Instructional Strategy and Parents' Education in Determining Secondary Students' Attitude in Agricultural Science

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ABSTRACT
The study investigates the effects of Learning-By-Doing Instructional Strategy (LBDIS) and parents' education in determining secondary school students' attitude towards agricultural science. The research design adopted was a pre-test, post-test, non-randomized control group quasi-experimental design involving 2×2 factorial matrix. The sample comprised fifty-three students from two schools (intact classes) with twenty-three and thirty in experimental and control groups, respectively. The Agricultural Science Attitude Scale (ASAS) and Skills Performance Rating Scale were the instruments developed by the researchers. ASAS was administered as pre and post-tests but SPRS was used after each lesson. Three hypotheses were formulated and tested, and then the data collected were analyzed with the use of frequency counts, percentages, means, standard deviation, ANCOVA, F-ratio and Multiple Classification Analysis (MCA). Results reveal that there is a significant difference between experimental and control group students' post-test mean scores of attitude towards learning agricultural science. Additionally, no significant main effect of parents' education level on the students' attitude learning in agricultural science is found. As part of the recommendations, the provision of instructional strategies like LBDIS that can assist to build and boost learners' attitude towards the learning of agricultural science should be emphasized and put in use in classroom practices.

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Introduction

Agriculture in Nigeria remains an important sector that is still used to drive the national economy. It is also capable of bringing food to the tables of its growing population, and it has the status of providing foreign currency, income for agricultural farmer households and employment opportunities for about 70 percent of the population (Otekunrin et al. 2019). In line with the perception that Nigeria is predominantly an agrarian nation, Aribisala (2003) reported that over 75% of the country's population depends directly or indirectly on agriculture for their livelihood. Arguably, despite the enormous importance of agriculture in the life of the population in the country, agricultural activities are still dominated by the aged and illiterates in the rural areas. Understandably, one can posit that it has now become imperative for young people to be deeply involved in agriculture to meet the

objectives of learning agricultural science in secondary schools on one hand and to increase food supply of the ever-rising population, on the other hand.

In accordance with the current administration's efforts in Nigeria through the Economic Recovery and Growth Plan (ERGP), a viable economic plan, agriculture is one of the major sectors of the economy considered in the ERGP that is being used to address the problem of recurrent situation of food insecurity, unemployment reduction, advancing improvement in foreign earnings and overhauling of the industrial sub-sector. This is a giant step that can be commended as veritable option in tackling national problems that are currently facing the country. This development is also in tandem with global drive in addressing some of the Sustainable Development Goals (SDGs), particularly, goal numbers 1, 2 and 8 of; no poverty, zero hunger and decent work and economic growth, respectively. Inusa et al. (2018) and Otekunrin et al. (2019) have equally lent credence to the ERGP of Nigerian government as a sustainable platform that is used to make agricultural sector regain its lost glory in the country. This has become more expedient in the face of continuous steady decline in the national revenue from crude oil at the international market since crude oil had remained the economic mainstay. Various experts in economic and educational circles have been advocating for concerted efforts and attention on ways to restore agriculture to its profitable place on national priority (Otekunrin et al., 2017; 2019).

Desirable attention given to students' attitude to learning agricultural science will resolve some identified problems if adequately addressed. It is against this background that it is essential to hand over the operations and activities of agriculture of a nation to the young vibrant, energetic, innovative, talented, interested, willing, mobile, and trainable people for sustainable agricultural production. The foregoing position had been supported by Ciroma (1994) that most of the youth facing problem of unemployment can venture into agriculture with the abilities identified which has high tendency to lead them towards boosting of food production and at the same time attaining reduced unemployment. Especially that, the youth can easily adapt to modernized farming system where technology and innovation in agriculture will be practiced which otherwise may be difficult for the old hands to accept and utilize. Going by the aforementioned, students in the secondary school stage in Nigeria who form a major constituent of the youth class should be oriented, counseled and trained to develop positive attitude towards learning agricultural science. This is because it is essential to educate young Nigerians on how to maximize the potentials embedded in the rich agricultural resources found in the country.

In other words, the category of Nigerian citizenry of young people, to which the majority of secondary school students belong, is a promising cohort that can easily align with the arguments of tapping into the highly resourced agricultural sector of the country if the right attitude and interest is promoted among them. Unfortunately, Adejoh et al. (2016) reported decline in the number of students who choose agricultural science among their list of subjects in senior secondary schools in Nigeria. Similarly, Baliyan & Nenty (2015) recorded the picture of a poor and declining enrollment trend in agriculture in senior secondary schools in Botswana as a major concern for agricultural educators across the country. Meanwhile Akintonde, et al., (2019) identified factors such as low farm income, societal views of the practice, value of agriculture and the government attitude towards improving agricultural production.

Consequently, the attitude of secondary students in learning agricultural science is expected to seek ways of improvement to achieve the four objectives of agricultural science at the senior secondary school level. The young people in secondary schools and outside school have great roles to play if sustainable development will be achieved in agriculture as they are the future of any country. They can be and are part of the solution to Nigeria's multiple problems of food scarcity, their contributions can help Nigeria out of its problem of food insecurity. As such, teachers of agricultural science should adopt method that will enhance students' positive perception and attitude towards agriculture. Efforts geared towards positive attitude to learn new skills and interest in agricultural enterprises or businesses will maximize agricultural production.

Many agricultural science teachers teach scientific principles with low level of agricultural practices, whereas agricultural practices are needed to reinforce skills acquisition. This approach creates

a wide discrepancy between the skills students ought to learn and what they actually end up learning. The gap between learning and display of learning outcomes becomes widen. This condition calls for immediate action to redress the imbalance in the learning input and the outcome which has also failed to achieve national goal of adequate food production and reduction in youth unemployment. Against this background, the teaching of agricultural science in Nigerian secondary schools should be properly managed by teachers. The secondary school system of education assumes the role of training and producing students for tertiary institutions and workforce for national development and the world of work. Therefore, the Agricultural Science curriculum has the following objectives:

i. To stimulate and sustain students' interest in agriculture,
ii. To impart functional knowledge and practical skills in agriculture to students,
iii. To prepare students for further studies in agriculture, and
iv. To prepare students for occupations in agriculture (Federal Ministry of Education, (FME), 2008:1)

The National Agricultural Science curriculum further explained that in order to meet the stated laudable objectives, the teaching-learning process in agricultural science should be made participatory, exploratory, experimental and child-centered; hence any form of learning by students should get them involved in activities that are hands-on. Meanwhile, a cursory analysis of situation of instructional delivery towards the learning of the subject for example, currently does not go in line with the provisions stated in the National Policy on Education (NPE) in Nigeria on the process of teaching-learning at the secondary school. The NPE states that, teaching shall be practical, activity-based, and experiential. In addition, the West African Examinations Council (WAEC) Chief Examiner's report for 2014 recommended that students should be exposed to practical aspect of agricultural science through field trips, excursions, laboratory activities and hands-on practice of agriculture, having identified that students lack basic production skills. Elsewhere, the WAEC Chief Examiner's reports of 2011, 2013 and 2014 consistently identified that agricultural science teachers should be continually trained and retrained on emerging trends in the teaching and learning of agriculture.

The curriculum also highlighted other issues pertaining to instructional delivery approaches and facilities which are quite germane to skills development in agriculture. In the opinion of the researchers, these objectives of enabling the students to acquire basic practical skills development and preparation for occupations in agricultural science are not being met as stated (Lawal, et al., 2014). The researchers proposed that these skills can be achieved through effective use of school farms and participation in other agricultural activities and practical work. The skill development is more required especially in the face of increasing need to impart functional knowledge and practical skills for productive life of the citizenry in our country as provided for in the national curriculum.

In line with the enumerated objectives of agricultural science and other provisions of the senior secondary education curriculum for agricultural science, learning-by-doing approach to teaching is recommended as effective instructional delivery approach. Learning-by-doing was also emphasized to ensure that students produce food for themselves and their communities. It is further pointed out that suggested activities in the agriculture program are designed to enhance psychomotor skills development. It is on this premise that, learning-by-doing instructional strategy was chosen as focal intervention for the study. As an experiential model of learning and with its activity-based features, learning-by-doing will promote interest building and attitudinal change in a positive manner.

The students' negative attitude, low interest in agriculture and lack of skills acquisition is traceable to teacher-centered methods used to deliver instruction. Such method (mostly teacher-centered and subject-matter oriented) does not promote hands-on, minds-on activities to equip the students for proper acquisition of the expected knowledge and skills. Teacher-centered method does not lay emphasis on psychomotor domain aspect of education which encourages leaning-by-doing. Modebelu and Nwakpadolu, (2013) identified poor attitude of student towards agricultural science as one of the seven major challenges facing agricultural science teachers in their quest to achieve effective teaching and learning of the subject. This is coupled with the fact that Modebelu and Duvie, (2012) recommended attitude development method as one of four innovative teaching methods that could

enhance quality and effective teaching and learning of agricultural science. Learning-by-doing instructional strategy has its root in the principles of experiential learning and just like the problem-based learning. Strobel and van Barneveld (2009) explained that it has the capacity for long-term retention of material and developing 'replicable' skills, as well as for improving students' attitudes towards learning.

A study of Sabtiawan et. al (2019) investigated the necessity of pondering over the use of active manipulation of students' attitude to make an impact on chemistry teaching-learning outcomes. They found out the students showed positive response to the learning (authentic assessment with embedded cooperative learning). In another study, Chowdhury et al. (2020) examined the effects of achievement motivation on leisure attitudes which was determined by running a regression analysis between the independent and dependent variables. The findings showed that students exhibited different straits in their performance style, though there is a significant relationship between the mediating variable (self-efficacy) and the dependent variable (leisure attitude). This present study chose two variables, learning-by-doing instructional strategy and parents' education to determine the attitude of secondary students in learning agricultural science.

Bruce & Bloch (2012) described learning-by-doing as the process whereby people make sense of their experiences, especially those experiences in which they actively engage in making things and exploring the world. They further expatiated on it as a pedagogical approach in which teacher is seeking to engage learners in more hands-on, thus a creative mode of learning. The instructional strategy has the potency to service positive attitude of learners in that it is flexible to use, it develops mind and body as learning is taking place, openness to experience and learners' interaction with their environment in order to adapt to situations from learning. There is need to adopt new instructional strategies that will stimulate and sustain the interest of students of agricultural science, improve knowledge and fortify their skill acquisition and performance in secondary schools. Therefore, the learning-by-doing instructional strategy was chosen as a variable of interest in this study because it was contextualized as a contributor to improving attitude of secondary school students towards learning in agricultural science.

Parents' education on students' attitude towards learning agricultural science deserves equal attention and plays a great role accordingly. On parents' education, several studies have presented different opinions but there never was a convergence on the outcomes of these various attempts to reaching a consensus. Studies on the trend of students to improve in learning outcomes which includes both academic achievement and attitude has shown to connect to parents' educational status as an important mediating mechanism in agriculture education studies (Anyanwu et al., 2014; Egunsola, 2014; Kapinga, 2014; Ogweno et al., 2014; Osokoya and Adegoke, 2014). It has been observed that play a great role in childrens' life. Parents can be regarded as an environmental factor that affects students' learning outcomes because a child's family is the most influential part of their life. Therefore, parents have a major role in childrens' education through cognitive, social, and emotional roles in students' overall development.

The development does not exclude the attitude of the children in learning school subjects like agricultural science which is germane to the survival and sustainability of humanity. Hence, parents' education was considered as an important variable in the study of secondary school students in agricultural science. It is an established fact that other factors directly or indirectly contribute to student attitudinal patterns of learning school subjects across. This factors cut across cultures and spatial distribution. From the argument so far made and, in an attempt to connect properly to this study, evidence showed from the literature gathered as this work is concerned that learning-by-doing as instructional strategy and parents' education have not been extensively examined in studies that involve agricultural science concepts among students in the study area. As a result, this study investigated how learning-by-doing and parents' education determine secondary school students' attitude in agricultural science in Ogun State, Nigeria.

Literature Review

Students' Attitude in Learning Agricultural Science

Ojimba et al. (2018) recommended that students could perform better in agricultural science if they could have a positive attitude towards and show interest in the subject amidst other things. Reference to theory of attitude formation and change as cited by Baliyan & Nenty (2015), it remarked that some indicators significantly affect students' attitude. These are parents, students, personal experiences, observations, knowledge, and value which consequently influence their belief, intentions and decision to participate actively in agricultural practices. Invariably, such situation will in no small way affect learners' attitude towards agriculture and their interest in pursuing careers in agriculture related courses at a later time in life. Meanwhile, some researchers have discussed on positive attitudes among students towards agriculture (Otekunrin et al., 2017; Darko et al., 2016; Onuekwusi & Ijeoma 2008). These scholars established that students exhibited positive attitudes towards agricultural science, nonetheless, the teachers should encourage them by providing the enabling environment for effective teaching and learning of both the practical and the theoretical aspect of the subject in secondary schools. Still on attitude towards agricultural science, Olorunfemi et al. (2016) carried out a study and found that as there was an increase in the educational level of the agricultural professionals', it directly increases their likelihood to having a positive attitude towards their wards taking agriculture as a career. As matter of fact, majority of the respondents who have higher levels of education will most likely be senior and successful professionals in the agricultural profession hence it gave them the leverage and required motivation to be able to confidently mentor their children/wards to take after their chosen career. Otekunrin et al. (2017) found that there exists a significant relationship between students' scores in Agricultural Science Achievement Test (ASAT) and the attitudinal variable of sustained students' interest in agricultural science; that for better performance, teachers should device innovative methods of teaching to sustain the students' interest throughout the lesson period. Shiyam and Inyang-Abia (2011) in a study revealed that students' perception of the method of teaching agricultural science significantly influence their attitude towards the subject. The report explained that the correlation was positive and significant; it then follows that the more favorable students' perception of the method of teaching agricultural science, the more positive will their attitude towards the subject tend to be. Darko et al. (2016) investigated gender differences in attitudes toward agriculture in public senior high schools in Central District of Ghana. The findings showed that most of the students have positive attitude towards the agricultural profession. They further revealed in their findings that both male and female agricultural science students generally have a positive attitude towards the learning of agricultural science in senior high schools. On a further analysis, the findings of Darko et al. (2016) indicated that the significant value (0.18) was greater than the alpha value (0.05). Therefore, there is no statistically significant difference between male and female attitudes towards the learning of agricultural science.

Akinoglu and Tandogan (2007) in a research on effect of problem-based active learning on attitudes towards science classes found that the arithmetic mean of the pre-attitude scores revealed by the research group students was 77.16 while the figure for the control group students was 71.76. In other words, there is no significant difference between the pre-attitude scores of the experimental and control groups at the 0.05 confidence interval. In a similar way, the findings of Tosun and Senocak (2013) gave the same direction on effects of Problem-based learning (PBL) on the meta-cognitive awareness and attitudes toward chemistry teacher-trainees with different academic backgrounds. The study was carried out on one group using both pre and post-test experimental studies and it showed in their findings that there were significant differences between the pre- and post-tests results of the Secondary School Science Teacher Education Program (SSSTEP) students.

Learning-By-Doing Instructional Strategy and Learning in Agricultural Science

Do agricultural science teachers provide students with active learning strategies that promote positive attitudes toward the subject? This question is very relevant in the context of this study and it guided the conceptualization. Zhao (2003) claimed that constructivist pedagogy necessitates giving respect to students' ways of learning consequently incorporating them into the educational processes that we adopt and utilize. In this study, by using Learning-By-Doing (LBD) method, the students' active and collaborative learning approaches were emphasized, and their skills of sense making and knowledge integration within a skill-based subject are developed. By using LBD instructional strategy, the student's learning curiosity is engaged, they are more motivated to identify the agricultural concepts and principles. For instance, Onanuga (2012) showed that gender is not a significant factor in the attitude of the Vocational Agriculture Students in the senior secondary schools in relation to learning-by-doing in the classroom practices during teaching-learning process. He explained that the teacher of agriculture should as a matter of professionalism provide all students the required and necessary learning environment irrespective of the nature of students to promote agricultural production. In another study of Onanuga (2015), there was a significant result of the application of the learning-by doing when the subjects in the experimental group had a higher score in vocational agriculture achievement after the treatment than the participants in the control group who had no treatment. It went further to reveal there is a significant relationship between receiving instruction in learning-by-doing and creativity in vocational agriculture students.

Parents' Education in Learning Agricultural Science

Parents' background, education inclusive (Adejoh et al., 2016) play significant role in determining the agricultural career of children and their finding showed that parents also influence students' attitude towards agricultural science subject in secondary schools. This study was an effort to address the deficiency in curricular objective of agricultural science in the area of skills development and preparation for occupations in agriculture among secondary school students. This is in concert with the objectives of post-basic education and career development in the NPE in conjunction with the fact that Secondary Schools' Agricultural Science Curriculum emphasized the acquisition of basic knowledge, attitude, and skills in all occupational areas of agriculture for the school products. On his own part, Ngogo (2014) explained that the level of education of the parents may have direct or indirect influence on the attitude of children because socialization begins at home and gradually as they move to another company for socialization outside the home for enhanced activities, they need to grow. He therefore submitted that a high level of education usually allows an individual to be able to get information on the educational and career implication of the school curriculum. It further explained that education helps in the acquisition of skills from different spheres of knowledge that may help parents to transfer to their children for the daily living. Akintonde, et al. (2019) revealed that there was significant relationship to the respondents' parents' educational level, father and mother's occupation. The study was carried out in Ogbomoso North Local Government Area of Oyo State, Nigeria to assess the attitude of senior secondary school students towards agriculture as a profession in five selected secondary schools. Egunsola (2014) found that the educational background of parents was highly correlated with and significantly influenced the academic performance of secondary school students in agricultural science. He explained that this could also show the way parents and other educated people in the home get involved in encouraging the students to learn at home, teach and guide them in doing their homework. Amao and Gbadamosi (2015) recorded that there is no significant achievement difference between male and female students in agricultural science according to parents' educational status of the high socio-economic status but there exited significance for the achievement of male and female in the low socio-economic status bracket.

Research Questions

The following research questions were raised to direct the study:

a. How does level of parents' education affect students' attitude towards Agricultural Science?
b. Would there be any interaction effect of learning-by-doing instructional strategy and parent's education level in determining attitude of students in Agricultural science?

Hypotheses

To guide the study, these three hypotheses were formulated:

i. There is no significant effect of Learning-By-Doing instructional strategy (LBD) on senior secondary school students' attitude towards learning agricultural science.
ii. There is no significant main effect of parents' education level in determining senior secondary school students' attitude in learning agricultural science.
iii. There is no significant interaction effect of Learning-By-Doing instructional strategy and parents' education level in determining senior secondary school students' attitude in learning agricultural science.

Methods

Research Design

The study adopted a pretest, posttest, non-randomized control group quasi-experimental design involving 2 × 2 factorial matrix. The two groups were randomly assigned to Learning-By-Doing Instructional Strategy (LBDIS) as experimental group and conventional method as control group. In experimental group, students received instruction through learning-by-doing for pre-planned practice information, demonstrations, and observations.

Practice Information**:** The students in the selected school were instructed using the learning-by-doing instructional strategy. Demonstration: In this session, the teacher gives the techniques or methods and demonstrates how to perform an agricultural operation on the field or farm. Observation**:** This is where the student has to perform the task(s) individually to show the extent of skill learning or acquisition. During the period, the teacher observes and grades each student using the Skill Performance Rating Scale (SPRS). The best performance actor will be recognized in order to serve as incentive to other students. In the control, the teacher used the conventional chalk and talk (verbal) instructional approach with illustration using teaching aids. Teacher was allowed to teach as he would usually do without any experiment.

Layout of the 2 x 2 factorial matrix of the study design

Treatment condition	Parents' Education Level	
	High	Low
X_1 Learning-By-Doing Instructional Strategy		
X_2 Conventional Method		

Parents' education was classified as low if not more than secondary school level but high when higher than secondary school stage. The dimension used was no formal schooling, primary education, secondary education, post-secondary not beyond national certificate in education (NCE), university education not beyond first degree, post-graduate education, measured nominally using 1, 2, 3, 4, 5 & 6, respectively.

Participants

The sample comprised fifty-three students from two separate schools in Ijebu division of Ogun State, Nigeria. In the experimental group were twenty-three students and thirty students composed of the control group. The intact class was used to carry out the study which lasted for five weeks of instruction delivery in the class which was preceded by one week of training the research assistant in the principles and practice of LBDIS and administration of the pre-test and one week of post instruction delivery for the post-test administration. In all, the process of data collection took seven weeks.

Data Gathering Procedure

The Agricultural Science Attitude Scale (ASAS) was used for the pre and post-tests while the Skills Performance Rating Scale (SPRS) was administered at the end of each lesson. As pre-data stage exercise, the attitude test was administered first, the reason was that any initial test administered before it may affect the attitude of the subjects. The researchers initially addressed the subjects in the various groups to solicit their cooperation and active participation in the experiment after the administration of the pre-test. The teachers, already certified competent based on the initial training moved in to train the students in the rudiments of learning-by-doing instructional strategy as it related to their experimental group.

Learning-By-Doing Instructional Guide

The teacher presented to the learners the sequence of tasks to be carried out thus:
For example: Cultural Practices of a Named Cereal: Maize

1. Looking for a suitable site (site selection)
2. Preparation of land for cultivation (land clearing, bush burning, ridging etc.)
3. Seed treatment
4. Seeding (Planting)
5. Application of herbicide
6. Thinning operation
7. Weeding
8. Application of fertilizer
9. Pest control / prevention
10. Harvesting of mature crop.
11. Storing the harvested crop.
12. Processing of the stored product.

The students were allowed to go to the farm to learn by doing following the sequence of tasks presented by the teacher. The teacher would go round to guide and grade the students accordingly in their bid to carry out the required performances.

Instruments

The two instruments used for the study were Agricultural Science Attitude Scale (ASAS) and Skills Performance Rating Scale (SPRS). The researchers prepared two different guides for the study. One instructional guide was for the experimental group and the other for the control group. The instructional guide for the experimental group consisted of the detailed contents of the topics to learn

and the related learning-by-doing procedures. In the same vein, the learning guide for the control group consisted of the same contents but no learning-by-doing features. The lesson plans were critiqued for validity by three experienced agricultural science teachers in secondary schools who are WAEC examiners for not less than five years. The researchers then handed over an appropriate guide to the teacher in each group to ensure strict compliance with the operational guidelines of the study.

The ASAS was researchers-developed, it was designed to measure the attitude of the students in learning agricultural science at the senior secondary school. It is made of 34 items alongside a 4-point modified Likert scale, that is, Strongly Agree (SA) Agree (A), Disagree (D) and Strongly Disagree (SD). The content validity of ASAS was determined by giving the instrument to researchers' colleagues. The content validity of ASAS was determined by giving the instrument to one language educator, two vocational experts and two educational evaluators. They ascertained the suitability of the instrument in terms of coverage of stated objectives in the senior secondary school agricultural science curriculum, language of presentation, clarity of application to class level of students involved in the study *as* well *as* content sub-scaling. The responses from these experts were used to produce the research instrument. The instrument was administered on forty (SSI) students in a secondary school in Odeda Local Government Area. The Cronbach coefficient alpha was used to determine the reliability index of the instrument and it gave 0.82 value. Positive statements were scored 4, 3, 2, and 1 for SA, A, D & SD, respectively while negative statements were scored 1, 2, 3, 4 for SA, A, D & SD respectively.

The SPRS has fourteen outlined major skills to be performed by each student on different occasions during instruction. The rating scale was given to three graduate agricultural science teachers with a minimum of 5 years teaching experience in the secondary school. This was to aid in determining the content validity of the skills performance items. Based on their recommendations and suggestions, the major skills were reduced to fourteen from the initial twenty-one. The reliability was established by giving the instrument to two teachers of agricultural science in two different senior secondary schools in Odeda Local Government Area to rate. After the collection of their responses, the instrument was subjected to inter-rater reliability. The analysis gave a 0.87 coefficient value using Cohen's Kappa statistic.

The rating scale has a range of 1 – 5 (that is, 1, 2, 3, 4, 5). The student can score a maximum of 5 marks and a minimum of 1 mark depending on the degree of display or demonstration of the specified sub-skills. In all, the total marks obtainable from the fourteen major skills would be seventy (70). The rating follows as:

For each major task provided, there are five sub-skills listed for measure. Each sub-skill was rated as 1 mark when performed correctly. Therefore, a major skill carries a maximum of 5 marks. In all, the seventy sub-skills gave a total of 70 marks.

Data analysis

The data collected were analyzed using frequency counts, simple percentages, Analysis of Covariance (ANCOVA), F-ratio and Multiple Classification Analysis (MCA).

Results

Analyses in the direction of the formulated hypotheses are presented below:

Hypothesis 1:

Table 1

Summary of Analysis of Covariance of Students' Attitude towards learning Agricultural Science According to Strategy and Parents' Education Level

Source of Variation	Sum of Squares	Df	Mean Square	F	Sig. of F
Main Effects	**3214.402**	**1**	**3214.402**	**20.322**	**.000**
Covariates (pre-test)	516.923	1	516.923	3.327	.040
Strategy (treatment)	1066.313	2	542.112	2.519	.023*
Parents' Education Level	6.210	1	6.210	.061	.862
2-Way Interactions					
Strategy * Parents' Edu Level.	422.122	2	178.631	1.193	.343
Explained	**1289.814**	**8**	**115.920**	**1.801**	**.026**
Residual	**7471.633**	**45**	**91.952**		
Corrected Total	**8761.447**	**53**			

* indicates significant F at .05 level, R Squared = 0.230, Adjusted R Squared = .130

From Table 1, the result shows significant outcome of the main effect of LBD instructional strategy ($F_{(2, 45)} = 2.519$, $p < .05$), thus implying that the difference in the students' post-test mean attitude towards learning agricultural science scores after exposure to the experimental and control groups is statistically significant at the .05 level of significance. Hence, the null hypothesis is rejected.

Hypothesis 2:

The result of the main effect of parents' education level in Table 1 shows no significant main effect of parents' education level on the students' attitude towards learning agricultural science ($F_{(1, 45)} = .061$, $p > .05$). This result implies that there is no significant difference in the post-test mean attitude scores of the students whose parents' level of education is low and the students whose parents' level of education is high after exposure to the experimental and control treatments used in the study. Hence, the null hypothesis is retained.

Hypothesis 3:

The result of the 2-way interaction effect of strategy and parents' education level in Table 1 shows no significant interaction effect of instructional strategy and parents' education level on the students' attitude towards learning agricultural science scores ($F_{(2, 45)} = 1.193$, $p > 0.05$). This outcome implies that the students' post-test mean attitude towards learning agricultural science scores exposed to the two groups of instructional treatments (LBD and CM) used as strategy in the study do not vary significantly across the two levels of parents' educational level (high and low). Hence, the null hypothesis is retained. In other words, there is no significant effect of instructional strategy and parents' education level in determining the senior secondary school students' attitude towards learning agricultural science.

Table 2 shows the magnitude of the post-test mean attitude scores of the students exposed to Learning-By-Doing Instructional Strategy (LBDIS).

Table 2

Multiple Classification Analysis of Students' Attitude Scores According to Strategy and Parents' Education Level

Grand Mean = 81.786

Variable + Category	N	Unadjusted Deviation	Eta	Adjusted for Independent + Covariates	Beta
Strategy (Treatment)					
1. Experimental Group (LBD)	23	3.560		3.129	
2. Control group (CM)	30	2.443	**.236**	2.101	**.215**
Parents' Education Level					
1. Low	29	2.130		1.854	
2. High	24	-2.431	**.079**	-1.794	**.060**
Multiple R Squared					**.092**
Multiple R					**.277**

Note: Learning-By-Doing (LBD), Conventional Method (CM)

The Multiple Classification Analysis (MCA) as shown in the results in Table 2 present the magnitudes of the post-test mean attitude scores of the students in order of magnitude. This is done to show the difference in magnitude of the mean scores recorded by subjects in the two groups after being exposed to the LBD instructional strategy and conventional method. The MCA shows that with a grand mean of 81.786, the students exposed to the experimental treatment (LBD) obtained the highest adjusted post-test mean attitude score of 84.915 (i.e., 81.786 + 3.129). The students exposed to the conventional method (CM) obtained the next higher adjusted post-test mean attitude score of 83.887 (i.e. 81.786 + 2.101).

This outcome shows that when order of magnitude of the post-test mean attitude scores of the students is considered, the students exposed to LBD treatment comes top, followed by the students exposed to the conventional method. Furthermore, the results in Table 2 reveal that strategy (the treatment) accounted for 21.5% of the variance in the students' attitude towards learning agricultural science while the other variables may have jointly accounted for 23.6% of the variance in the students' attitude scores.

Discussion

The result of effect of LBD instructional strategy in determining students' attitude towards learning agricultural science after exposure to the experimental and control show significant outcome of the effect of instructional strategy. This outcome may be attributed to the fact that Learning-By-Doing (LBD) is learner-centered that not only emphasizes active and collaborative learning, but also asserts that students and teachers would discover and construct knowledge together. Thus, implying that the difference in the students' post-test mean attitude towards learning agricultural science scores after exposure to the experimental and control interventions is statistically significant. The finding is in concord with the earlier findings of Akinoglu and Tandogan (2007) and Tosun and Senocak (2013) that reported difference between the post-test attitude scores of the experimental group and control group. This outcome therefore indicates that a particular attitude as one's individual attribute can be

developed, influenced, or changed over time especially when monitored or subjected to certain conditions.

This finding can be attributed to the fact that there was an improved attitude among the students which may have resulted in the collaborative nature of the instructional strategy involved in the study. In addition, this finding supports the outcome of Otekunrin et al. (2017) which revealed that there was a significant relationship between pre-attitude scores of experimental and control groups. In essence, when learning-by-doing is incorporated in agricultural science instruction, it is most likely to improve the attitude of students towards learning subject. On the contrary, Shiyam and Inyang-Abia (2011) reported that students' perception of the method of teaching agricultural science has no significant influence on their attitudes towards the subject.

The result of the main effect of parents' level of education shows no significant main effect of parents' education level in determining students' attitude towards learning agricultural science. This result may not be unconnected to uncensored negative attitude of the typical parents in the study area towards agriculture and its related activities. In spite that lesser number of the parents belonged to the high level of education; this might have affected their not-too-pleasant attitude towards agricultural undertakings when they perceive agriculture as a career that is not prestigious. The negative disposition of many of these parents may have brought its attendant effect on their children directly or indirectly. A further analysis through MCA revealed that the students whose parents' level of education is low recorded higher attitude towards learning agricultural science than the students whose parents' level of education is high though, it recorded a slight difference, but the difference is not statistically significant. It thus revealed that parents' education level accounted for 6% only of the variance in the students' score in attitude towards agricultural science at the end of treatment. The result shows that parents' education level is not an important factor in determining students' attitude towards agricultural science. The plausible reason for this may relate to the fact that education of parents of the participants showed from the data collected that they spread well and did not skew towards a particular educational attainment. This finding did not conform to an earlier finding of Olorunfemi et al. (2016) who reported that an increase in the educational level of the parent increases their likelihood to having positive attitude towards making their children and wards taking up careers in agricultural profession. This result shows that parents' education level is not a determinant in attitude of students towards agricultural science in senior secondary school. The finding departs from Ngogo (2014) who opined that the level of education of the parents may have direct or indirect influence on the attitude of children as the socialization begins at home, before they move to another company for socialization. Therefore, high level of education may afford an individual the leverage to access information on the educational and career implication of the school curriculum.

On the two-way interaction, the result of the 2-way interaction effect in Table 1 pertaining to strategy and parents' education level shows no significant interaction effect of instructional strategy and parents' educational level in determining the students' attitude towards learning agricultural science after exposure to the two levels of instructional treatments (LBD and CM). The outcome shows that the relationships between the variables are fairly shared. This finding is incongruent with the earlier result of Singh and Imam (2014) who found that father's education correlated significantly to the student attitude toward science learning in the secondary school. Going by the outcome of this present study, the parents' education level did not directly influence the direction of the attitude of the students towards agricultural science either positively or negatively. In other words, the students may only make personal decision on whether to pick occupation in agriculture but not based on their parents' education.

Conclusion

In past and recent years, literature on science education has discussed the need to beam searchlight on ways that can improve students' learning and attitude which could reduce their total dependence on teachers who are most time perceived as the knowledge reservoir. This current study

was conceptualized with the aim of contributing towards meeting this need and to complement the existing body of knowledge. Various scholars and researchers have shown that students' interest and attitude towards learning agricultural science has not been encouraging over the years, whereas the country needs to train young citizens who would provide food for the citizenry. In addition, the approach to learning the subject is also of great concern in the scholarship, hence these two challenges needed some attention in the body of knowledge. To tackle such scenario, the pretest, posttest quasi-experimental design was employed in the study. The findings showed that learning-by-doing is significant in determining students' attitude towards learning agricultural science. Beyond the conventional method, the instructional strategy that was involved in this study concentrated on the active participation and attitudinal reconfiguration for improvement in building sustained interest in agricultural science at the secondary school level. In order to achieve this, parents' education level was introduced as moderator variable in determining students' attitude towards agricultural science. It was found that parents' education is not significant in determining attitude to learning agricultural science. The outcomes showed the potentials of the learning-by-doing in enhancing and improving attitude towards agricultural science.

Recommendations

Arising from the findings of this study, the following suggestions are recommended:

Agricultural education, an important area of concern is the provision of instructional strategies that can assist to build and boost learners' attitude towards the learning of agricultural science. In as much as this study suggested that Learning-By-Doing (LBD) is potent and present viable platform to conventional method in boosting attitude of students in agricultural science, it has become pertinent to look at its effectiveness in our teacher education programs. The inclusion of the instructional strategy in the curriculum of teacher education program will strengthen its use in classroom practices by teachers on the field.

Agricultural science students should be made to see the importance of building a positive attitude towards the use of school farm in enhancing their ability and competence in performance in the classroom. The various groups of stakeholders should make it a point of duty to create opportunities for the training of secondary school teachers in the use of innovative strategies like LBD in learning in agricultural science.

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