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Students' Mental ability and Attitude towards Biology as correlates of students' academic performance in Biology in Senior Secondary Schools, Ondo State, Nigeria

[1]I.O. AKINWUMI (PhD), [2]F. A. FALEMU & [3]F.E. OLU-AJAYI (PhD)

[1,2,3]Department of Science Education, Bamidele Olumilua University of Education, Science and Technology, Ikere -Ekiti (BOUESTI), Ekiti State, Nigeria.
[1]Phone No: +239065575261, E-Mail: akinwumi.ibukun@bouesti.edu.ng.
[2]Phone No: +2348081083371, E-Mail: falemufunky@gmail.com
[3]Pone No: +2348038015872 , E-Mail: olu-ajayi.funmilayo@bouesti.edu.ng

Abstract
This study examines the students' mental ability and Attitude towards biology as correlates of students' academic performance in biology in Senior Secondary Schools, Ondo State, Nigeria. The research design used for the study was survey design of the descriptive type. The population of the study comprised of all biology students from the public senior secondary schools in Akure South Local Government Area of Ondo State. The sample of the study was two hundred (200) students selected from eight (8) public secondary schools. Simple random sampling technique was used to select twenty-five (25) respondents from each of the selected secondary schools. The instrument for data collection for the study was a questionnaire. The instrument was subjected to validity and reliability mechanism. A coefficient of reliability of 0.86 was obtained. The formulated hypotheses were tested using inferential statistics of Pearson Correlation statistical analysis. The analysis was done through computerized package of SPSS software version 20.The findings of this study reveals that there was a significant positive correlation between students' mental ability and academic performance of senior secondary school Biology students. The study also reveals that there was a significant positive correlation between students' Attitude towards Biology and academic performance of senior secondary school Biology students. Based on the results, appropriate conclusion and recommendations were made.
Keywords: mental ability, attitude, correlates, Senior Secondary School student.

Introduction

Mental ability can be described as the level of cognitive achievement demonstrated when pupils are exposed to educational processes which make them to progress from a state of ignorance to a level where knowledge and skills are acquired and utilized. Mental ability is among the most significant components of functional capacity for a worker, particularly a mental worker, to execute job duties, as it indicates a child's "brain power" in many elements of competency, such as verbal, arithmetic, spatial, and logical thinking (https://www.verywellmind.com>theories-of-intelligence, 2005).

Yoloye (2004) defined mental ability as genetic, cognitive, physiological, nutritional and social factor, ' as well as acquisition of skills, all taken together to decide ability. The influence of ability and gender grouping on SS Chemistry students' achievement on the concept of redox reactions was investigated by Inyang & Hannah (2000). The authors concluded that ability grouping significantly affected students' performance. Salawu (1999) used a standardized mental ability test as proposed by Australian Council for Educational Research (ACER) to categorise the level of performance of students into two ability levels, high and low.

The instrument discriminates among the student level of cognition, thereby making it possible to determine who can benefit best from science education. An individual who has a high ability to cope and excel in a subject or task will invariably develop a positive attitude towards learning while the one with low ability will develop a negative attitude and not be able to learn well. However, students with low ability could be trained and motivated to improve their ability.

Higher mental abilities refer to highest level of Blooms taxonomy, which Bloom (1956) describes as a generalized way of thinking and solving problems that could be applied to a wide variety of subjects (Boone, Boone & Garting, 2005).

According to George & Amalraj (2016) the mental ability represents a person's brain power in different areas of competency. Psychologists agree that the term mental ability describes a person's ability to learn and remember information, to recognize concepts and their reaction and to apply information to their own behavior in an adaptive way.

The mental ability of any student can be measured by conducting cognitive ability tests. Cognitive ability tests abilities that involved thinking (e.g. reasoning, perception, memory, verbal and mathematical ability, and problem solving) (https://www.sxcejournal.com>apr-jun-2016>mental).

Attitude plays an important role towards the future of science students. Attitude could be positive, negative or neutral. Any concept that specifies an individual's feeling of likeness or dislike to anything is termed his/her attitude towards that item (lliyasu, et al., 2015). Student's success in science is affected by their attitudes. According to Cheung (2011) cited in Adejimi, et al (2022) attitude object may range from things like biology, biologists, biology lessons, topics taught in school biology, inquiry-based biology laboratory experiments, biology education research, biological weapons, and biotechnology.

Different studies show the outcome on student's attitudes towards different subjects. A study conducted by Usak et al. (2009) cited in Iliyasu, et al (2015) revealed that students attitude towards Biology is neutral. Fareo (2019) found that there is significant difference between study attitudes of rural and urban secondary school students. Also found that there is no significant difference between the study attitudes of female and male in secondary school students. He also found that sudents' attitude towards biology is positive.

Fareo (2019) attitude is a fairly stable emotional tendency to respond consistently to some specific objects, situation, person, or category of people. According to Adejimi, et. al (2022) students' attitude towards a subject ought to be an essential concern during teaching, and it is incumbent on teachers to note their students' attitudinal disposition towards their subject. Students' attitude is one of the most important secondary school learning outcomes (Adejimi et al, 2022).Urrg (2000) in Fareo (2019) assets that the process of social interaction, which starts from the family, brings about certain development, including formation of attitudes. Fareo (2019) the study attitude is one of the main factors that affects academic performance of learners. Hussain (2006) cited in Fareo (2019) that Academic achievement is a function of study habit of the students.

Studies of Starwar, Bashir & Alam (2017) and Ajayi, Kassim, Adewale & Abayomi (2016) reported a positive correlation between attitudes towards subject and achievement. Adejimi, et al (2022) attitude occupies a central position that determines students' disposition towards a particular school subjects. Students' attitude motivates them to pursue a particular course of study and continue in their efforts to attain a mastery level in the subject matter. Students' attitude towards a particular school subject is also reflected in the way they manage their perception and behavior to be content being learnt. An important variable that affects students' attitude towards biology is the quality of teaching adopted by the teacher in the classroom. In the studies conducted by Adejimi, et. al (2022) on Enhancing students' Attitude Towards Biology using consensus and Cooperative Reflective Journal writing Educational Strategies revealed that students in the experimental or treatment groups had a more positive attitude towards biology than the students in the control group.

According to Adejimi, et al. (2022) researchers like Bennett, et al. (2001) and Salta & Tzougraki (2004) reported positive correlations between students' attitude and achievement in chemistry. Russell & Hollander (1975) cited in Adejimi, et al. (2022) also observed that there is strong relationship between attitude and achievement, but a positive attitude cannot be from achievement alone. Stark & Gray (1999) cited in Adejimi, et al. (2022), submitted that if attitude is given utmost consideration, the much-anticipated change in cognitive domain may be achieved.

Ogembe, et al (2015) cited in Abza, et al (2022) attitude is a key to achieve contemporary objectives of science learning and improving students' performance in science education. Attitude is the mind frame of learners to particular phenomena on science learning (Prayitno, et al, 2017, Widiyatmoko & Shimizu, 2018). According to Abza, et al (2022) attitude is described as a complex

contruct, however, fairly stable emotional tendency to respond often to some specific thing, condition, individual and groups.

Abza, et al (2022) cited SSarwar, et al (2017) that students attitude towards biology learning is influenced by teacher selection of teaching method. Adejimi, et al. (2022) cited Shuaibu & Ishak (2020) that Studies on students' attitude towards Biology have evolved as a targeted area of study because researchers hade demonstrated the role attitude plays in students' academic achievement. Prayitno, et al. (2017) reported that attitude is components of science learning like science process skills and contents knowledge in science education. In similar way, Widiyatmoko & Shimizu (2018) also reported that attitude is a core component of science learning. In another study reported by Sofiani, et al (2017) students' attitude towards science is not found gender difference. Hu, et al. (2018) affirms that there were significant differences in attitude towards science learning among the gender.

It is generally believed that students' attitude towards a subject determines their success in that subject. In other words, a favourable attitude results in good achievement in a subject. A student's successful experience can make him to develop a positive attitude towards learning a subject while his failure can make him exhibit a poor attitude towards the learning of the subject. However, research reports have shown that effective teaching strategies can bring positive attitude of students towards a subject.

Biology is one of the subjects studied in secondary schools in Nigeria. Biology is the study of living things. According to Abu (1998), the study of Biology enables one to become more aware of the changing environment, explore it better and be better adapted to it. Okebukola (1998) reported that Biology first appeared in the curriculum of CMS Grammar School, Lagos (the first secondary school in Nigeria) in 1859 and was taught as a combination of Philosophy, Botany and Zoology.

The study of Biology is imperative because it is a required subject in the preparation of the work force for the medical, paramedical, agricultural and other related professions. Especially, the contributions of the biologist are
strategic in industries, crime detection, research, health and disease control, population control, agriculture and teaching.

Olagunju (2002) cited in Ojetola (2006) stressed the importance of ecology, a major component of the Biology curriculum, in environmental education, understanding of socio-cultural' surrounding and preservation of nature.

Of great importance in the debate to unravel the causes of students' underachievement in Biology is the instructional strategy commonly employed by Biology teachers (Olajuyigbe,2000). The Senior Secondary School Biology curriculum is designed to serve the needs and interest of the students of a wide ability group. Consequent upon the introduction of the 6-3-3-4 educational system in 1985, the new curriculum recommended, among others, that guided discovery approach, resting on the activities of the pupils, be used in teaching. The expectation is that a successful implementation of the curriculum objectives based on recommended techniques will produce learners that are equipped with adequate knowledge, attitude and skills that would enhance performance, sustain their interest and consequently serve as the springboard for the nation's scientific and technological breakthrough. But contrary to expectations, the level of achievement among secondary school Biology students has remained abysmally low.

A variety of reasons have been advanced for the downward trend in students' under-achievement in public examinations. Idowu (1998) and Osokoya (2002) reported poor teaching methods, lack of qualified staff, inadequate facilities and textbooks, poor communication skills and dearth of the knowledge of certain concepts as contributory factors. In general, the poor level of performance of students in major examinations could be traced to government, examining bodies, the school, the teachers, the home and the subjects. It is often stated that no educational system can ever rise above the level of the quality of its teachers, and that the quality of a teacher is totally described by his effectiveness. Therefore, the teacher's role and strategies are critical to the successful implementation of any educational system. Studies have shown that effective teaching strategies can bring about positive attitude of students towards a subject (Olowojaiye, 2000; Onanuga, 2001; Nwagbo, 2001). Adeyemo (2001) asserted that students' academic performance can be influenced

through the teacher's resourcefulness, interest in the subject area, attitude to work, creativity and interaction with the students.

According to Njoku & Nwagbo (2020) throughout education system learning biology appears to be a gender-neutral science. According to Mehmood & Answer (2020) attitude of gender to biology learning always contradictory.

Hacieeminoglu (2016) found that males have positive attitude towards science learning than females.

The Senior Secondary School Biology curriculum designed for the current 6-3-3-4 of education in Nigeria is expected to prepare students for the attainment of reasonable and functional scientific attitudes, therefore, this study is intends to examine the Students' Mental ability and Attitude towards Biology as correlates of students' academic performance in Biology in Senior Secondary Schools, Ondo State, Nigeria.

Research Hypotheses

The following null hypotheses (Ho) were generated and tested in this study:

1. There is no significant relationship between students' mental ability and academic performance of senior secondary school Biology students in Akure South Local Government Area of Ondo State.
2. There is no significant relationship between students' attitude towards Biology and academic performance of senior secondary school Biology students in Akure South Local Government Area of Ondo State.

Methodology

The research design that was used for the study was survey design of the descriptive type. The population of the study comprised of Biology students from public senior secondary schools in Akure South Local Government Area of Ondo State.

The sample of the study was two hundred (200) students selected from eight (8) public secondary schools. Simple random sampling technique was used to select twenty-five (25) respondents from each of the selected secondary schools. The instrument for data collection for the study was a questionnaire.

The instrument was subjected to validity and reliability mechanism. A coefficient of reliability of 0.86 was obtained. The formulated hypotheses were tested using inferential statistics of Pearson Correlation statistical analysis.

The data collected from these respondents was subjected to inferential statistics of Pearson's Product Moment Correlation (PPMC) to determine the value of reliability coefficient (r) at 0.05 level of significance.

The researchers personally administered the questionnaire to the selected students with the help of two (2) self-trained research assistant. The questionnaires were retrieved immediately from them as soon as they completed their responses.

In analyzing the data for this study, the researchers used descriptive statistical tools of frequency counts and percentage to analyze the demographic data of respondents, percentage was used to answer the research questions while inferential statistics of t-test was used to test the hypotheses at 0.05 alpha level of significance. The analysis was done through computerized package of SPSS software version 20.

Results and Discussion

Hypothesis 1: There is no significant relationship between students' mental ability and academic performance of senior secondary school Biology students in Akure South Local Government Area of Ondo State.

Table 1: Correlation analysis of students' response

		Students' Mental Ability	Students' performance
Spearman's rho Students'	Correlation Coefficient	1.000	0.742*

interest	Sig. (2-tailed) N	 200	0.032 200
Students' performance	Correlation Coefficient Sig. (2-tailed) N	0.742* 0.032 200	1.000 200

* = significant at the 0.05 level.

The result in Table 1 shows the correlation between students' mental ability and academic performance of senior secondary school Biology students. The table indicates that there was a significant positive correlation between students' mental ability and academic performance of senior secondary school Biology students ($r = 0.742$, $N = 200$, $p < 0.05$). Hence, the null hypothesis was not upheld.

Hypothesis 2: There is no significant relationship between students' attitude towards Biology and academic performance of senior secondary school Biology students in Akure South Local Government Area of Ondo State.

Table 2: Correlation analysis of students' response

			Students' Attitude towards Biology	Students' performance
Spearman's rho	Students' perception	Correlation Coefficient Sig. (2-tailed) N	1.000 250	0.643* 0.046 250
	Students' performance	Correlation Coefficient Sig. (2-tailed) N	0.643* 0.046 200	1.000 200

* = significant at the 0.05 level.

The result in Table 2 shows the correlation between students' attitude towards Biology and academic performance of senior secondary school Biology students. The table indicates that there was a significant positive correlation between students' Attitude towards Biology and academic performance of senior secondary school Biology students ($r = 0.643$, $N = 200$, $p < 0.05$). Hence, the null hypothesis was not upheld.

Discussion of Results

The finding revealed that there was a significant positive correlation between students' mental ability and academic performance of senior secondary school students in Biology. The finding of this work agrees with the result of Inyang & Ekpenyong (2000) who reported significant effect of ability grouping on students' performances. The work of Mackintosh (1998) established a correlation between the mental ability of students and school performance grades. Also, Rinderman & Neubauer (2004) and Burt (2005) showed a relationship between ability and education latent trait and academic competence. However, Rinderman & Neubauer (2004) reported that in spite of individual differences in ability level, it is possible for one's intelligence to be increased especially through appropriate instructional strategies.

The finding of also revealed that there was a significant positive correlation between students' attitude towards Biology and academic performance of senior secondary school Biology students. The result obtained in this study reveals that there was a significant relationship between the attitude of students and academic achievement in Biology (Table 2). Bassey (2002) noted that students with positive attitude towards a subject perform better than students with negative attitude to the subject. Akubuiro & Joshua (2004) reported that students' attitude to science subjects is crucial in achievement and concluded that attitude is a factor that sometimes explains the poor performance in science subjects in Nigerian secondary schools. Also, Ogembe, et al (2015) cited in Abza, et al (2022) attitude is a key to achieve contemporary objectives of science learning and improving students' performance in science education.

Conclusion

Based on the findings, the following recommendations were made:

Students' mental ability influences the academic performance of senior secondary school students in Biology. Students' attitude influence their passion, commitment and readiness to learn in Biology class and have effects on their academic performance in senior secondary schools. Students' positive attitude pre-determined the academic performance of senior secondary school Biology students.

Recommendations

Based on the findings, these recommendations were made:

1. Biology students' should have a change in their attitude towards biology and feeling about Biology topics and methodology and rather see Biology as subject that improve their learning skills.
2. School administrators should ensure a fair mix of students according to their ability levels into the various class arms. This may have an interaction effect among the students.

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