

# Measurement Of Scientific Attitudes Acquired By Senior Secondary School Science Students In Kontagora, Niger State, Nigeria

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**Abstract:** *The paper measured the scientific attitudes acquired by senior secondary school Science students in Kontagora, Niger state, Nigeria. Two hundred and sixty-eight (268) (127-males and) 141 females) science students constituted the subject of this study. The sample was randomly draw from a population of 809 science students in 14 secondary school (6 – public and 8 – private schools). The instrument used for data collection was a questionnaire, which consists of 40-item structured questions developed by the researchers. The instrument was validated by experts and reliability tested, data collected after administration of questionnaire were analyzed using mean ratings to answer the research question raised. The t – test was used to test two hypotheses raised at  $p < 0.05$  level of significance. The result revealed that the science students acquired moderate level of scientific attitudes related to curiosity, open-mindedness, critical mindedness, objectivity, humility, rationality, willingness to suspend judgment and low level of honesty, furthermore, the students still hold unto some superstitions beliefs due to their background. In addition, statistically, the science students do not differ in scientific attitudes acquired in terms of gender and school type (public or private). Based on the result obtained, recommendations were made to school owners: government and private to provide adequate infrastructure and necessary facilities for studying of science and sponsor science teachers for in-service training, attendance of conferences and workshops so as to enhance quality science education.*

**Keywords:** *scientific attitudes, acquisition, science students, senior secondary school, Nigeria.*

## I. INTRODUCTION

Attitude is the way one feels or thinks about something (Hornby, 2001), that is, attitude could be an expression of like or dislike of a person, place, thing or an event. The WebFinance Incorporated (2017) defined attitude as the predisposition or the tendency to respond positively or negatively towards a certain idea, object, person or situation. Attitude can therefore be acquired or formed, Gbore and Daramola (2013), Amjad and Mohammed (2012) all argued that due to the elastic nature of attitude, it can be learnt from past and present experiences, family member, teacher, society

and group norms. They also added that attitudes are also interlinked or influenced by mental set which is composed of beliefs, values, likes and dislikes, hence attitudes determine behaviour of a person.

Science is seen as a systematic and logical approach to discovering how things in the universe work. It is also the body of knowledge accumulated through the discoveries about all the things in the universe (Bradford, 2015), science therefore consists of several dimensions: processes, products and attitudes. However, up to the middle ages, only the processes and products of science were more emphasized than scientific attitudes in science instruction. In the sixteenth

century, science started taking strides whereby scientific attitude is given recognition as one of the dimensions of science and this should be developed in science instruction (Amjad and Muhammad, 2012).

The development of a nation is believed to depend on the level of scientific and technological attainment of that nation. In this regard, science progresses as scientific investigation continues by people who are committed to it. According to Amjad and Muhammad (2012), there could be well-equipped laboratories to carry out investigations but the most important factor in research is the attitudes and characters of persons using the laboratories, these persons plan, devise and conduct experiments and draw suitable inferences from the experimental results. In essence, attitude influences every individual's endeavour in terms of making choices, aspirations, actions, reactions to challenges, incentives and rewards.

Every profession has its ethics, in scientific study, the scientist has to put up some attitudes that will enable him to progress and bring the best out of his work. Scientific attitude has been defined as the combination of many qualities and virtues that are reflected through the behaviour and action of the person (Janciran, Dhevkrishnan and Devi, 2012). Scientific attitudes are therefore norms or ethics of sciencing or carrying out scientific investigations, these scientific attitudes are traits that are expected of scientists. These include curiosity, objectivity, intellectual honesty (or truthfulness), open-mindedness, confidence in willingness to suspend judgement, rationality, critical mindedness, intellectual honesty, humility, appreciate and understand s nature and respect for life (Igwebuike, 1998, Jancirani, et al (2012), Amjad and Muhammad, (2012). The meanings of some scientific attitudes are:

- ✓ Curiosity is the act to have strong desire to know about something. That is, strong desire to explore and understand science.
- ✓ Rationality is the behaviour of a person based on reasons or facts available rather than on emotions.
- ✓ Willingness to suspend judgement is the act of a person to put away his own opinions by investigating thoroughly on the idea.
- ✓ Open-mindedness is the act of willing to listen, think and change of mind in the face of reliable evidence and respect other people's views.
- ✓ Critical mindedness is the act of challenging authorities (that is findings) of other people by asking constructive questions that demand answers with evidences.
- ✓ Objectivity is the act of regarding facts and true to behave in accordance with them.
- ✓ Intellectual honesty is act of telling the truth in reporting findings.
- ✓ Humility is quality of a humble person, he does not feel nor show that he is better than his colleagues/counterparts in the field of study (Hornby, 2001; Amjad and Muhammad, 2012).

It has become very important for Nigeria as a developing country to utilize science education for sustainable development. Nigeria therefore needs a considerable number of scientists in industries, agriculture, health as well as in research institutes that will steer national development. It has

also become imperative to inculcate scientific attitudes in learners at all level of education in Nigeria and especially in those in senior secondary schools (SSS). This is because the SSS level of education prepares the students for useful living within the society and higher education (Federal Republic of Nigeria (FRN), 2004). The students at SSS level of education in Nigeria make choice or decision of studying subjects related to science, business, humanities and technology. The science students offer pure sciences: Biology, Chemistry and Physics with other core subjects like English Language, Mathematics and a trade (entrepreneurship education).

However, inspite the importance of science to human and its place in national development, studies have shown that most people do not seem to place high value on science and most students have negative attitudes towards the study of science (Eze,1996; Rogers and Ford,1997; Osborne, Simon and Collins, 2003). They further said that lack of interest and negative attitude of students toward science is responsible for low enrolment and poor performance in the science subjects in Nigeria. Adesoji (2008) citing Halladyna and Shanghessy (1982) concluded that a number of factors have been identified as related to students' attitude to science; such factors include teaching methods, teacher's attitude, influence of parents, gender, age, cognitive styles of pupils, career interest, societal view of science and scientists, social implications of science and achievement. Since, attitude can be acquired through leaning, science educators have advocated for student centered approach to science education. Hence teaching methods, techniques, competent teacher, material resources stocked with Information and Communication Technology materials are needed to stimulate students' curiosity in finding out more about science (Stefan and Ciomos, 2010; Narmadha and Chamundeswari, 2013). The authors therefore measure the level of scientific attitudes acquired by SSS science students in Kontagora town of Niger State, Nigeria.

## II. OBJECTIVES OF THE STUDY

Specifically, the study sought to measure the scientific attitudes of science students in senior secondary schools in Kontagora, Niger State, Nigeria. Also, to find out to what extent the scientific attitudes have been acquired by students at SSS level of education.

## III. RESEARCH QUESTION

The following research question shall guide the study:

- ✓ What is the level of scientific attitudes acquired by science students in SSS in Kontagora town?

## IV. RESEARCH HYPOTHESES

H<sub>01</sub>: The scientific attitude acquired by science students in terms of gender do not differ significantly.

H<sub>02</sub>: The scientific attitude acquired by science students in public and private schools do not differ significantly.

V. RESEARCH METHODOLOGY

The researchers adopted survey method for the present study. That is, it involves collection of data using questionnaire for the purpose of describing and interpreting existing conditions or qualities about the population. The study was carried out in Kontagora town, Niger state, Nigeria. The target population consists of all SS 2 science students in the senior secondary schools in Kontagora.

Fourteen schools were sampled purposively based on the condition that such schools have been offering pure science subjects (Biology, Chemistry and Physics), prepare students for Senior School Certificate Examination (SSCE) and write same in the schools using their facilities. Based on this condition, the fourteen schools consist of 6-public and 8-private. A total of 268 science students formed the sample of the study (127 boys – males and 141 girls-females). The average age of the students is 16. The 268 science students were randomly drawn from these 14 schools, 20 students from 12 schools, while, the remaining two schools had 13 and 15 students respectively and were purposively used.

The instrument used was a self made questionnaire and some questions were adopted and modified after Amjad and Muhammad (2012). The questionnaire consists of two sections A and B. Section A sought information on bio data: name of school, age, sex and class, while section B are structured questions on a 4-point Likert type scale of Strongly Agreed (SA) Agreed (A) - 3, Disagree (D) - 2 and Strongly Disagree (SD) - 1. The structured questions in section B sought for the degree or level of agreement on scientific attitudes acquired. There are 8 parts: curiosity, rationality, willingness to suspend judgement, open-mindedness, critical mindedness, objectivity, honesty and humility. Each part consists of 5 items, thus section B consists of 40 structured questions.

The instrument was validated by an expert in science education in Federal College of Education, Kontagora. The comments and corrections made were incorporated in the final draft of the questionnaire used. The reliability of the questionnaire was determined by administering the instrument twice to 30 science students that were not involved in the study. Data collected was used to compute product moment correlation and 0.62 was obtained as the coefficient value, this value was considered high enough for the study.

The questionnaire was administered to students by the researchers and with the assistance of the science teachers in each school. The questionnaire were collected immediately the students responded to them, this is to avoid interaction between the respondents. A total of 268 copies of questionnaire were administered and returned. The research questions were answered using mean ratings, a mean of 2.50 and above was taken as an indicator that the respondents agreed with the item statement on the questionnaire, while, a mean of 2.49 and below is an indicator that the respondents disagreed with the item on the questionnaire. The grand mean of a scientific attitude is used to classify its level or degree. That is, 1.00 - 2.49 (low level), 2.50 - 3.20 (moderate level) and 3.30 - 4.00 (high level). The hypotheses were tested using t-test statistics at  $P < 0.05$  level of significance.

VI. RESULT

The results were presented according to the research question (Tables 1-8), while, the t-test of the the two hypotheses were presented on Tables 9 and 10.

Item No	Item Statement	Mean rating $\bar{X}$	Remark
1	I learnt computer operation as a modern technology by myself.	2.93	Agreed
2	I do read books, journals and internet browsing to get latest information about space research.	3.22	Agreed
3	I would get detailed information from radio broadcast about an earthquake that occurred in a prone earthquake region (mobile belt).	2.90	Agreed
4	I would like to know why a red rose flower dipped into sulphur-dioxide gas changes colour?	2.93	Agreed
5	I would like to run an electric circuit again inspite my finger got burnt before in a similar circuit.	2.52	Agreed
	Grand mean rating	2.90	Moderate level of curiosity

Table 1: Mean ratings of science students' responses on scientific attitude - curiosity

Table 1 showed that the respondents agreed with all the item statements related to scientific attitude of curiosity. The highest and lowest mean ratings are 3.22 and 2.52 and the grand mean rating is 2.90. This presupposes that the students are perceived to be moderately curious in their scientific endeavour.

Item No	Item Statement	Mean rating $\bar{X}$	Remark
6	A motorist saw a black cat standing beside the road and the motorist had an accident, I believe that the cat caused the accident.	2.86	Agreed
7	I would believe on it if many observations and	3.35	Agreed

	experimentations verify that Kola-nut is injurious to health.		
8	I would believe on the saying of the elders that when one hits his right leg against an object is a sign of good omen, conversely, the left leg it is a sign of bad omen.	2.80	Agreed
9	A shooting star in the sky is a sign of war.	2.43	Disagreed
10	I would stop sitting under a tree which is popularly believed that the tree harbours gins or demons.	2.81	Agreed
	Grand mean rating	2.85	Moderate level of rationality

Table 2: Mean ratings of science students' responses on scientific Attitude - Rationality

Table 2 showed that the respondents agreed with item statements 6, 7, 8 and 10 (with mean ratings of 2.86, 3.35, 2.80 and 2.81 respectively) which are related to scientific attitude of rationality. The grand mean rating 2.85, this is an indication that the science students are moderately rational. Thus, they are still holding to some forms of superstitious beliefs as agreed with the statements.

Item No	Item Statement	Mean rating $\bar{x}$	Remark
11	Every person I see coughing is as a result of smoking.	1.82	Disagreed
12	I would like to reject my friend's opinion without giving any proof.	3.44	Agreed
13	I would like to declare the name of a person without any evidence about my missing Chemistry textbook.	2.05	Disagreed
14	I would agree that any quick deduction made about any idea is correct.	3.29	Agreed
15	I would like to quickly say how good or bad a person is after	2.41	Disagreed

	seeing him for the first time.		
	Grand mean rating	2.60	Moderate level of willingness to suspend judgement

Table 3: Mean ratings of science students' responses on scientific Attitude - Willingness to suspend judgement

Table 3 revealed that the respondents disagreed with item statements 11,13 and 15 with mean ratings 1.82, 2.05 and 2.41 respectively, while, the respondents agreed with item statements 12 and 14 with mean ratings of 3.44 and 3.29 respectively. The grand mean rating is 2.60, this implies that most of the respondents are moderately willing to suspend judgment.

Item No	Item Statement	Mean rating $\bar{x}$	Remark
16	I would be ready to provide first aid to an opponent person who is injured in a science practical class.	3.23	Agreed
17	I believe on scientific findings by Japanese only.	2.23	Disagreed
18	I would rather support my blood brother who is telling a lie in a case than our home servant who is telling the truth.	1.85	Disagreed
19	I would accept a research carried out by an Asian based on observations and experimentations.	3.03	Agreed
20	In an international science quiz competition, I would encourage the leading school, even if they are whites.	3.13	Agreed
	Grand mean rating	2.69	Moderate level of open-mindedness

Table 4: Mean ratings of science students responses on scientific Attitude- Open mindedness

Table 4 revealed that the respondents agreed with item statement 16, 19 and 20 with mean ratings of 3.23, 3.03 and 3.13 respectively while, they disagreed with item statements 17 and 18 with mean ratings of 2.23 and 1.85 respectively, the

grand mean rating is 2.69. This is an indication that the science students have moderate level of open-mindedness.

Item No	Item Statement	Mean rating $\bar{X}$	Remark
21	Questions do arise from my mind when I'm reading and studying a science book.	3.49	Agreed
22	I believe on every scientific discussion without thinking about the concepts being discussed.	2.31	Disagreed
23	I would demand for a proof from someone who says that feeling of irritation in he palm is a sign that one will get a token of money.	2.46	Disagreed
24	In case I am ill, I would like to ask the doctor the causes of the illness.	3.58	Agreed
25	I would like to ask the doctor how, why and nature of stone formed in a patient kidney.	3.34	Agreed
	Grand mean rating	3.04	Moderate level of critically mindedness

Table 5: Mean ratings of science students' responses on scientific Attitude - Critical mindedness

Table 5 showed that the respondents agreed with item statements 21, 24 and 25 with mean ratings of 3.49, 3.58 and 3.34 respectively. This is an indication that the respondents are critically minded about science by asking questions to get convincing answers. However, the respondents disagreed with item statements 22 and 23 with mean ratings of 2.31 and 2.46 respectively, this means that the science students are not critically minded about superstitions beliefs. However, the grand mean is 3.04 which implies that generally, the science students are critically minded.

Item No	Item Statement	Mean rating $\bar{X}$	Remark
26	I would want my friends to also acquire things I possessed.	3.04	Agreed
27	I would like to use old apparatus as used by the founding scientists just for the sake of truthfulness of the experiment I want to perform.	2.99	Agreed

28	I would like to get more pocket money from my father than my brothers and sisters.	2.9	Agreed
29	I would like a strict supervisor to give me a chance to cheating during Biology examination.	1.74	Disagreed
30	As the class monitor, I would like to give preference to my friends in selecting a group of student to represent the class in a technological debate without considering their abilities.	2.05	Disagreed
	Grand mean rating	2.56	Moderate level of objectivity

Table 6: Mean ratings of science students' responses on scientific Attitude - Objectivity

Table 6 showed that the respondents agreed with item statements 26, 27 and 28 with mean ratings of 3.04, 2.99 and 2.96 respectively but disagreed with item statements 29 and 30 with mean ratings of 1.74 and 2.05 respectively. The grand mean rating is 2.56, this indicates that the science students have acquired scientific attitude of objectivity, they tend to search for facts about nature and work in accordance to scientific findings.

Item No	Item Statement	Mean rating $\bar{X}$	Remark
31	I would like to help my close friend in Physics examination by allowing him to copy my work.	1.96	Disagreed
32	I would like any of my science teachers to give me an assistance during science practical examination.	2.31	Disagreed
33	I would like to have that cash of money accidentally found on my way to school.	2.38	Disagreed
34	I would like somebody else to help me draw a given specimen under the microscope since I am poor in drawing	2.02	Disagreed
35	I would be glad if illegal favour is	2.20	Disagreed

	given to my group in an assignment rather than the other group who has done better than us.		
	Grand mean rating	2.18	Low level of honesty

Table 7: Mean ratings of science students' responses on scientific Attitude - Intellectual honesty

The result on table 7 showed that the respondents disagreed with all the item statements related to negative attitudes towards persons and studying of science. The highest and lowest mean ratings are 2.38 and 1.96 respectively, while, the grand mean is 2.18, this indicates that the science students are perceived to be of low level of honesty in their dealings with individuals and studying of science.

Item No	Item Statement	Mean rating $\bar{X}$	Remark
36	I would like to convince people to treat other people softly and tenderly rather than harshly in favour of me.	3.06	Agreed
37	As a science student, I consider myself better than the arts students.	3.08	Agreed
38	I would like to gain more respect from my classmates even if I had the lowest score in science.	2.85	Agreed
39	I would like to accept from the depth of my heart new idea that is put forward by someone to prove my wrong idea.	2.98	Agreed
40	I would like to be strict with my school mates if I am appointed as the head boy/girl of my school.	2.47	Disagreed
	Grand mean rating	2.89	Moderate level of humility

Table 8: Mean ratings of science students responses on scientific Attitude - Humility

Table 8 showed that the respondents agreed with all the item statements except item 40. This implies that the science students are humble in their interactions with individuals but could not be strict with their school mates if they are made head boy/girl (as indicated in item 40). In general, the grand mean 2.89 indicates that the respondents possess moderate of scientific attitude (humility).

Variable	Sources of variable	Number of respondents	Mean rating $\bar{Y}$	Standard Deviation (SD)	Degree of Freedom (DF)	$t_{cal}$	$t_{crit}$	Conclusion
Scientific attitudes	Male respondents	127	2.62	0.46	266	0.51	1.96	Not significant
	Female respondents	141	2.61	0.43				

Table 9: t-test of the mean responses of male and female science students' scientific attitude acquired

Table 9 presents the analysis for null hypothesis 1 ( $H_{01}$ ). The mean ratings of both males and females (2.62 and 2.61) indicate they are all in moderate level of scientific attitude. The t-calculated ( $t_{cal}$ ) 0.51 is less than the table value ( $t_{cal}$ ) 1.96 at  $p < 0.05$ . Hence, the null hypothesis is not rejected, that is, the scientific attitude acquired by science students in public and private schools do not differ significantly.

Variables	Sources of variable	Number of respondents	Mean rating $\bar{Z}$	Standard Deviation (SD)	Degree of Freedom (DF)	$t_{cal}$	$t_{crit}$	Conclusion
Scientific attitudes	Public school	120	2.68	0.39	266	0.68	1.96	Not significant
	Private school	148	2.72	0.57				

Table 10: t-test of the mean responses of science students' (in public and private schools) scientific attitudes acquired

Table 10 presents the analysis for null hypothesis 2 ( $H_{02}$ ). The mean ratings of students from public and private schools are 2.68 and 2.72 respectively. This indicates that students from both type of schools are moderate in scientific attitudes acquired. The t-calculated ( $t_{cal}$ ) is 0.68 which is less than the table value ( $t_{cal}$ ) 1.96 at  $p < 0.05$ . Hence, the null hypothesis is not rejected, that is, the scientific attitude acquired by science students in public and private schools do not differ significantly.

## VII. DISCUSSION OF FINDINGS

Scientific attitudes of SS 2 science students measured in this study indicated that the students possessed moderate scientific attitudes in: curiosity, open-mindedness, critical-mindedness, objectivity, humility, rationality and willingness to suspend judgment and low level of honesty. This results is similar to the result obtained by Amjad and Mohammed (2012) in their study of scientific attitudes possessed by secondary school students in Pakistan. In a similar vein, the study carried out by Ataha and Ogumogu (2013) on investigation of scientific attitudes among science students in senior secondary schools in Edo south of Nigeria, the study revealed that the students possessed on the average scientific attitudes of curiosity, open-mindedness and objectivity.

The possession of scientific attitudes by students will help them along way in developing positive attitude towards studying of science. Thus, there is possibility of producing future scientists that are humane, compassionate and objective who would contribute to the national development of the country like Nigeria. However, the result of this study showed that students do not seem to have acquired scientific attitudes of rationality and willingness to suspend judgement, especially those related to emotion and superstitious beliefs. This may be attributed to the students' different kinds of tradition and other religious beliefs. Superstitious beliefs could pose a constrain in studying of science. According to Olorundare (1998), superstitious beliefs held by students impede their conceptualization of scientific knowledge by creating an existing prior knowledge which is in contrast to science knowledge to be learnt; thus, there is need to expose students to consistent experiments.

The study also revealed that scientific attitudes acquired by students in terms of gender and school type (public or private) do not differ statistically at  $P < 0.05$  level of significance. This implies that, the scientific attitudes acquired by the students are the same. This result is consistent with the study of Ataha and Ogumogu (2013) whose result showed that the scientific attitudes possessed by male do not differ significantly with the female students.

### VIII. CONCLUSION

The current study measured the scientific attitudes acquired by senior secondary school science students in Kontagora, Niger State, Nigeria. The following findings were obtained:

- ✓ The science students possessed moderately scientific attitudes of curiosity, open-mindedness, critical-mindedness, objectivity, willingness to suspend judgement, humility, rationality and low level of honesty.
- ✓ The science students still hold onto superstitions beliefs which is responsible for them not possessing fully the scientific attitude of rationality and willingness to suspend judgement.
- ✓ The scientific attitudes possessed by the science students do not differ statistically in terms of gender and school type.

### IX. RECOMMENDATION

Based on the findings of this study, the following recommendations are made:

- ✓ Nigerian government and private school ownerships should provide standard infrastructure, science laboratories and workshops where students/teachers can have access to in carrying out practical works, this will go in no small way to eradicate superstitious beliefs in students.
- ✓ Owners of schools should provide necessary facilities and instructional materials for teaching and learning of science in Nigerian schools.
- ✓ Owners of schools should sponsor teachers for in-service training, attendance of relevant workshops and conferences, this will improve the teacher's competency in teaching.

### REFERENCES

[1] Adesoji, F.A. (2008). Managing students' attitude towards science through problem-solving instructional strategies. *Anthropologist* 10 (1), 21-24.

[2] Amjad, I.P. & Muhammad, F. (2012). Measurement of scientific attitude of secondary school students in Pakistan. *Academic Research International*, 2(2), 379-392.

[3] Ataha, U. & Ogumogu, A.E. (2013). An investigation of the scientific attitude among science students in senior secondary schools in Edo south, senatorial district, Edo State. *Journal of Education and Practice*, 4(11), 12-17.

[4] Bradford, A. (2015). *Science and the scientific Method: A definition*. Retrieved on 10<sup>th</sup> March, 2017 from [www.livescience.com](http://www.livescience.com)>Human Nature

[5] Eze, H.O. (1996). Psychological aspects of teaching and learning of Science and Mathematics. *Journal of Technology Education*, 1(1), 138-143.

[6] Federal Republic of Nigeria (FRN) (2004). *National policy on education*. Yaba - Lagos: Nigerian Educational Research and Development Council (NERDC) Press.

[7] Gbore, L.O & Daramola, C.A. (2013). Relative contributions of selected teacher's variables and students' attitude toward academic achievement in Biology among senior secondary school students in Ondo State. *Current Issues in Education*, 16(1), 2.

[8] Hornby, A.S. (2001). *Oxford Advanced Learner's Dictionary* (6<sup>th</sup> ed-special price). Oxford: Oxford University Press.

[9] Igwebuike, T.B. (1998). Prospects for equal educational opportunity in science and technology for national development. *Journal of Education for National Development and International Cooperation*, 2 (1), 36-48.

[10] Jancirani, R; Dhevakrishman, R. & Devi, S. (2012). A study on scientific attitude of adolescence students in Namakkal district. *International Educational E. Journal*, 1(4), ISSN 2277-2456.

[11] Narmadha, U. & Chamundeswari, S. (2013). Attitude towards learning of science and academic achievement in science among students at the secondary level. *Journal of Sociological Research*, 4(2), 114. Doi:<http://dx.doi.org/10.5296/jsr.4i2.3910>

[12] Olorundare, S. (1998). Superstitions beliefs as constraints in the learning of science. *Nigerian Journal of Guidance and Counselling*, 6(1 & 2), 133-150.

[13] Osborne, J. Simon, S; & Collins, S. (2003). Attitudes towards science: A review of the literature and its implications. *International Journal of Science Education*, 2 (9), 1049-1079.

[14] Rogers, W.D. & Ford, R. (1997). Factors that affect students' attitude toward Biology. *Bioscene Journal of College Biology Teaching*, 23(2), 3-6.

[15] Stefan, M. & Ciomos, F. (2010). The 8<sup>th</sup> and 9<sup>th</sup> grades students' attitude towards teaching and learning of Physics. *Acta Didactica Napocensia*, 3(3), 7-14.

[16] WebFinance Incorporated (2017). *Attitude*. Retrieved on 10<sup>th</sup> March, 2017 from [www.businessdictionary.com](http://www.businessdictionary.com)