

The Effect of Teaching Materials on Secondary School Students Performance and Attitudes towards the Study of Biology in Biu Local Government of Borno State Nigeria

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Abstract— This piece of research work was done based on experimental method in order to investigate the impact of instructional materials on second school students as regards their achievement and attitudes as it concerns study of Biology within Biu local Government council. This work adopted the use of post – test – only experimental research design in which a test was administered on parallel groups of students after the treatment. The sample of the study was made up of one hundred and twenty students, who were randomly selected from six schools representing the whole secondary schools offering Biology within the study area of the study. Also as part of the study, two sets of questionnaires (BSAT and SAS) were developed and administered on the students who were grouped into control and experimental groups. In order to give clear direction, three research questions as well as three hypothesis questions were formulated while the data collected were analysed using mean scores, frequencies count, percentile, *t* – test statistics and chi-methods. Also for sake of this work, literatures were reviewed as well as many acknowledged materials were consulted. The result obtained showed that instructional materials significantly influenced achievement and attitudes of the students towards Biology. It also shows the direct relationship between achievement and attitude in such a way that they are interwoven. The research was concluded with a result which determined that instructional materials significantly have influence on achievement and attitudes of students in Biology. Finally, some useful recommendations were made available for teachers, curriculum developers and implementers as well as to all other stakeholders.

Keywords— Instructional, materials, achievement, attitude, hypothesis and randomly.

I. INTRODUCTION

Nowadays, the fallen standard of education has become the most widely discussed topic universally, but however it still remains the major backbone of development of every country of the world. Today, the main factors usually associated with the fallen standard of education are the instructional materials and because of that much emphasis has to be channelled towards its effectiveness since many researchers have considered it to be important and very effective in terms of regaining, retaining and maintaining of students attention. In the same manner, it is also considered to serve as an effective

tools towards reducing the rate of disturbance, illusion and hallucination, it also improve the intensity specification as well as directing students attitudes which make teaching and learning more effective, meaningful and permanent.

Behaviour and modification are often tied to a process called teaching and learning. Teaching as such is said to be the act of importing knowledge, skills and values by learners through teachers (Olaita and Agusiobo, 1981). It is believe that culture, knowledge, skills and value are the provisional variations which takes place within an individual developmental stage in behaviour which contributes towards better living.

Right from the inception, teaching and learning have been taking place via different means, such as lecturing and explanatory as being the most dominant strategies which encourage rote learning. These methods were in the 19th and 20th and 21st centuries being enhanced by the use of instructional media and materials. This laid much emphasis towards sense of sight as being the most effective means for retention of an ideas, experience and events and it is considered to be in agreement with the statement of sir, Jansen in 1997 which said that at least 87% of students under any given situation are said to be visual learners (Tileston, 2004).

The important aspect of teaching science is to develop students' knowledge as well as to prepare the learners towards understanding the world better and to facilitate their acquisition of skills in the investigation of the natural phenomena. In another development, Ennosho (2008), stressed the need of an appropriate learning episodes as being requisites in order to achieve these goals which enable students to embrace the fundamental principles in the supposition of science and hold the enshrined meaning towards the application of scientific method in the investigation of the world around them.

According to Smith, (2007), teaching is a process of carrying out activities which provides students with experiences that can induce learning. In another development, Farrant (1990), consider learning to be a procedure of obtaining and retentive of information, skills attitudes,

understanding and competences which cannot be associated with hereditary behaviour designs or physical growth. However, according to Erinosh (2008), Science teaching can best take place when a teacher organises a series of practical experiences in scientific activities, the intention of which is to make students learn new knowledge and acquire skills and competence in science.

Biology as a discipline in science is basically a considered to be a practical subject and therefore required a highly equipped laboratory as well as field skills. However, notwithstanding in as much as factual knowledge is important, the understanding of how get and evaluate information is consider to be greater than the ability to memorize facts (Jones, Reeds and Weyer, 2007). But (Ramaligam, 2007) analyse biology as a charming study which ranges from microscopic cellular molecules to the biosphere including the earth surface and its living organism. Because of this, biology students often observe living phenomena at their natural settings and therefore, use scientific methods to rebuild the mysteries of life.

The instructional materials are therefore used in order to attract attentions of the students which makes teaching to be of more practical benefit (Kumar, 2008). If attitude are supposed as learning determinants, that means that one's attitude towards subjects may affect performance or achievement in that particular subject which implies that if one has a negative attitude towards a subject, one might develop fear or hatred towards the subject as well as to the subject master which may subsequently lead to discouragement, failure or under achievement. Attitudes are said to be acquired, adopted and can be changed, it is therefore, said to have aspects such as direction, intensity, generality and specificity (Aggarwal, 1994).

The instructional materials does not only draws attention of the students, but also motivate and instruct the students interest for the activities involved and therefore improve their achievement and attitudes towards the subject (Kamar, 2008).

For Erinosh (2008), instructional materials does not only motivate students, but could also attract their attention and promote readiness as well as their interest which are requisites for effective teaching and meaningful learning to take place. This is because all the three factors are important for proper awareness and preservation of concepts. Therefore, the opposite may be the case when instructional materials are poorly used or not completely used.

Statement of the Problem

As all knowledge gained through scientific means are considered to be evidence in nature, therefore, the teaching of biology as one of the branch of pure sciences also most involve practical skills and all other experiences which tend to proof the aforesaid nature of sciences.

Examining the popular lecture, explanatory and teacher cantered methods, devoid of instructional materials encourage rote learning, assimilatory or verbatim memorization. However, on the other hand, the emergence of as well as domination of new teaching technique is characterised by modern instructional materials, which involve the use of

concrete materials in order to ease understanding as well as to improve retention. It is as a result of this that this research intends to investigate as well as to scrutinize the effect of instructional materials on senior secondary school student's achievements and attitudes towards biology in Biu local council of Borno state. This study has become necessary because of the negative attitudes, poor and underachievement has been attributed to the non-use of instructional material. Also the enthusiasm and moral of the leaners has been diminished therefore, resulting into developing of apathy towards biology which the researcher considers to serve as a basis for this research.

Purpose of the Study

This research is designed in order to determine influence of instructional materials on student's achievements as well as their attitudes towards Biology. However, the specific objectives of the study include:

1. To determine the influence of instructional materials on students attitude towards Biology.
2. To determine the impact of instructional materials on the achievement of students in Biology.
3. To find out the attitudes of students towards Biology after BSAT.
4. To find out whether achievement in Biology determines attitudes of students towards the subject.

Research Questions

These research questions were formulated in order to guide towards the direction of the study

1. To what extend does the use of instructional materials enhance achievement of students in Biology.
2. What is the influence of instructional materials on student's attitude towards learning? Biology.
3. To what extent does achievement determines attitudes towards Biology?

Hypothesis

The following hypothesis was formulated in order to verify the variables of the study:

1. There are no significant relationship between instructional materials and achievement in Biology.
2. There are no significant relationship between instructional materials and attitudes towards Biology.
3. There are no significant relationship between achievement and attitude towards Biology

Significance of the Study

Even though it was generally agreed that the use of instructional materials is fundamental towards effective teaching and learning, however the result of this research will also be useful to the following category of people:

1. It will assist the students towards realizing the role of instructional materials and therefore pay more attention as well as to be curious while performing experiments and to even explore new knowledge on their own, which will finally boost their moral as well as their achievement in Biology.

2. To parents, it will encourage them to provide their wards with both hard and soft ware of instructional materials in order to facilitate their understanding as well as their achievement.
3. To the teachers, it will enable the opportunity to enrich their lessons with proper and effective use of instructional materials.
4. The result will also assist curriculum planners as well developers to put more emphasis on the use of instructional materials so that it will enable the students to use their senses while learning which will assist towards retention, permanency and understanding of concepts which discourages rote learning.
5. To other regulatory agencies as well as all stakeholders, the result will be useful since the use of instructional materials will ensure transparent, self- dependent, independent learning as well as forming egalitarian society and meaningful learning.

Sampling Technique(S)

All schools used for this research were randomly selected using hart and draw method with replacement in order to ensure equal opportunity of selection for each of the elements which constitute the population. Schools sampled for the research are:

- a. Government community secondary school Biu
- b. Government science secondary school Waka - Biu
- c. Government secondary school Biu
- d. Army Day secondary school Biu
- e. Government girls secondary school Miringa
- f. Government day secondary school Biu

Instrument (S) for Data Collection

The instrument used for the purpose of obtaining data for this research was a questionnaire developed by the researcher for the purpose of collecting data which would be used in order to analysed and answer the research questions formulated in chapter one

Procedure for the Data Collection

The researcher first of all seek the permission of the principals of the respective schools selected as well as the assistance of the Biology teachers in order to teach the concept and also to administer the instrument and give the respondents enough time in order to get correct responses from the students after which all the scripts were immediately collected and returned for data analysis.

II. METHODS OF DATA ANALYSIS

All the data collected were analysed through the use of mean scores, standard deviation, and percentile, t – test statistics and chi – square

Question one was answered using mean scores and the standard deviation. This was purposely done because the question would be answered from the test result and are also found to be the best method suitable for the revelation of the difference in performance (mean scores) and the degree to which these scores varied (standard deviation). This is because attitude cannot be measured by using raw scores. Also research questions two and three are related to student’s attitude and are therefore using simple frequencies and

percentile. As such, the overall mean scores for the students for both SAS and BSAT were used as boundary for negative or positive attitude and higher or lower achievement respectively.

Lastly, the hypothesis one was answered using t – test which was calculated based on the available raw scores in order to measure any difference that exist and is also significance between the two groups. It is also the best for the hypothesis one while for the hypothesis two and three, chi – square test was used. It was chosen because of the nominal nature of the responses collected; since an attitude cannot be measured by using just scoring, that is why chi – square (x^2) test is taken as the most suitable method for testing hypothesis two and three. Even though, the summary of the analysis were presented using tables and figures in order to ensure effective communication. The entire teste were carried out at a statistical significance of 0.05 levels of probability and $n - 1$ a degree of freedom.

III. RESULT PRESENTATION AND INTERPRETATION

Research Question One

To what extent does the use of instructional materials enhances the achievement of students in Biology?

TABLE 1: Students means scores on BSAT

Group	N	Mean Scores	$\sum(x - \bar{x})^2$	SD
Experience	60	7.76	3.66.9493	2.4730
Control	60	3.97	306.5540	2.2604

The result above shows that instructional materials enhance achievement of Biology students. This is because one can easily observe from the table above that the students (respondents) from the experimental group have high mean scores of 7.76 and 2.47 standard deviation while on the other hand, those from the control group (who were taught without instructional materials) have obtained at least the mean scores of 3.97 as well as the standard deviation of 2.26 which shows that students who were taught using an instructional materials have the highest possibility of scoring 66% against the other group who were taught without the usage of instructional materials who have the possibility of scoring 34% of the items which is below average.

Research Question Two

What is the influence of instructional materials on student’s attitude towards learning Biology?

TABLE 2: Student’s attitude based on responses.

Group	Positive	Negative	Total
Experience	45	15	60
Control	28	31	59
Total	74	46	119

Table 2: This result in table two shows that attitude could be influenced by instructional materials. This is however highly pronounced on figure 1 of which results from the experimental group with positive attitude occupied the wider space which is followed by that from the control group whose negative attitude has percentage frequency of 38 – 26

respectively. Both have 12% and 23% for experimental with negative attitude and for the control with positive attitude respectively. The result has clearly shown that students who

were taught using instructional materials develop interest in the subject and that instinct the love and care for the subject thus promote their attitude.

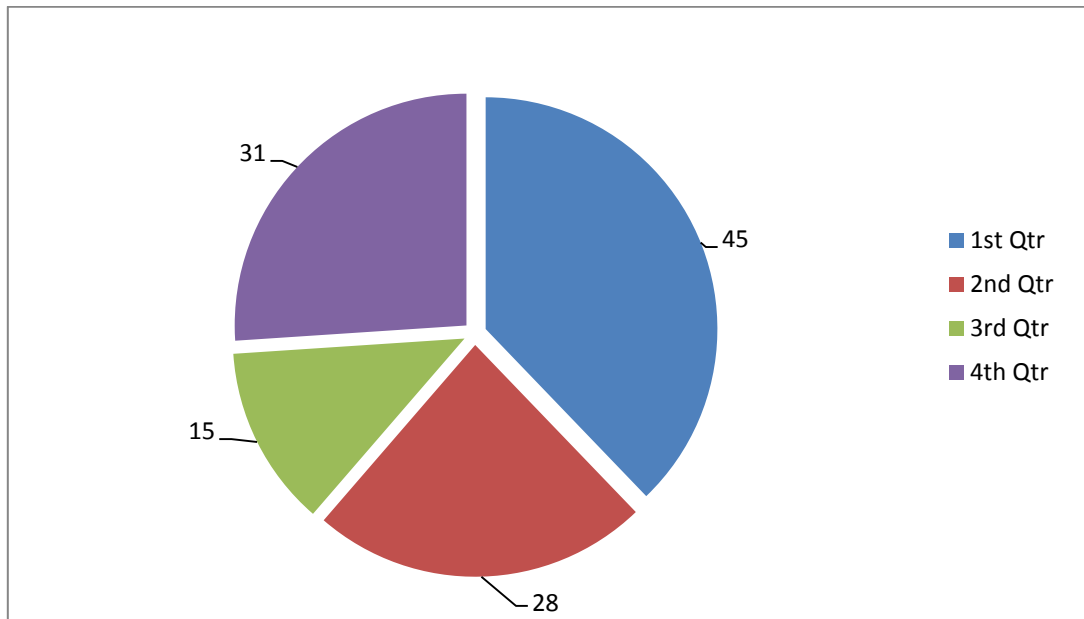


Fig. 1: A pie chart for attitude/group distribution

Research Question 3

To what extent does achievement determines attitude of students towards Biology?

The result above shows that students with higher achievement have negative attitude. Figure two has conspicuously shown higher achievers with positive attitudes who have higher percentage frequency and it was followed by lower achievers with negative attitude. The shortest bar shows that the least percentage group are those with higher achievement with negative attitude. The result vividly shows that the interdependency of achievement and attitude influenced and determined attitude of students towards Biology.

TABLE 3: Summary of responses for attitude and achievement

Achievement	Attitude Positive	Negative	Total
Higher	48	14	62
Lower	24	33	57
Total	72	47	119

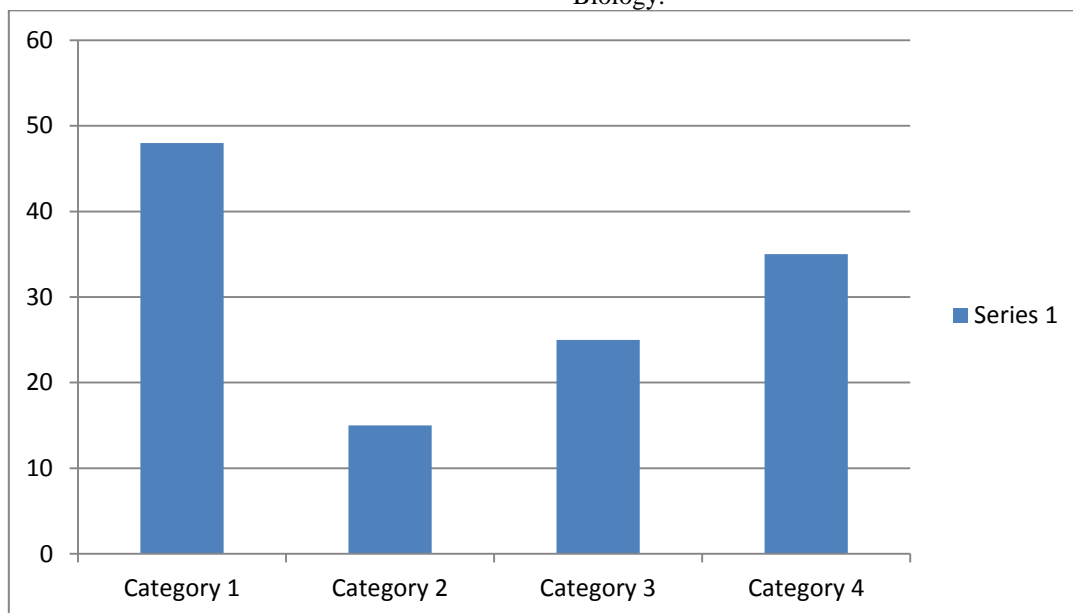


Fig. 2: Percentage by/achievement/attitude

Interpretation of result to test the hypothesis

Hypothesis One

There is no significance relationship between instructional materials and achievement in Biology.

TABLE 4: Mean scores and t – values of students on BSAT

Group	N	X	T - cal	T - tab
Experiment	60	7.76	53.9118	1.96
Control	60	3.97		

This result indicate that 53.91 is significance at $p = 0.05$ level. This implies the rejection of hypothesis one, which mean that the student’s achievement in relation to the usage of the instructional materials is significance.

Hypothesis Two

There is no significant relationship between instructional materials and attitude towards Biology.

TABLE 5: Observed frequencies for control and experimental groups.

Group	Attitude Positive	Attitude Negative	Total
Experimental	45	15	60
Control	28	31	59
Total	73	46	119

TABLE 6: Expected frequencies based on the above hypothesis

Group	Attitude Positive	Attitude Negative	Total
Experimental	37	23	60
Control	36	23	59
Total	73	46	119

TABLE 7: Chi – square summary for student’s attitude

O	Σ	(O - Σ) ²	(O - Σ) ² /Σ
15	23	64	2.78
28	36	64	1.78
31	23	64	2.78
45	37	64	1.75

Both table 5 and 6 gave the observed and expected frequencies based on responses on SAS for both the experimental and control groups. The chi – square (x^2) distribution summary on table 7 which shows that $x^2 - cal$ is 9.07, with one degree of freedom. A 95 percentile, the $x^2 - tab$ is 3.84, which is less than the $x^2 - cal$ (observed). Therefore at 5% the observed chi – square is significant that suggest the rejection of the null hypothesis, therefore, instructional materials seriously influenced attitude of students.

Hypothesis 3

There is no significant relationship between achievement and attitude toward Biology.

TABLE 8: Contingency table for observed frequencies of SAS/BSAT

Achievement	Attitude Positive	Attitude Negative	Total
Higher	48	14	62
Lower	24	33	57
Total	72	47	119

TABLE 9: Expected frequencies on the basis of this hypothesis

Achievement	Attitude Positive	Attitude Negative	Total
Higher	$62/119 \times 72 = 37$	25	62
Lower	35	22	57
Total	72	47	119

TABLE 10: x^2 summary on students attitude based on achievement

O	Σ	(O - Σ)	(O - Σ) ² /Σ
48	37	121	3.3
33	22	121	5.5
24	35	121	3.5
14	25	121	4.8
			17.1

$X^2 = 17.1$

This will be approximately a chi – square distribution with 1 degree of freedom of which 95% percentile is $3.84 < 17.1$ the observed x^2 is significant at 5%, so the null hypothesis is rejected with the conclusion based on the information available on the achievement of students, extremely determine their attitude.

IV. FINDINGS AND DISCUSSION

Research Question One

To what extent does the use of instructional materials enhance achievement in Biology?

Based on the presentation of research question one, it was realised that instructional materials has greater impact on achievement of students. It was also observed that there was greater variation in terms of the performances on the mean scores and frequencies between students taught with instructional materials and those taught without it. Therefore, the result clearly revealed up to 82% of students taught with instructional materials have high chances of scoring 60% and above of a given test items and up to 78% of those taught without It have the probability of scoring less than 60%. It has also indicated that about 18% of students taught using instructional materials may have scored lower grade.

This finding may however, be contrary to Adeniran (2006) findings which believe that the use of Biology improvised instructional materials do not enhance student’s achievement in Biology. However, this may be due to the nature and manner of the methodology adopted by the research especially, when dealing with the improvised instructional materials which may not represent the actual model. But however, student age group, level of intellectual maturity and capacity may have also play some roles in determining their performances. These and other factors may be interfering, but the controlled nature of the research, minimizes their effect. In another development, the results agree with the findings of Osinem (2012), Okachi (2012), Landu (2011) and Mango Mohammad (2012) who all are of the opinion based on research findings that activity – based instructions enhance academic performance of students.

Research Question Two

What is the influence of instructional materials on student’s attitude towards Biology?

Findings and Discussion

Question two results revealed that instructional materials promote attitude of students towards Biology. Even though Adeniran (2010) findings revealed that instructional materials neither enhance achievement of student nor promote their attitude, but however, geographical differences in terms of the

research may be another factor. The result indicate that about 77% of students who were taught with instructional materials usually have positive attitude, while 23% may likely have negative attitude. The result is an indication of the linkage between attitude and instructional approaches on the contrary, also result from the control group shows that approximately 50% have positive attitude and 50% negative, This may not be separated from other factors such as zeal from student (from within) empowered by colleagues or just responses to please teacher, to boost the morale of the school or guessing due to lack of knowledge.

The result from the experimental group has however, judge the case, as indicated by Aggarwal (2009) that attitude direction, intensity, generally and specificity, thus, it can be changed. The positive attitude for students taught with instructional materials may be due to the nature it has which directs the students attention specifically to it or due to influence from other factors, like logical presentation and productivity of teacher etc. the result is in agreement with Tileston (2004) and kumar (2008) that postulate instructional materials motivate students interest and achievement which in turn promote attitude.

Research Question Three

To what extent does achievement determines attitudes of students towards Biology?

Findings and Discussion

The findings here have agreed with Longbap (2006) who state that achievement and attitude are interdependent. The interpreted result from research question three has proved that attitude is determined by achievement. Of all, the result presented 48 students with high achievement and positive attitude against 33 with low achievement and negative attitude. It also presents 14 students with high achievement and negative attitude as against 24 with low achievement and positive attitude. This also indicated that there is high possibility of having higher achievers with positive attitude than lower achievers with positive attitudes.

In another development as stated by Erinosh (2010), the positive attitude most students have may be as a result of the pleasure derived as well as the encouragement gained from the higher achievement as observed from the results, it may however not necessarily be accepted that all higher achievers should have positive attitude because a reason or another may cause an exception as observed in the result which presented about 20% of higher achievers who have positive attitude which may also be applicable to the lower achievers. Although, it may seem to be annoying, but ones inner passion and interest must play some role.

Discussion of findings based on the Hypothesis

Hypothesis One

There is no any significant difference between instructional materials and achievement in Biology.

Findings and Discussion

Instructional materials significantly enhance achievement in biology. This outcome has agreed with the findings of Osinem (2012) and Kumar (2010) who upheld the view that

effectiveness and good results is highly reliant on evaluation and practical methods adopted. In another development, Tileston (2004) also suggest that most students are visual learners and that about 98% of of information coming into their brain is through the senses. This result therefore indicated that the influence of instructional materials on achievement of students is highly noticeable. It may be as a result of the concretized effect of instructional materials used as well as the elegant explanation and reasonable presentation of the idea and retentive ability of the method or the classroom condition which often make information to be permanent.

Hypothesis Two

There is no significant difference between instructional materials and attitude towards Biology.

Findings and Discussion

The hypothesis two suggests that instructional materials enormously encourage attitudes towards biology. The result specified that influence of instructional materials on attitude of students is highly distinct such that up to 80% and above of students that were taught using instructional materials may develop positive attitude towards the subject while less than 20% may have established negative attitude. The positive attitude students may not be unconnected to the physical teacher – student's interaction nature characterized as a result of the usage of instructional materials. However, those who were taught devoid of instructional materials may develop positive attitude. This may not be separated from other factors such as gender, nature of school, condition of students, maturity of the students, teaching methods as well as other classroom conditions in which the students find themselves. This finding is in agreement with Olaita and Agusiobo (1991) who stated that instructional materials stimulate interest and make learning more meaningful as well as permanent therefore, increases performance.

Hypothesis Three

There is no significant difference between achievement and attitude towards Biology.

Findings and Discussion

The result from hypothesis three interpretations allows the conclusion that achievement significantly influenced attitude. However, there is tendency that student's excellent result and negative attitude probability may be less, which that achievement and attitude are extremely interwoven in such a way that one can hardly exist without the presence of the other. This also agrees with Aggarwal (2009) who suggest that attitude and achievement are extremely interrelated.

The positive attitudes and higher achievers may not be unrelated to the desire they derived from the manipulative, sight and auditory nature/ effect of the instructional materials.

As already mentioned while discussing research questions, positive attitude may neither be solely dependent upon the use of instructional materials nor on higher achievement, some other factors most also be considered. This is clearly observed in result presentations of which about 20% of higher achievers have negative attitude and about 42% of lower achievers have positive attitude. The lower achievers may develop negative attitude either due to discouragement from low performance or poor/not understanding the subject at all. This may however,

not lead to the conclusion that all higher achievers have positive attitude, meaning there is exceptions, but keeping all other factors constant, the influence of achievement and instructional materials on attitude is highly significant.

V. CONCLUSION

Based on the research finding, the information is so clear that the use of instruction materials has so much impact over the achievement as well as attitude of students towards Biology. Therefore, without any mince of words, it could easily be said that achievement have meaningfully determine attitude towards learning Biology. The result has also determine that the use of instructional materials could tremendously improve achievement as well as encourage attitude of students in such a way that higher grade could be obtained with full participation and that through the effective usage of instructional materials, the students can easily score high grade as well as help the students to develop more interest in the subject. However, in another dimension, if the instructional materials happen not to be well utilized or not used completely, the students may end up scoring lower grade which intern will make the students to lose interest in the subject. The effectiveness of instructional materials can never be separated from either the relevancy of the instructional materials used, logical presentation of the instruments, teacher productivity as well as the level of subject mastery or the type of the instructional materials towards impacting the knowledge. Finally, there is no doubt that making good use of instructional materials can surely improve the teaching – learning processes, it also increases skills acquisition as well as make learning more real, significant and enduring.

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