



**RELATIONSHIP BETWEEN SECONDARY SCHOOL
STUDENTS' ATTITUDES TOWARDS SCIENCE
AND THEIR SCIENCE ACHIEVEMENT
FOR A SUSTAINABLE DEVELOPMENT.**

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Abstract.

This research work examined the relationship, between secondary school students' attitude towards science and their science achievement. The population consisted of the public senior secondary school students (SSS3) from 10 Local Government Areas of the state and with a figure of 650. The study sampled out 350 respondents of whom 61.40% (n = 220) are female students and 38.60% (n = 130) are male students. The participants are secondary school students in Plateau state. The study has applied the "Science Attitude Scale" developed by Baykul (1990) which has an alpha reliability coefficient of 0.94 and a questionnaire was admitted to the sample. The data were analyzed by ANOVA, t and Scheffe's tests and correlation coefficients (r). The results of the study indicated that students' gender, socio-economic of their families, the perceptions of their parents' attitude and their perceptions of science achievements have a significant effects on their attitudes towards science. The results of the study also reveals a meaningful relationship between the secondary school students' attitudes towards science and their science achievement ($r = 0.26$, $P < 0.001$).

Key Words: Secondary school students, attitude, and achievement in science courses

Introduction

Science is the rational and systematic study of the environment through experimentation and observation, with a view to understanding the environment in order to manipulate and control it for the betterment of human conditions. The study of science yields both theoretical and practical knowledge about the environment, which can be used

to manipulate and harness the forces and resources of nature for human development and well being (Njoku, 2007).

The global drift towards scientific knowledge has encouraged many ways of gaining information which help individuals to know more about themselves and their environment better and frequently develop, and renew this information in today's world. Teaching science and technology being the basic background for any meaningful national development to individuals, help them to learn how to adopt and adjust an inclination which enforces them to think objectively and make the right decision confronting different events and situations. This inclination provides a comfortable life for them, their families and the environment in which they lives (Akgun, 2001). It is believed that, if students learn science effectively using a scientific procedure and skills, they would be able to transfer these procedures and skills in their daily life activities. Applying these effectively students' attitudes towards science will increase, hence the formation of their creativeskills. During the secondary school educational period, courses on science and technology achieve a great importance comparing with other courses, since these courses teach students the environment, natural events and the scientific developments as well as critical thinking and problem solving. That is geared towards a sustainable development.

A sustainable society as pointed out by (Taylor, 2002; Akinyeni, 2007) is that which manages its economy and population size without exceeding all or part of the planet's ability to absorb environmental insults, replenish its resources and sustain human and other forms of life over a specific period usually hundreds to thousands of years. During this period, it satisfies the needs of the people without depleting earth capital, thereby jeopardizing the prospects of current and future generations of human and other species. The message embedded here is that, ones the capital has been depleted, the society will move from a sustainable to an unsustainable life style. The same lesson applies to the sustainable development of a nation. The question is, can the current science and technology education taught in our secondary schools today enable us attain sustainable development with the rate at which we are exploiting our natural resources? Can the acquisition, development and application of knowledge enable us attain a sustainable society within this complex society that is situated in a global village? Can students attitude affect their achievement in science? In an attempt to re-address these questions, we will require a general re-orientation of attitude and to our secondary school students' towards science.

An attitude is an inclination to gaining a skill and is identified as an individual characteristic that provide a background for accepting a positive subject or denying a negative one (Serin&Behbood, 2009). Thus, by improving a positive attitude among students towards science, while we can increase students' attitudes towards science and lead them to choose employment related to professional careers. In the same vein, studies concerning the effects of the attitudes on learning science depict a significant role among students resulting in their success and also motivates them to continue to work in fields related to science (Parker & Gerber, 2000). Also, some studies have proved that positive attitudes towards science have affected the learning process (Weiss, 1987; Linn, 1992; Altinok, 2004; Senol, Bal&Yildirim, 2007; Serin&Behbood, 2009). As a result, it is necessary to examine the secondary school students' attitude towards science and their science achievements for sustainable development since they are going to be effective in the life of next generation. Thus, this study inspired by this necessity, is going to examine the

secondary school students' attitude towards science and their science achievements for sustainable development in Plateau State.

Research Questions.

The research questions formulated to guide this study were as follows:

1. Is there any change in attitudes of the secondary school students' towards science concerning gender?
2. Is there any significant change regarding the socio-economic level of the secondary school students' parents?
3. Is there any change considering the perception of their teachers?
4. Is there any change considering the perception of the students' achievement of science?
5. Is there any significant relationship between the students' attitudes towards science and their achievement?

Methodology

Population, sample and sampling technique.

The population for this study comprises of the secondary school students (SSS 3) of Plateau state drawn from 10 public secondary schools with a figure of 650. The sampling of the study consisted of 350 students of whom 61.40% (n=220) are female and 38.60% (n=130) are male chosen by applying simple random sampling technique.

Data Collection

The researcher applied the scale of Attitudes towards science developed by Baykul (1990) as adopted from a similar study carried out by Serin & Bahbood, (2009). The Cronbach Alpha validity of the scale is 0.94. The scale consisting of 40 positive and negative sentences is scored totally by reversing the negative sentences. The highest and lowest scores are 145 and 35, respectively, and the highest scores show the positive attitudes. On the other hand, 6 questions about participants' individual characteristics have been incorporated in the scale to offer a reliable result.

Data Analysis

The analysis of this research work was achieved on the percentage of data on the bases of objective of the study and a one-way ANOVA, t and Schaffer significant tests, and also Pearson correlation coefficient(r) been measured and scored on a significant level of 0.05.

Results

The findings and the analysis was carried out in consideration to the research questions.

Table 1: The distribution of the mean score of students' attitudes on science considering their gender.

Sex	N	\bar{x}	Sd	t	p
Male	130	106.98	22.48		
				3.34	0.01*
Female	220	99.41	21.84		

*P<0.01

The table analyses the mean scores of the secondary school students' attitudes towards science considering the sex variable which depicted a significant change (t=3.34, P < 0.01). Table 1 shows, that the attitude of male students are more than their female students in science.

Table 2: The mean score of students' attitudes in science considering their parents' socio-economic status (SES).

SES	N	\bar{x}	sd	F	P
High	79	104.12	25.46		
Middle	232	99.93	23.82	6.63	0.002*
Low	39	115.60	20.10		

Analyzing the mean scores of the secondary school students' attitude towards science considering the socio-economic status of their parents (SES), the result in table 2 shows a meaningful change in science achievement visa viz student attitude. The Scheffe's tests was introduced to determine the parental group that made this change as it was proved that it was students from the middle to low socio-economic status that showed the difference.

Table 3: The distribution of the mean score of students attitudes on science achievement considering their teachers' attitudes.

Teacher A	N	\bar{x}	sd	F	p
Authorizer	116	102.53	77.86		
Inattentive	47	81.31	19.26	29.23	0.000*
Democratic	186	109.46	24.72		

*P<0.001

In analyzing the mean scores of the attitudes in order to measure the students' perception of their teachers' attitudes towards themselves' the one-way variance is examined and from table 3, the results show that there is a meaningful change in the perception level of students attitudes towards their teachers (F = 29.23, p < 0.001).

However, in order to determine the groups making the change, the Scheffe's was applied. Therefore, the changes are between the groups perceiving their teachers' attitudes as democratic with students who perceived their teachers' attitudes as authorizer and careless. This change was in the favour of students who perceived their teachers' attitudes as democratic.

Table 4: The distribution of the mean score of students' attitudes on science and their science achievement.

Success	N	\bar{x}	Sd	F	P
Very good	166	112.56	23.46		
Good	128	101.46	21.35	37.74	0.000*
Weak	56	83.24	13.54		

*P<0.001

To measure the students' attitudes towards their science achievement, the students' overall score was analyzed according to the one-way variance and the analysis depicted a significant change among students' attitudes toward science ($F = 37.74$, $P < 0.001$). The Scheffe's test was implemented in order to determine the group making the change. Therefore, it was evident that the change is between the weak group considering the achievement level and this was in the favour of the group having a positive perception.

The findings concerning the fifth research question has been linked with table 4, of the question 4 of the study that posed as "whether there is a relationship between the secondary school students' attitude score and their science achievement. The mean scores of the whole sampling considering their science attitudes and their science achievement was analysed and the correlation coefficient of $r=0.239$ ($P<0.001$) was measured at 0.05 level of significance.

Discussion

It is glaring from the positive findings related to secondary school students' science attitudes considering the gender of the subjects, in which the male attitudes was more than the female ones, showed a change which is supported by other research findings (Weinburgh, 1995; Kanai & Norman, 1997; Francis & Greer, 1999; Yaman&Oner, 2006; Turkmen, 2008; Serin&Behbood, 2009). Moreover, the researches conducted by Houtz, 1995; Boone, 1997; Turkmen, 2002; Bilgin&Geben, 2004; Altinok, 2004; Serin&Behbood, 2009) proved that the attitudes towards science has not been changed considering the sex of the subjects. Many research conducted by (Baker, 1983; Greenfield, 1996; Serin&Behbood, 2009) revealed that the attitudes toward science was higher among the secondary school students' attitudes considering the sex of the subjects which begins in this period and is seen very frequently.

The findings from this study is considered very interesting since they showed that students with low socio-economic situations have positive attitudes. These findings placed the researchers to think that the subjects with weak socio-economic status have not any choice but having positive attitudes towards the courses and school. The findings of this study are in consistent with the findings of the researches carried out (Serin&Behbood, 2003) but contradict the findings of researches by (Hammrich, 1998; Saracaloglu). This is due to the fact that these researches were carried out on different, cultural and level of students. Moreover, these researches had been applied to even university students.

The groups of students who expressed a democratic attitude towards themselves had more positive attitudes compared with those who comprehend an authorizer and

Careless teacher, and this depicted that teachers attitudes in the secondary schools influence students attitudes. Also, the findings of this study contradict the results of the study carried out by Serin (2001). Similarly, others studies on students teachers (Talsma, 1996; Serin&Behbood, 2003) revealed that, they have been influenced by their primary and secondary school science teachers thus confirming the results of this research work.

On the other hand, those students with science achievements of “average” and “good” have positive attitudes toward science. The findings of this study are in contradiction with a study conducted by Serin (2001), but in confirming with the results of the study conducted by (Saracaloglu, Baser, Yavuz, &Serin (2002), on College students' attitudes.

In the same vein, the correlational coefficient (r) of students participating in the sampling of the study is measured and the relationship between their attitudes on science and their science achievements is showed as $r = 0.239$ ($P < 0.001$). Thus, it can be inferred that, there is a significant relationship between the students' attitudes towards science and their science achievements. This finding is supported by studies carried out by (Weinburgh, 1995; Neathery, 1997; Saracaloglu, Altinok, 2004; &Karaer, 2005) which affected attitudes Serin&Bohbood, 2009 also opined that, there is a proportionate relationship between students attitudes towards the course and their achievement (Baykul, 1990). Also, the positive attitudes towards science affect students' achievement in science vice versa.

Conclusion

The main objective of this research work was based on the fact that, there is a relationship between the secondary school students' attitudes on science and their science achievement, however, the results of the study showed that the students attitudes toward science had a meaningful change considering their gender, the parents' socio-economic status (SES), the perception level of students' in understanding their teachers' attitudes and their science achievement. Moreover, the findings of the study showed that there is a significant change, $r = 0.239$ ($P < 0.001$), between the students' attitudes towards science and their science achievement.

In conclusion, it is certain that the attitudes of secondary school students' towards science, generally, was “highly positive ($\bar{X} = 103.16$)” and their science achievement level was “very good ($\bar{X} = 2.34$)”. The findings that revealed the existence of a meaningful positive correlation between the attitudes and achievement proves that the positive attitudes towards the science affected positively the science achievements of the students.

Recommendations

From the findings of this study, it is pertinent to draw the following recommendations.

- i. When carrying out science activities considerations should be given to learning/teaching status in order to encourage students to learn the subject completely, and give more time to individual activities and differences to improve positive attitudes towards learning the science subjects.
- ii. The students should be given the opportunity to see and visit the science and natural environments.
- iii. The teacher should create a situation in which students interests in these activities

- are raised which could improve their positive attitudes.
- iv. Also, in an attempt to improve positive attitudes of students in Science, objectives concerning the perception and sense should be incorporated in the curriculum and tried to be transformed into their behaviour.
 - v. Similarly, study to examine students' attitudes and their science achievement should be implemented to other groups with different age, class and departments.
 - vi. Parent's socio-economic status should be improved and they should have positive attitudes toward their children's academic pursuit.
 - vii. Government should organise workshops, seminars and conferences to change negative perception of parents towards science.

References

- Akgun, S (2001). Gender, parental and peer influences upon science attitudes and activities. *Public understanding of science*. 1, 183 – 197.
- Akinyemi, F.O. (2007). *Curriculum enrichment of Science technology and mathematics education as a basis for sustainable development*. 50th Annual Conference proceedings of STAN, 32 – 35.
- Altinok, H. (2004). Gender, race, ethnicity, and science education in the middle grades. *Journal of Research in Science Teaching*. 32, 143 – 157.
- Baker, D.R. (1983). *The Relationship of attitude, cognitive abilities, and personality to science achievement in the junior high school*. Paper presented at the annual meeting of the NARST, Dalla.
- Baykul, Y. (1990). Attitudes toward science and science knowledge of intellectually gifted and average students in third, seventh and eleventh grades. *Journal of Research in Science Teaching*. 25, 679 – 687.
- Behbood, M. & Serin, O. (2009). The relationship between primary school students' attitudes toward science and their science achievement Sampling; IZMIR. *International Cyprus University*.
- Bilgin, I. & Geban, O. (2004). *A study of relationship of science attitudes, achievement and self-concept of pre-service teachers*. Paper presented at the Annual meeting of the National Association for Research in Science Teaching 49th, San Francisco, California.
- Boone, W.J. (1997). *Science altitudes of selected middle school students in china: A preliminary Investigation of Similarities and Differences as a function of Gender*. School Science and Mathematics.
- Francis, L.J. & Greer, J.E. (1999). Measuring altitudes toward science and attitudes about the utility of science. *International Journal of Science Education Vol. 28*; 6, 571 – 589.
- Greenfield, T.A. (1996). Gender, ethnicity, science achievement and attitudes. *Journal of Research in Science in Teaching*. 33, 901 – 933.
- Hammrich, P. (1998). Promoting females' success in science. *Journal of Supervision and Curriculum Development*. 1, 4.
- Houtz, L.E. (1995). Instructional strategy change and the attitude and achievement of seventh eight-grade Science Students. *Journal of Research in Science Teaching*. 32; 629 – 648.
- Kanai, K. & Norman, J. (1997). *Systematic Reforms Evaluation: Gender Differences in Student Attitudes toward Science and Mathematics*. Proceedings of the 1997 Annual International Conference of the AETS. ERIC ED 405220.
- Kaptan, F. (1999). *Students perception and attitudes toward science*. Paper presented at the conference on Improving Science and Mathematics Teaching. Effectiveness of Interventions in Southern Africa, Namibia.
- Linn, M.C. (1992). Science education reform. Building the research base. *Journal of Research in Science Teaching*. 29: 821 – 840.

- Mattern, N. & Schau, C. (2001). Gender difference in attitude – achievement relationships over time among white middle school students. *Journal of Research in Science Teaching*. 39, 324–340
- Neathery, M.F. (1997). Elementary and Secondary Students perception toward Science. Correlations with gender, ethnicity, ability, grade and science achievement. *Electronic Journal of Science Education*. 2, 1.
- Njoku, Z.C. (2007). *Engendering learning equity in science and technology classrooms for sustainable development*. 50th Annual Conference proceedings of STAN 24–31.
- Parker, V. & Gerber, B.L (2000). Effects of a science intervention program on middle – grade student achievement and attitudes. *School Science and Mathematics*. 100, 236–242.
- Saracaloglu, A.S., Serin, O. & Bozkurt, N. (2001). Influence of students' background and perception on Science attitude and achievement. *Journal of Research in Science Teaching*. 23, 177–187.
- Senol, H.; Bal, S. & Yildirin, I.H. (2007). Defining attitude for Science educators. *Journal of Research in Science Teaching*. 25, 8:659–678.
- Serin, U. C. (2001). Differences between pupils' from mixed and single – sex school subjects and in their attitudes to Science and School. *Educational Review*. 42, 221–230.
- Talsma, V.L. (1996). *Science Autobiographics: What do they tell us about Perservice Elementary Teachers' Attitudes Towards Science and Science Teaching?* A paper presented at NARST Annual Meeting.
- Taylor, D. (2002). *Education for Sustainable Development*. 43rd Annual Conference Proceedings of Science Teachers Association of Nigeria. 90–93.
- Turkmen, L. (2008). Science attitudes and preparation of preserve elementary teachers. *Science Education*. 77 (3). 279–291.
- Weinburgh, M. (1995). Gender differences in students attitudes toward Science: A meta-analysis of literature from 1970 to 1991. *Journal of Research in Science Teaching*. 32, 387–398.
- Weiss, I.R. (1987). *Report of the 1985 – 86 national survey of science and mathematics education*. Research Triangle Park, NC: Research Triangle Institute.
- Yaman, S. & Oner, F. (2006). *Research on the affective dimension of science learning*. *Dergisi Mart*, 14:1, 339–346.