Relationship Of Attitudes Toward Self, Family, And School With Attitude Toward Science Among Secondary School Students In Zimbabwe

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ABSTRACT

This paper presents evidence obtained from a survey of forms two, three and four about the relationships of attitude towards self, family and school with attitude toward science. Among secondary school students in Zimbabwe three categories of variables were identified namely self-concept, home environment and school environment. The major findings of this study were:

1. That three categories of variables; self, family and classroom environment, contained significant predictors of attitude towards science.

2. Self variables explained between 40%-60% of the variance in attitude towards science.

3. Family variables predicted between 15%-40% of the variance in attitude towards science.

4. Classroom environment variables accounted for 48%-76% of the variance in attitude towards science.

5. The findings also indicate that all three categories of variables have a positive relationship with attitude toward science.

Introduction

How Zimbabwean attitudes towards science are formed and manifested represents an important area of study for many researchers in science education. Relationships between important environmental influence and attitude formation among secondary school students is of particular

concern. Three categories of variables; self-concept, home environment and school seem to play an important role in determining student attitude toward science.

Several investigators have reported positive relationships between student self-perception and cognitive and non-cognitive learning outcomes (Bloom, 1976; Kremer and Walberg, 1981; Simpson and Troost, 1982 and Urgulrou & Walberg, 1979). Haladyna, Olsen, and Shanghnessy (1982) suggested that there is "powerful evidence" that student attitude toward science is linked to a perception of self and the ability to learn. It appears that students with a strong positive regard for their own abilities to learn have a more positive attitude toward science.

Family is also a strong influence on the student. Kremer and Walberg (1981) examined thirteen studies in which home environment variables were related to student learning outcomes. The results of these studies indicated that high parent involvement in students' studies was related to high science attitudes and interests among students. Schibeci and Riley (1983) found that home environment and parent education exerted a strong influence within a causal chain linking instruction with attitude and achievement.

Classroom environment has been shown to be an important determinant of attitudes toward science. Several authors have examined the relationship between the classroom learning environment and cognitive and effective learning outcomes (Keeves, 1975; Haladyna et al, 1982, 1983 and Walberg, 1968, 1969). In general, it is reported in these studies that characteristics of teachers, peers, curriculum and classroom climate are strongly related to attitudes toward science. Findings from these studies suggest that self, home and school play an important role in shaping student attitude towards science. The purpose of this study was to examine the relationship of independent classroom-environment, self and family variables with the dependent variable, namely student attitude toward science in forms two, three and four levels.

The Study

For this study, stratified random sampling techniques were used. The sampling design consisted of five categories, namely Group A schools (formally white, asian and coloured), Group B (formally all blacks), registered private schools, rural secondary and mission secondary schools. During sampling, consideration was given to variables which were significant to the research. These included age and location. A total of 600 form two, three and four students responded to the questionnaires (see Tables 1).

Table 1
Composition And Characteristics Of The Sample Based On Questionnaire Returns

KEY: Reg = Registered

P.V   = Private

School Type	No. Of schools	A	B	Rural	Reg. Pv	Miss.	No. Of Respondents
HARARE	4	2	2	0	0	0	120
MANICALAND	2	0	0	0	0	2	90
MASHONALAND EAST	2	0	0	0	0	2	90
MASHONALAND WEST	2	0	0	0	0	2	100
MASVINGO	2	0	2	0	0	0	100
MATABELELAND NORTH	2	2	0	0	0	0	100
MIDLANDS	2	1	1	0	0	0	100

Multiple linear regressions were performed using Stepwise procedures. Analyses examined the relationship of each individual category of variables with attitude toward science. Models were developed using the entire set of self, family and classroom environment variables to determine which of these variables were significant predictors of attitudes towards science. R square values were used in examining the amount of variance in the criterion that was accounted for by the significant predictors. The F values associated with the Type IV sums of squares were used to determine if the variables were significant predictors of attitudes toward science. If the probability level associated with each variable was less than 0.05 that variable was considered a significant predictor of attitude toward science.

FINDINGS

The models which examined the predictive ability of the self, family and classroom environment categories of variables varied widely in the number of significant predictors for attitudes toward science. Of the three sets of variables, the classroom environment variables predicted the greatest amount of variance in attitude toward science in forms two, three and four. Anxiety, achievement motivation, and science self-concept variables, were found to be significant predictors of attitudes toward science (Table III).

R^2 values for self variables regressed on attitudes towards science ranged from 0.39 to 0.62 (Table IV). Self variables showed the strongest relationships with attitude toward science in form four. This may be due to the fact that the form four classes were taking additional science. Students choosing to take science classes would probably regard themselves with a higher self-concept in relation to science. Many researchers have shown a relationship between academic self concept and achievement (Bloom, 1976; Mitchell and Simpson, 1982; Cannon and Simpson, 1980; Kremer and Walberg, 1981; and Urgurlou and Walberg, 1979). Gardener (1975) reviewed several studies and found that self-concept and achievement motivation were related to a positive attitude toward science. Haladyna et al (1982) showed that students who possess confidence in their own abilities, a sense of control of their own

fate, and a feeling for science as being important, also possess positive attitudes toward science. The findings from the present study indicate that subject area related feelings of self-confidence have a strong relationship with attitudes toward the subject, even more so than general self-concept. It may be that by increasing positive feelings toward a specific discipline the discipline, related self-concept will improve.

Table II
Items Comprising Instrument Subscales

Subscale   *Cronbach
 ALPHA

1. ATTITUDE TOWARD SCIENCE	0.92	1. Science is fun. 2. I have good feelings toward science 3. I enjoy science courses 4. I really like science 5. I would enjoy being a scientist 6. I think scientists are neat people 7. Everyone should learn about science	
2. FAMILY SCIENCE	0.65	1. My parents help me with my science homework 2. My brothers and sisters like science 3. My father likes science 4. My mother likes science	
3. FAMILY GENERAL	0.54	1. I argue a lot with my family 2. I am a member of a happy family 3. My parents expect me to do well in school	

4. ATTITUDE
   TOWARD SCIENCE   0.63

   1. Most teachers at this school are fair with students
   2. I feel like I am in prison when I am at school
   3. I am under great pressure at school
   4. The headmaster of this school is good
   5. I feel like I have little control over what happens to me at school
   6. The harder I try, the better I do in school

5. EMOTIONAL
   CLIMATE OF THE
   SCIENCE
   CLASSROOM   .54

   1. I feel nervous in science class
   2. I usually look forward to my science class
   3. This class is a good place
   4. I am afraid of doing experiments

6. SCIENCE
   CURRICULUM   .78

   1. We do a lot of fun activities in science class
   2. We learn about important things in science class
   3. We cover interesting topics in science class
   4. I like our science textbook

7. PHYSICAL
   ENVIRONMENT
   OF THE SCIENCE
   CLASSROOM   .52

   1. I consider our science classroom attractive and comfortable
   2. Our science classroom contains a lot of interesting equipment

8. SCIENCE
   TEACHER   .57

   1. My science teacher encourages me to learn more science
   2. I enjoy talking to my science teacher after class

3. My science teacher makes good plans for us
4. Sometimes my science teacher makes me feel dumb
5. My science teacher expects me to make good grades

9. OTHER STUDENTS IN THE SCIENCE CLASSROOM   .54

1. I don't have many friends in this class
2. The students work well in this class
3. The students in this class are not much fun

10. FRIENDS ATTITUDES TOWARDS SCIENCE   .74

1. My best friend likes science
2. My best friends in this class like science
3. My friends like science
4. Most of my friends do well in science

11. ACHIEVEMENT MOTIVATION   .90

1. I always try hard, no matter how difficult the work
2. When I fail that makes me try that much harder
3. I always try to do my best in school
4. I try hard to do well in science

12. ANXIETY   .53

1. Science makes me feel as though I am lost in a jungle
2. My mind goes blank when I am doing science
3. Science tests make me nervous
4. I would probably not do well in science if I took it at the University

13. SCIENCE SELF CONCEPT	.54	1. I consider myself a good science student
		2. I think I am capable of becoming an engineer, scientist or doctor
14. SELF CONCEPT	.52	1. I like myself
		2. I feel I have a number of good qualities

*Cronbach's alpha reliability estimate for subscales.

Table III
Significant Predictors Of Attitudes Toward Science Among Self Using t -Values And Their Combined R^2 Values

Variables	Form II N = 200	Form III N = 200	Form IV N = 200
Achievement	2.460*	2.360*	2.425*
Motivation	2.320*	2.545*	2.572*
Anxiety	2.403*	2.340*	2.425*
Science Self	2.362*	2.462*	2.432*
Concept	2.250*	2.320*	2.420*
Self Concept	2.572*	2.630*	2.732*
R^2 Value	0.45	0.55	0.52

* = Significant predictor at the 0.05 level of probability and R^2 values.

* R^2 was obtained as a result of modelling the six variables.

Keeves (1975) reported a median correlation of 0.35 between the home environment and student learning outcomes. Haladyna et al (1982) found that student exogeneous variables-family background and environment did not show any significant relationship with attitude toward science. The variables used in his study were more similar to the Family General subscale used in this study. The Family Science subscale was always a significant predictor and accounted for the greatest portion of the variance in attitude toward science where the Family subscales were examined. From this it would appear that family support of science has the strongest relationship with attitude toward science, while other family variables have a weaker relationship.

Considering the classroom environment category of variables, Physical Environment and School were not, for the most part, significant predictors of attitude toward science. (Table IV). R^2 values for significant classroom environment variables regressed on attitudes toward science in step-wise analyses ranged from 0.63 to 0.75. The findings from this study are similar to those reported by other researchers, but in general the classroom environment variables when aggregated accounted for a greater amount of the variance in attitudes toward science. Lawrence (1976) found that 23% of the variance in attitude toward science among Biology students was accounted for by the classroom environment. Walberg (1969) reported that the learning environment predicted 25% of the variance in affective outcomes. Haladyna et al (1982) found that classroom learning environment accounted for 9%-32% of the variance in attitude toward science when individual responses were examined. Models that were developed in this study using class means accounted for 44%-78% of the variance in attitude toward science.

This clearly indicates that the school has a great impact on attitude development and its enhancement. The classroom environment is crucial in developing positive attitudes towards science.

Table IV
Significant Predictors Of Attitude Toward Science Among Family Variables Using of Values of t-Values And R^2 Values

Variables	Form II	Form III	Form IV
	N = 200	N = 200	N = 200
Family Science	2.023*	2.450*	2.475*
Family General	2.052*	2.325*	2.532*
R^2 Value	0.48	0.54	0.62

* = Significant predictor at the 0.05 level of probability.
R^2 Value was obtained as a result of modelling the two variables.

Table V
Significant Predictors Of Attitudes Toward Science Among Classroom Environment Variables Using t-Values And Their Combined R^2 Values

Variables	Form II	Form III	Form IV
	N = 200	N = 200	N = 200
Climate	2.231*	2.370*	2.678*
Curriculum	2.342*	2.560*	2.235*
Friends	2.256*	2.381*	2.462*
Other Students	2.370*	2.520*	2.374*
Physical Environment	2.452*	2.210*	2.210*
School	2.520*	2.254*	2.420*
Teacher	2.560*	2.672*	2.572*
R^2value	0.63	0.70	0.75

* = Significant predictor at the 0.05 level of probability.
R^2value was obtained as a result of modelling the seven variables.

Regression models that included the significant predictors of attitude toward science in all three categories of variables; self, family, and classroom environment accounted for between 60% and 82% of the variance in attitude toward science. Five variables remained consistent predictors of attitude toward science: Climate, Curriculum, Friends, Science Self Concept and Family Science.

The findings of this study are similar to those of Falton and Simpson (1986). However, in this study the classroom environment variables consistently provided the largest number of significant predictors for attitude toward science in each form (Climate, Curriculum and Friends), while the family and self categories of variables each produced only one significant predictor (Science Self-Concepts and Family Science). From this it would appear that the classroom has the strongest relationship with attitude toward science in this population.

CONCLUSION

The major findings of this study are that three categories of variables; self, family and classroom environment, contained significant predictors of attitude toward science. Self-variables explained between 40%-60% of the variance at Form IV level; family variables predicted between 15%-40% of the variance at all levels; and classroom environment variables accounted for 48%-76% of the variance at all levels. An overall model containing all the categories explains between 62%-82% of the variance in attitude toward science. These findings suggest that a large portion of the variance in attitude toward science may be explained by students' feelings about self, family and classroom environment.

The findings also indicate that all three categories of variables have a positive relationship with attitude toward science. When each category of variables was examined separately, classroom environment possessed the strongest relationship with attitude toward science. The fact that the classroom environment is under direct control of the teacher is significant. By increasing teacher awareness to the important role that classroom environment may play in the formation of student attitudes toward science, it may be possible to substantially increase student interest and

achievement in science. If classrooms are fashioned into stimulating, supportive environments in which students may question and develop their interests in science, this would contribute significantly in developing positive attitudes toward science.

Self-concept in science should also improve if students are given a supportive environment in which they can explore the nature of science. Apart from the classroom environment, the family and self categories are significant positive predictors of attitude toward science.

This suggests that the family, self, and classroom play an important role in students' attitude toward science. It is important for educators to realize that while a teacher may have an influence in developing positive student attitudes within the science classroom, other factors, outside the classroom, also need to be considered. These findings are consistent throughout the different form levels.

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