# EFFECTIVENESS OF THE PERSUASIVE COMMUNICATION MODEL IN CHANGING STUDENTS' ATTITUDE TOWARDS SCIENCE ENROLMENT IN SECONDARY SCHOOLS IN BENUE STATE, NIGERIA

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***Abstract:*** *Earlier researches had documented the massive decline of Nigerian Students from the study of science at all levels. This ugly trend was attributed to the fact that the students possessed negative attitudes towards science. The purpose of this research was to assess the effectiveness of the Persuasive Communication Model (PCM) as a tool for changing students' attitude towards science enrolment in Benue State Secondary Schools. Two research questions were formulated and eight hypotheses tested for the study. The study employed the survey, true-experimental and ex-post facto research designs to obtain solutions to the problem. Data were gathered from1840 JS3 students with ages between 13 and 15 years from Benue State, Nigeria by means of three instruments namely, Science Attitude Survey (SAS), the Science Attitude Questionnaire (SAQ) and the PCM message. The SAQ had a reliability coefficient of 0.73 using Cronbach Alpha method. Three probability sampling techniques were used to select the sample for the study in three stages. Data were analyzed using frequencies, means, t-test and the factorial ANOVA at P < .05 significance level. The study found that 35 modal salient beliefs determined JS3 students' attitudes towards enrolment in science. It was also found that students who were exposed to the PCM message (treatment) changed their attitude towards science enrolment significantly. The location, type and ownership of school, which the students attended, as well as gender, did not act as significant barriers to the effectiveness of the PCM. PCM was therefore, recommended as an effective strategy for changing attitude of students towards science enrolment in secondary schools.*

**Key words: Persuasion, Attitude and Science Enrolment**

## Introduction

People need to acquire requisite knowledge and opportunities to enable them translate material wealth into goods and services for use by the populace. For them to do this well, Siamwiza (1998) recommends that the people themselves need to be developed to enable them reach their maximum potentials. It is only then that they can initiate and accelerate the process of national development.

Nigeria needs to develop the young people by educating them in the knowledge of science and technology subjects. With these, they can contribute meaningfully to the attainment of the nation's desire for self-reliance in science and technology.

In Nigeria, Okebukola (1997) had put scientific literacy at below 10 percent. The implication is that functional literacy in science subjects which should have produced the required knowledge that would be applied in translating natural resources to man's benefit is lacking in quantity and quality. This may be due to the steady loss of interest by Nigerian students in the study of science (Salim, 1998). In other words, individuals who should have been developed through education in science and technology are staying away from the opportunity for training. Azeke (1987) had noted earlier, that increase in the student enrolment into schools was not been corroborated by similar increase in the number of students opting for science. For their own reasons, according to him, the students seemed to prefer other subjects to science. Similarly, other

researchers noted that the low student enrolment in science and technology subjects is a world-wide phenomenon that has continually been of great concern to science educators (Bello, 1987).

For about two decades in Nigeria, researchers have reported that students' enrolment in the sciences dwindled year after year. The trend was described with such terms as "a swing away from science" (Akpan, 1986a), "a movement away from science" (Bojuwoye, 1985), "a drift away from science" (Ukoli, 1986), "a shying away from science" (Umeoduagu, 1990), and "unimpressive enrolment in science" (Orukotan, 1997). Salim (1998) aptly described this trend as unhealthy for a technologically ambitious country like Nigeria. Hence, Aghadiuno (1987) suggested that adequate supply of suitable candidates for training in the scientific and technological professions in the higher institutions should be ensured at the lower levels. In the same vein, Bomide (1987) reiterated the need to raise the number of science-oriented students in the tertiary institutions by reducing the attrition rate in the secondary school classes. These views underscored the need to address the causes of students' low enrolment in the sciences at the secondary level in Nigeria.

Many researchers (Ogunniyi, 1986; Akpan, 1986b, 1987; Akale, 1990; STAN, 1992, Eze, 1996; Habour- Peters, 1997) reported that the negative attitudes of Nigerian students towards science were responsible for their low enrolment in the science subjects in secondary schools. According to them, students demonstrated lack of interest in the study of science; they were generally truant, lukewarm and disenchanted with the whole enterprise. The implication is that students who possess these dispositions, show that they tend to reject science as a subject internally and externally too. In this case they cannot commit themselves seriously enough towards studying science; so when they are faced with the decision to enroll in it, they simply "swing-away" to other subject areas leaving a trail of sparsely populated classrooms behind them.

In an earlier study, Akpan (1986b) showed that among four factors of intelligence, attitude, personality and type of school; attitude stood out as the most important determinant of students' choice of science subjects in Nigerian secondary schools. In this study, attitude accounted for 64.8 percent of the variance in students' choice of science subjects. The study thus establishes a cause-effect relationship between attitude and science enrolment in Nigerian secondary schools. It follows logically that the situation of low student enrolment in science subjects may be reversed by changing the negative attitude of students towards science (Piburn & Baker, 1993), using an appropriate attitude change model.

It is against this backdrop, that the present study assessed the effectiveness of the Persuasive Communication Model (Shrigley, 1978) in an attempt to change Junior Secondary Three (JS3) students' attitude towards enrolment in science in Benue State secondary schools. As its theoretical framework, the study is based on the Theory of persuasion and communication by Hovland, Janis and Kelley (1953), as applied to science education by Shrigley (1978) in the Persuasive Communication Model (PCM). The basic assumption is that attitudes are changed when people are presented with related persuasive communication messages.

**STATEMENT OF THE PROBLEM**

Attitudes of Nigerian students are negative towards science. This development has perverted the system for decades by lowering enrolment and performance of students in the sciences. This situation is unhealthy for an ambitious country like Nigeria that is aspiring to develop her technology in the new millennium and be one of the first twenty industrialized nations by the year 2020. This state of the art constitutes the problem of this study.

**RESEARCH QUESTIONS**

People's beliefs form the cognitive basis of their attitude towards particular behaviours (Fishbein, 1963; Oppenheim, 1983; Crawley & Koballa, 1994). Therefore, to identify the salient and modal salient beliefs of students which form the basis of their attitude towards enrolment in science, the following questions guided this research:-

1. What are the salient beliefs of JS3 students towards enrolment in science in the secondary schools?
2. What are the modal salient beliefs of JS3 students which form the basis of their attitude towards enrolment in science?

**HYPOTHESES**

The following hypotheses were tested during the study:-

1. There is no significant difference in the science and non-science enrolment figures of students exposed to the PCM message and those who were not.
2. There is no significant mean difference in the posttest scores of students exposed to the PCM message and those who were not exposed to it.
3. There is no significant difference in the posttest scores of students who were pretested and those who were not, before exposure to the PCM message.
4. There is no significant mean difference in the posttest scores of students exposed to the PCM message in the urban and rural schools.
5. There is no significant mean difference in the posttest scores of students exposed to the PCM message in the single sex and co-educational schools
6. There is no significant mean difference in the posttest scores of students exposed to the PCM message in government and mission schools.
7. There is no significant mean difference in the posttest scores of boys and girls exposed to the PCM message.
8. The interaction effects between the PCM message and each of the factors (school location, school-type, school ownership and gender) on students' attitude change are not significant.

**RESEARCH METHODS**

**Research Design**: The research design for this study was an integration of true-experimental, survey and ex-post facto research designs. Cohen (1964) found that in this kind of approach, the values of each design add to the other to yield more insightful results. True experimental design was used because manipulation of variables, comparison of groups and control of respondents was involved in order to assess the effectiveness of the Persuasive Communication Model in changing students' attitude towards enrolment in science. In the collection of baseline data survey research designs were employed. In assessing the action component of the students' attitude change, the ex-post facto research design was then used.

The type of true-experimental design used in this study was the Solomon Four-Group Design. Solomon Four-Group Design has the advantage over other designs in the sense that it controls for many sources of internal and external invalidity of a research.

Solomon Four-Group Design as used is denoted as follows:

| $E_1$ | $C_1$ | $E_2$ | $C_2$ |
|---|---|---|---|
| $O_1X\ O_2$ | $O_3\ O_4$ | $X\ O_5$ | $O_6$ |

Two of the groups ($E_1$ and $E_2$) received the treatment (X); the control groups ($C_1$ and $C_2$) did not receive treatment; one of the experimental groups ($E_1$) received a pretest ($O_1$); one control ($C_1$) received a pretest ($O_3$); and all the four groups received posttest ($O_2$, $O_4$, $O_5$, and O6).

**Population:** The target population for this study was the entire Junior Secondary Three ( JS 3) students in Benue State secondary schools in Nigeria who were considered to have already accumulated a history of learning in science, which could have predisposed them to act favourably or unfavourably towards a decision to continue to study science at the end of the JS 3 class.

**Sample:** The sample for this study comprised 1,840 boys and girls of ages between 13 and 15 years in the JS3 class.

**Sampling:** The sample for this study was selected in three stages using three sampling techniques, the Probability Proportionate to Size (PPS), proportional stratified random sampling and simple random sampling techniques.

**Instruments for Data Collection:** Three instruments were developed and used for gathering data, namely, the Science Attitude Survey (SAS), the Science Attitude Questionnaire (SAQ) and the Persuasive Communication Model (PCM) message.

**Validation of the SAQ:**

. The items were examined to ensure that they measured a representative sample of the students' salient beliefs toward enrolment in science. Items which were similar in content or did not relate closely to the problem of the study were eliminated. Similarly, items which elicited highest number of neutral responses after the instrument was trial-tested were eliminated.

**Reliability of SAQ:** Two forms of reliability coefficients were estimated for the SAQ namely, the internal consistency of the items and the stability of the instrument over a period of twelve weeks. Cronbach coefficient alpha method was used to obtain a reliability coefficient of 0.73. For the SAQ, this method was particularly suitable because it was not a speeded test and respondents had enough time to complete the items.

The value of 0.73 was considered to be significantly high enough as a measure of the internal consistency of the SAQ since it was an attitude scale which depends on moods and emotions of respondents (Sowell & Casey, 1982).

**Validation of Instruments:** The Persuasive Communication Model was validated by using the opinions of twelve experts who were senior lecturers in science education from four universities in Nigeria. They all agreed that the message was highly persuasive (giving a score of 80%).The full model is represented in Figure 1:

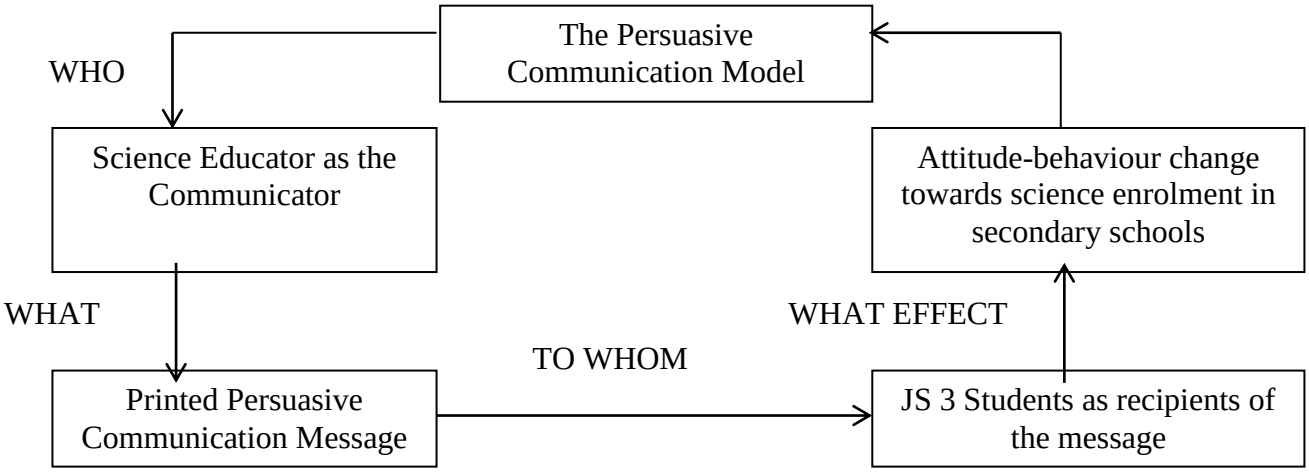


**Figure 1: The Persuasive Communication Model for the Study**

**Procedure for Data collection:** Data for this research were gathered through the administration of the instruments on students in their schools and the ex-post facto assessment visit to the schools nine months later.

**Intervention Programme:** The intervention programme involved the presentation of the persuasive communication message to the students by the researcher in the experimental groups for about two hours.

**DATA ANALYSIS METHOD:**

**Research Question One:** The salient beliefs of JS 3 students towards enrolment in science were obtained using frequency counts. By means of tallies, statements of students with frequencies of five and above were noted as salient beliefs towards enrolment in science.

**Research Question Two:** The modal salient beliefs of students towards science enrolment were determined by calculating the means of scores per item from the SAQ and rank-ordering them. Belief statements with mean scores above 3.0 on the Likert scale formed the modal salient beliefs of students towards science enrolment.

**Hypotheses:** The statistical tools used to test the hypotheses were Chi square, t-test and F-ANOVA.

**RESULTS AND DISCUSSION:**

The major findings based on the research questions were as follows:

a. Seventy-five salient belief statements were expressed by the students towards science enrolment.

b. Thirty-five modal salient belief statements were found to be the underlying beliefs for attitudes of students towards science enrolment in Benue state secondary schools.

The results of the analyses are summarized in Table 1 based on the hypotheses.

**Table 1: Summary of Results for the Hypotheses**

| Hypothesis | Statistical Test | Calculated Value | Critical Value |
|---|---|---|---|
| HO: 1 | $x^2$ | 7.81* | 3.841 |
| HO: 2 | t | 7.02* | 1.980 |
| HO: 3 | t | O.608 | 1.980 |
| HO: 4 | t | 1.420 | 2.000 |
| HO: 5 | t | 1.420 | 2.000 |
| HO: 6 | t | 0.081 | 2.000 |
| HO: 7 | t | 1.560 | 2.000 |

* Significant at P‹ 0.05.

From the results shown in Table 1 it was deduced that:

1 Students who were exposed to the PCM message enrolled significantly more in the science class in senior secondary one (SS 1) than their counterparts who were not exposed to it.

2 Students who were exposed to the PCM message had their attitude towards science changed positively thereby, obtaining significantly higher mean scores in the posttest than their counterparts who were not exposed to it.

3 The pretest-treatment interaction did not have a significant effect on the experiment, indicating that students who took the pretest before being exposed to the PCM treatment did not perform significantly better than their counterparts in the posttest.

4 None of the antecedent variables (school location, school type, school ownership and gender) posed significant barriers to the effectiveness of the PCM in changing students' attitude towards science enrolment in the secondary schools.

5 There were no significant interaction effects between the antecedent variables (school location, school type, school ownership and gender) and the treatment variable (PCM message) in changing students' attitude towards science enrolment (see Table 2). It means that students' attitude change

towards science enrolment in this research was not enhanced by these variables but it was due rather to the sole effect of the PCM message.

**Table 2: Summary of F-ratio Values of Interaction by Antecedent Factors**

| Antecedent Factor | F-ratio for Interaction |
|---|---|
| School Location | 3.29 |
| School Type | 0.79 |
| School Ownership | -0.77 |
| Gender | 0.42 |

P‹0.05, F-critical=3.92 at df = 1,236

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**DISCUSSION**

Students expressed 75 salient belief statements towards science enrolment in the secondary schools. In other words, whenever they were confronted with the decision to enroll in the study of science, these were the beliefs that quickly flooded their minds. Some of these beliefs look quite peripheral and are not likely to be considered seriously by the students when it comes to actually taking a decision about science. Therefore, such beliefs are not likely to lead to the formation of attitude, since, according to Ozoji (1991), only salient beliefs can lead to attitude formation. Research question two was therefore, to ascertain those expressed beliefs which could constitute the modal salient beliefs of students towards science enrolment. The result of data analysis showed that **35** out of **75** beliefs expressed earlier, constituted the modal salient beliefs of students towards science enrolment.

The implication is that these modal salient beliefs form the cognitive basis of the attitudes of students which determined their behaviour (enrolment in science). Of the 35 belief statements, 24 are positive towards science enrolment. If 24 statements making 68.6% are favourable towards enrolment in science, why then are students' attitude negative towards science, as revealed by Akpan (1986b), Akale (1990) and Orukotan (1997)? Logically, these positive belief statements should have culminated into positive attitude which in turn should lead to increased enrolment in sciences in this population. But this has not been so.

Of these 24 positive belief statements, only seven (i.e. 29.2%) had mean scores above 4.0 on the Likert scale. This indicates the number of statements which had strong influence in the formation of attitude that could determine behaviour. It means that the remaining 17 (70.8%) out of the 24 statements which were positive, must be mildly positive because their mean scores on the Likert scale fell between 3.0 and 3.5. Their effect on the attitude formation process must also be weak. Eleven statements out of 35 are out rightly negative (mean score below 3.0).

Altogether, therefore, 28 (11+17) out of 35 belief statements, representing 80 percent, is a combination of negative belief and mildly positive belief statements. These would result into the formation of poor attitude towards science enrolment. This is the reason which this study has found, why majority of the students shy away from the study of science. These attitudes need to be changed to enable the students enroll in science and choose it for a career.

The effectiveness of this strategy via the Persuasive Communication Model (PCM) was assessed through testing of the related hypotheses as discussed in the succeeding sections. The results show that students who were exposed to persuasive communication message enrolled significantly more in the science class than their counterparts who did not receive the message. This finding corroborates an earlier one by Crawley and Koballa (1994) who exposed grade 10 students to persuasive messages regarding enrolment in chemistry in grade II. They also found that those exposed to the message enrolled more in the chemistry class than their counterparts in the control group. This finding provides support for using belief- based messages to promote enrolment in science.

What has happened is that members of the group that was exposed to the persuasive message have had their beliefs/attitudes confronted by persuasive messages and this influenced them to change their behaviour by enrolling more in the science subjects. As noted earlier, man is basically a rational information processor; hence, his beliefs, attitude and behaviour can be influenced by the information available to him (Ajzen & Fishbein, 1975). This happens when the information is formally presented to him with clear evidence which counters his beliefs (Travers, 1973). Accordingly, he will see the need for an attitude change and consequently learn the new attitude as one learns to read or compute (Hovland, Janis, & Kelley, 1953). This is probably what has happened to students used in this study.

As learners enter school, they begin to acquire a history of learning and to form opinions and beliefs in their contacts with science and other subjects. Some of these beliefs predispose them favourably or unfavourably towards the subjects. As this trend is left unchecked, students are seen to flock away from some subjects (as in science) to other subjects for their own reasons.

In the present study, the effectiveness of this approach was assessed partly by measuring students' responses to a posttest and also by their enrolment in the science class. In this case both the cognitive, affective and action components of attitude were involved as suggested by Travers (1977). In order to assess the extent to which students have changed their attitude in the cognitive domain, hypothesis two was formulated and tested. A summary of the results of testing this hypothesis shows that the magnitude of the difference between the mean scores of the two groups was very significant. This sort of experimental-control group comparisons, according to Crawley and Koballa (1994), documents the impact of changed beliefs on the direct measures of attitude.

The PCM has by virtue of these results proved to be an effective strategy in changing students' attitude towards science enrolment in the secondary schools. It has done this by identifying beliefs/attitudes which were mildly positive, reversing the negative ones and causing the individuals to develop new positive beliefs/attitudes toward science enrolment. These dimensions are in consonance with Johnson and Matross' (1975) concept of attitude change. According to them, attitude change may involve reversal of opinion/attitude, intensification of earlier attitudes or acquisition of new ones.

The results of the study did not reveal pretest-treatment interaction in the experiment. The implication is that, there is confidence in generalizing treatment differences by attributing the change to the effect of the independent variable (PCM message) alone in the experiment.

Since attitude subsumes behaviour (Triandis, 1971), the paucity of girls in science is linked to their negative attitude towards science. According to Baker (1983) and Weinburgh (1995), because boys have a more positive attitude towards science, they choose science more often and achieve better in it than girls. Thus, Schibeci (1984) reiterates that gender is a persistent influence on students' attitude towards science. This study assessed the extent to which the Persuasive Communication Model would be effective in changing students' attitude towards science enrolment based on their gender types. It was found that the PCM was an effective strategy for persuading both boys and girls to change their attitude towards science enrolment, to the same extent

A summary of the results of F-ANOVA showed that there was no significant interaction effect between any of the study variables and the treatment variable (PCM message). This shows that school location, school type, school ownership and gender, did not interact with or contribute to, the treatment variable (PCM message) in bringing about mean differences in the posttest scores between experimental and control groups in these backgrounds.

The implication of these findings is that the Persuasive Communication Model could be used to persuade students to change their attitude towards science enrolment.

**RECOMMENDATIONS**

This study found that students in this population harboured specific modal salient beliefs which formed the basis for their attitude towards enrolment in science. Some of them represent invalid knowledge about science; others are quite true about the subject.

On this basis, it is recommended that scientist should rise to the challenge of defending the image of science in society. This they can do in the private or public fora through seminars, symposia, workshops or in the mass media. Scientists in private sector should support this move too, especially in the secondary schools by holding public lectures on the benefits of science to society. These will likely dispel negative beliefs which keep students away from studying science. This will afford them the opportunity to lay a foundation for positive attitude development among the young ones in the schools. If the students have such opportunities, it is likely that other people will not influence them to shy away from the study of science.

PCM is recommended for use by teachers, as a strategy for winning more students for the sciences at the secondary school level. It can be adapted for the same purpose at other levels. This will entail that the message content (in particular) and the other components of the model be designed appropriately. Persuasive appeals should be based on specific beliefs which underlie the attitude towards the behaviour of interest. Assessment of the effectiveness of the strategy should not stop at the cognitive and affective components of attitude, but should extend to the action component as well. The reason is that, it is possible for people to strongly agree to change their attitude/behaviour and yet not keep faith with their promise when it is time to act. Therefore, in the application of the PCM, an ex-post facto assessment approach is required to judge the extent to which it addresses the required change.

The PCM is further recommended to the science teacher for use in understanding other specific behaviours of students towards science in the school. For instance, students who under achieve in science examinations could be helped to get out of this problem. They may be plagued by some unfavourable attitude towards science which make them less committed to studying the subject to pass. Beneath those attitudes are beliefs which when isolated and confronted, can be changed using the PCM. The change in beliefs will lead to change in attitude and hence in achievement.

The model could be used by the guidance counselor to guide a client towards a chosen career. Quite often, students' choices of careers are based on their beliefs about such careers. They tend to detest some careers which they don't like on account of their beliefs. If the counselor isolates the beliefs, he can use the PCM to change them and get his counselee to conform appropriately.

PCM is recommended for use by curriculum planners and education policy makers. It can be incorporated into the school curriculum backed up by policy whereby, school managers could set up a "beliefs bank". In this case students' (pupils') beliefs could be obtained regarding various school subjects. These could be edited by experts who will be required to design persuasive messages to address the beliefs. Teachers will then be required to administer these messages in the respective subject areas. Some of the messages could be built into course modules for students to learn. The steps for developing, validating, applying and assessing the relevant instruments have been provided in this study and could be adopted for use.

**CONCLUSION**

The purpose of this study was to assess the effectiveness of the Persuasive Communication Model (PCM) in changing students' attitude towards science enrolment in Benue State secondary schools in Nigeria. The study found that students in this population harboured 35 beliefs towards science which were actually capable of determining their attitude towards enrolment in science. JS 3 students who were exposed to the PCM message changed their attitude towards science enrolment and hence, enrolled significantly more in science class in SS I than their counterparts who were not exposed to the message.

The PCM was, therefore, recommended as a tool for increasing students' participation in the sciences if teachers, guidance counselors and curriculum planners apply it in the school system.

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