Expressive Teaching Behaviour: Bridging The Gender Gulf In Secondary School Chemistry Achievement

Francis A. Adesoji
Department of Teacher Education
University of Ibadan,
Ibadan, Nigeria

&

A. G. Babatunde
Department of Chemistry
Osun State College of Education
Ila Orangun, Nigeria

ABSTRACT

This study investigated how the gap created by gender in students’ chemistry achievement (as evidenced from various researches) could be bridged. The researcher tested the use of expressive teaching behaviour on the achievement of male and female students in chemistry. A total of 178 SSI chemistry students (82 males and 96 females) in four mixed schools in Oyo state were involved in this study, which employed the quasi-experimental pre-test post-test control group experimental design. t – test analysis of the scores of male and female students that were taught with expressive teaching behaviour were not significantly different (t = 0.40; df = 176; P>0.05). Based on this, therefore, the researcher recommended the use of expressive teaching behaviour for the teaching of chemistry concepts and principles to students. This paper claims, would enhance the chemistry achievement of female students as well as their male counterparts.

Introduction

The influence of gender on students’ achievement in Science has for a long time been a concern to many researchers and science educators. Many of them sought to determine whether it is true that there is male superiority in science achievement or not. The results obtained are varied. For instance, Shaibu and Marri (1997) explained that female subjects were significantly better than their male counterparts and that there was significant difference between male and female subjects in their ability to solve quantitative problems. Similarly, Ahiakwo (1988) concluded that there was sex difference in performance with chemistry process skill test. In this study he concluded that girls performed better than boys and that the difference between their mean scores was significant beyond P< 0.001. Contrary to these findings, Inyang and Jegede (1991) reported that gender had no effect on students’ achievement in science. Similarly, Shaw and Doan (1990) asserted that emerging data on differential gender performance in science indicated that elementary students did not exhibit any gender difference in achievement and attitude towards science. Balogun (1994) similarly stated that the difference between the mean scores in chemistry test for boys and girls was not significant.
In his own findings, Trigwell (1990) argued that male subjects were superior over their female counterparts in problem-solving and achievement in chemistry. He further argued that the superiority of male is evident in the fact that the number of women in science departments in most tertiary institutions was considerably less than the number of men. Bazler and Simonis (1991) similarly noted that women represented only 20.5% of the natural science and 5.8% of the engineering work force in U.S.A. In the same vein, Whitely (1996) discovered that 53 out of 65 academic staff in the faculty of Natural Sciences were males in the University of West Indies in 1991. Other researches that supported male superiority in science achievement include Aremu (1999), Casserly (1983), Idowu (1990) Marshall and Smith (1987), Osafehinti (1984) and Skypek (1980).

All these researches show that various views and reports abound on the issue of gender in science achievement. However, the main concern of chemistry educators should be what is to be done to eliminate the gender gulf in chemistry and generally, achievement in Science. To tackle this issue successfully, it is necessary to identify the causes of such differences; it is then that suggestions could be offered on how to bridge this gap. According to Fennema and Sherman (1977), sex differences in performance are related to sex-related differences in attitude, which is in turn, dependent on a person's nature or disposition. Wood (1977) supported this idea by claiming that an individual who has a conformist attitude (which is usually the case with females) might find it difficult to deviate from laid down rules and procedures. On the other hand, boys display independence, aggression and activity. They do challenge traditional rules and procedures and also do things in unique ways. They are therefore more creative and develop into better achievers in science courses than their female counterparts.

For the gender gap to be bridged from this perspective, it is imperative to create a conducive atmosphere characterized by freedom of speech and expression. This is a feasible solution because it allows classroom interaction and participation irrespective of gender. It also allows the child to develop a positive self-concept irrespective of gender. This will enable the females as well to break out of the traditional stereotypes. Another cause of the gender gulf in Science, Technology and Mathematics (STM) as proffered by Orton (1987), has to do with societal attitude and expectations. Balogun (1994) described this as the “Bicultural model”. According to this model, the gender problem derives from traditional stereotypes for roles and expectations, which is in turn, translated into sex stereotyping in science. According to Aremu (1999), the culturally defined roles given to females (i.e., mothers, cooks, helpers, etc) which is generally not challenging could be reasons for females not being motivated to learn STM and thus not achieving as the males. With regard to this perspective, Aremu (1999) suggested that a way out included carefully mounting consistent awareness programmes to make the society realise that females could do much more than being mothers and cooks.

The third cause of the gender gulf, which is by far, the most meaningful to any science educator was identified by Skypek (1980) and Casserly (1983). They opined that it is teachers that cause the difference. Marshall and Smith (1987) supported this idea by claiming that the traditional instructional method employed by most teachers is the major reason for males’ superiority over their female counterparts. The implication of this, according to Low and Over (1993) is that educators should modify existing educational practices so that neither group is disadvantaged. Hence, there are some strategies which, if employed in chemistry classroom, could help females perform as good as their male counterparts. Such strategies include the use of expressive teaching behaviour to disseminate information during classroom instructions.
Smith (1985) defined teacher-expressiveness as ability of the teacher to communicate to students through the use of appropriate words, gestures and looks. Babalola (2000) described teacher-expressiveness in terms of four observable behaviours, which include physical movements, voice inflection, eye contact and humour. Smith (1995) opined that teacher-expressiveness brings about positive classroom interaction, which invariably arouses students’ interest and motivation to learn even difficult topics, irrespective of gender. Antell (1991) noted that the use of the eye or appropriate eye contact stimulates and alerts the students. Smith (1995) discovered that gazing at the students promotes their attentiveness and involvement and positive regard for the teacher. In view of the foregoing discussion, it is necessary to find out whether the use of expressive teaching behaviour could bridge the gender gulf in chemistry achievement.

Statement of The Problem

This study therefore sought to find out if the use of expressive teaching behaviour could yield positive effect on chemistry achievement of both male and female students. It also investigates if there would be any difference in the achievement of male and female students in chemistry after being taught with expressive and conventional teaching behaviours.

Hypotheses

H₀₁: There is no significant difference in the chemistry achievement of students taught with expressive and conventional teaching methods.

H₀₂: There is no significant difference in the chemistry achievement of male and female students taught with the conventional teaching methods.

H₀₃: There is no significant difference in the chemistry achievement of male and female students taught with expressive teaching methods.

Research Design

The research design employed in this study is the quasi-experimental pre-test, post-test control group experimental design. There were two groups involved (the experimental and control groups). The experimental group was taught with expressive teaching behaviour and the other control group with the conventional teaching behaviour. The two groups were intact groups comprising of both males and females. The design is diagrammatically represented below:

\[ O_1 \quad X_1 \quad O_2 \quad \ldots \quad O_3 \quad X_2 \quad O_4 \quad \ldots \]

Where

- \( O_1 \) and \( O_3 \) represent pretests
- \( O_2 \) and \( O_4 \) represent post tests
- \( X_1 \) represents expressive teaching behaviour
- \( X_2 \) represents conventional teaching behaviour
Selection of Chemical Concept For The Study

Since chemistry is a broad subject area, the researcher chose just one area, which is the mole concept. This was based on the fact that several studies have recognized the concept as one that poses difficulties to students (Gabel and Sherwood, 1983; Gorin, 1994; Huddle and Pillay, 1996; Kolb, 1978; Rowell and Dawnson, 1980).

Population and Sampling Procedure

The target population for this study was all SSI students in Ibadan, capital city of Oyo state, Nigeria. A total of ten schools were selected for this study. They were ensured to be mixed, have at least a chemistry teacher and must be a school whose chemistry teacher had been observed while teaching chemistry by the researcher and considered to be trainable to be an expressive teacher or can be used as a teacher of conventional teaching method. Six of them tended towards expressive teaching behaviour while four tended towards conventional teaching behaviour. Simple random sampling was used to select two out of the six schools whose teachers were considered trainable to be expressive teachers and these constituted the experimental schools. Using the same procedure, two of the remaining four schools were selected to represent schools with teachers of conventional teaching behaviour. These were the control schools. In each of the four schools selected, an arm of SS 1 chemistry class was picked to participate in the study. In all, a total of 173 SS 1 chemistry students comprising 80 males and 93 females took part in the study. 91 students (40 males and 51 females) were in the experimental group while 82 (40 males and 42 females) were in the control group.

Instrumentation

Two research instruments were used in this study. They were:
(i) Teacher – Expressiveness Observational Schedule (TEXOS), and
(ii) Chemistry Achievement Test (CAT)

TEXOS was an observational schedule developed by Perry, Abrami and Levanthan (1979) to:
(a) Determine who among chemistry teachers could be used as teachers of expressive or conventional teaching behaviour, and
(b) Monitor teachers during the research in their classes to ensure that they do not deviate from the stipulation of the experiment.

TEXOS consisted of categories of verbal and non-verbal components of teaching behaviours. It has inter-observer reliability, giving Scott-pie values ranging from 0.82 to 0.95

CAT was a test of students’ cognitive achievement in chemistry with test items measuring knowledge, comprehension and application of the topic of discussion. It consisted of fifty (50) multiple-choice questions. Each item in CAT was given to specialists in chemistry and science education of University of Ibadan for face and content validity. Adjustments were made based on their suggestions. CAT gave a test – retest reliability of 0.71.
Research Procedure

CAT was administered to pupils as a pre-test on the first day of the study. Subsequently students in the experimental group were taught the mole concept through the use of expressive teaching behaviour; while those in the control group were also taught but with the conventional lecture method. The researcher made sure that the teachers followed the guides provided by touring the schools. Teaching took place two times a week for six weeks, after which post – tests were given. The pupils indicated their sex (whether male or female) on their answer sheets. Since there were only two groups involved, t-test was used to compare the scores.

Results

To test for Ho₁, the post – test mean scores of the experimental and control groups were compared as shown in table 1

Table 1: t- test comparison of scores of subjects in the experimental and control groups.

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>X</th>
<th>S.D</th>
<th>T cal</th>
<th>T tab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental</td>
<td>91</td>
<td>33.3</td>
<td>2.39</td>
<td>6.35*</td>
<td>1.96</td>
</tr>
<tr>
<td>Control</td>
<td>82</td>
<td>29.8</td>
<td>4.44</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant at p <0.05

From table 1, it could be seen that treatment had contributed significantly to the variation in subjects’ achievement scores. Therefore, Ho₁ was rejected.

To test for Ho₂, the post- test mean scores of male and female chemistry students taught with the conventional teaching behaviour were compared as shown in table 2 below.

Table 2: t-test comparison of achievement scores of male and female chemistry students exposed to the conventional teaching behaviour (the control group).

<table>
<thead>
<tr>
<th>Group</th>
<th>Gender</th>
<th>N</th>
<th>X</th>
<th>SD</th>
<th>T cal</th>
<th>T tab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>Male</td>
<td>40</td>
<td>28.1</td>
<td>3.88</td>
<td>6.94*</td>
<td>1.96</td>
</tr>
<tr>
<td>Group</td>
<td>Female</td>
<td>42</td>
<td>21.3</td>
<td>4.96</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant at p<0.05

Table 2 shows that there was significant difference in the achievement scores of male and female students exposed to the conventional teaching behaviour. Therefore, Ho₂ was rejected.

To test for Ho₃, the post-test mean scores of male and female chemistry students in the experimental group were compared as shown in table 3 below.

Table 3: t – test comparison of achievement scores of male and female students exposed to expressive teaching behaviour (the experimental group).

<table>
<thead>
<tr>
<th>Group</th>
<th>Gender</th>
<th>N</th>
<th>X</th>
<th>SD</th>
<th>T cal</th>
<th>T tab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental</td>
<td>Male</td>
<td>40</td>
<td>38.21</td>
<td>2.35</td>
<td>0.40 NS</td>
<td>1.98</td>
</tr>
<tr>
<td>Group</td>
<td>Female</td>
<td>51</td>
<td>37.99</td>
<td>2.82</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Not significant at p > 0.05
Table 3 shows that there was no significant difference in the achievement scores of male and female students exposed to expressive teaching behaviour. Therefore, Ho3 was not rejected.

Discussions

The results obtained in this study showed that students exposed to expressive teaching behaviour performed significantly better than their counterparts exposed to conventional teaching behaviour (t = 6.35; p < 0.05). Therefore, it could be said that students’ chemistry achievement depends on the extent to which the teachers make use of expressive teaching behaviour. This could be due to the fact that the use of expressive teaching behaviour fosters conducive classroom environment and positive classroom interaction and participation (Babalola, 2000; Smith, 1995). The results also showed that the post-test mean scores of male and female chemistry students exposed to the conventional teaching behaviour were significantly different. This shows that the conventional teaching behaviour is gender biased and is therefore, not suitable for teaching chemistry concepts and principles.

A further comparison of the post-test mean scores showed that there was no significant difference in the chemistry achievement of male and female students exposed to expressive teaching behaviour (t = 0.05; p < 0.05). This implies that the use of expressive teaching behaviour is an effective means of bridging the gender gulf in chemistry achievement. The result of this study confirms the claim of Casserly (1983) and Skipper (1980) that it is the teachers that cause the gender gulf in science achievement due to their failure to use expressive teaching behaviour. It also supports Perry, Abrami and Levathan (1979) who said that students can be “academically seduced” to achieve better through the use of expressive teaching behaviour.

Conclusion and Recommendation

This paper has presented and discussed the results of a study carried out to proffer a solution to the observed differences in the chemistry achievement of male and female students. With the use of expressive teaching behaviour, the performance of female students was not significantly different from that of the male students. Therefore, the use of expressive teaching behaviour by teachers is recommended for teaching chemistry, particularly at the Senior Secondary level. In order to communicate to students effectively and arouse their interest, a chemistry teacher should develop expressive teaching behaviour by maintaining eye contact with the students, speak loudly enough and create opportunity for relaxation by smiling or cracking jokes periodically, but not monotonously. There is also the need for the Ministries of Education and organized bodies, e.g. the Science Teachers Association (STAN) to organize training workshops and seminars for chemistry teachers on the appropriate use of expressive teaching behaviour during classroom teaching. In addition, institutions running Teacher Education programmes should train their products to develop expressive teaching behaviour.

REFERENCES


