The effects of wait time strategy on senior secondary school students' academic achievement in, and attitude towards chemistry

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Abstract This study sought to investigate the effects of wait time strategy on the senior secondary school students' academic achievement in, and attitude towards Chemistry. Two instruments were used to collect the data in the study. These were Chemistry Achievement Test (CAT) and Students' Attitude Towards Chemistry Scale (SATCS). The data were analysed using mean scores, standard deviation and t-test at 0.05 level of significance. The sample consisted of 45 students in SS 1 intact class of a senior secondary school in Ekiti State, Nigeria. It was found that the students exposed to extended wait time had a higher post mean scores than their counterparts in the control group. Also, the attitudes of students exposed to extended wait time was more favourably disposed towards Chemistry than their counterparts in the control group after the treatment. It is therefore recommended that Chemistry teachers should be enjoined to use extended wait time strategy in teaching their students.

Keywords Wait time strategy, attitude, achievement, students, teachers

Introduction

Many attempts have been made by researchers to enhance the learning outcomes of the learners. These include carrying out different researches on the teaching strategies which can enhance the academic performance and improve on the skills of the students. Among these is working on the length of time appropriate for a teacher to pause for his students to respond to questions posed during questions and discussion sessions in the classroom. This period of pausing is called wait-time.

Wait-time is a period during which the students process information cognitively with a bid to responding to questions posed by their teachers. The learners need sometime to reflect on what the teachers put across to them. If the teachers would influence students' learning outcomes, opportunities must be provided for the learners to process cognitively the information contained in the lesson.

According to Stahl (1994), a learner must have uninterrupted periods of time to process the information, reflect on what has been said and consider what their personal response will be. Wait-time is therefore referred to as a distinct period of uninterrupted silence by the teacher and all students so that they both can complete appropriate information processing tasks, feelings, oral responses and actions [1]. Also, Fakunle (1995) viewed wait-time as an instructional strategy which allows students time to reflect, to formulate positive answer and respond appropriately [2].

It is in view of these that this study sought to investigate the effect of wait-time on senior secondary school students' academic achievement in and attitude towards Chemistry.

Statement of the Problem

The advent of technology in Nigeria requires increase in the level of skills of our young learners. This can be brought about by finding ways of allowing them to think deeply on what has been put across to them. Many teachers and students are not opportuned to have much time to process on tasks information during lessons

thereby leading to less achievement and poor attitude towards learning Chemistry. Hence, there is need for improving on the lesson received by the learners and taught by the teachers.

Research Questions

1. Is there a significant difference between the experimental and control groups in students' academic achievement in Chemistry?
2. Is there a significant difference between the experimental and control groups in students' attitude towards Chemistry?

Research Hypotheses

Ho$_1$: There is no significant difference between the experimental and control groups in the student's academic achievement in Chemistry

Ho$_2$: There is no significant difference between the experimental and control groups in the student's attitude towards Chemistry?

Review of Related Literature

A few literature was reviewed. In this study in a study carried out by Tobin (1987), he suggested that increasing teacher's wait-time during a lesson leads to longer students responses and less failure to respond [3]. Also, Andrus and Gooding (1983) in the result of a study, found that students' questions increased in number and that a greater proportion of their questions tended to be at a higher level of complexity than was the case for teachers in the class where extended wait-time was not used [4]. Furthermore, Hanna (1977) in the study of the impact of extended wait-time an quality of primary school pupils' responses to stories, rated the quality of pupils' responses higher under the extended wait-time treatment than under the control format of one second [5].

Not only these, Fowler (1975) also conducted a research on wait time and however, found no significant difference in the attitude of pupils after the treatment [6]. Similarly, in her study on the effect of wait-time on gender equity, academic achievement and attitude towards a course, Fakunle (1995) found no significant difference in the academic achievement and attitude towards Integrated Science between the experimental groups and the control group [2]. Also, in the study on wait-time, Mausfield (1996) found no significant difference in the academic achievement and attitude of students towards business studies between the experimental group and the control group [7]. Carrying out his study on wait-time strategy, Honea (1980) found no significant difference in the attitude of students towards some selected topics in social studies when extended teacher wait time was utilized. He, however, found that students asked more questions, interacted more with peers and demonstrated greater confidence when extended wait time was used [8].

In view of these contradictory results on various researches carried out on wait time, the researcher sought to investigate the effect of wait-time strategy on the senior secondary school students' academic achievement in, and attitude towards Chemistry.

Methodology

This study adopted quasi-experimental pre-test, post-test design. The population consisted of 45 students in SS 1 intact class of St. Augustine Comprehensive High School, Oye Ekiti, Ekiti State. They were made up of 20 boys and 25 girls. The experimental group consisted of 10 boys and 13 girls while the control group consisted of 10 boys and 12 girls. The experimental group was exposed to extended wait-time (10 seconds or more) during question and discussion or session. When the teacher posed a question, he would wait for about 10 seconds before rephrasing or directing the question to another student. However, the control group was exposed to the conventional method of instruction (short wait time of less than (one second). Here the teacher waited for about 1 second for students to respond. Two instruments were used. These were Chemistry Achievement Test (CAT) and Students Attitude Towards Chemistry (SATC). The CAT and SATC were administered to both experimental and control groups as pre-test. The experimental group was exposed to treatment (extended wait-time) which lasted six weeks. The treatment was administered by Chemistry teacher who had earlier been trained by the researcher on the use of extended wait-time. The control group was been taught by another

Chemistry teacher using the conventional method of short-wait time. The groups were exposed to the same topics in senior secondary Chemistry syllabus during the period.

The two groups were made to go through CAT and SATC after the period of six weeks.

Results

Ho$_1$: There is no significant difference between the experimental and control groups in the students' academic achievement in Chemistry.

Table 1: t-test summary of students post-test scores in groups

Group	N	$\overline{X}$	SD	tcal	ttab
Experimental	23	55.14	8.84		
				3.20	2.04
Conventional	22	45.98	10.25		

Table 1 shows that t-calculated value (3.20) is higher than t table value. Hence, the hypothesis is rejected. Therefore, there is significant difference in the achievement scores between the experimental and control groups.

Ho$_2$: There is no significant difference between the experimental and control group in their attitude towards Chemistry.

Table 2: t-test summary on students' post-test scores on attitude

Group	N	$\overline{X}$	SD	tcal	ttab
Experimental	23	45.20	7.25		
				2.55	2.04
Conventional	22	35.70	7.96		

Table 2 shows that t calculated is higher than t table value. Hence, the null hypothesis is rejected. This means that there is significant difference in the attitude of students towards Chemistry at the end of the treatment.

Discussion

The t-test result of the hypothesis 1 shows that there is significant difference in the achievement of students after the treatment. The students exposed to long wait-time performed better than their counterparts exposed to short wait time in the post test-scores using Chemistry Achievement Test (CAT).

This implies that if students were given the opportunity to process information cognitively before responding to questions posed to them, they are likely to give positive answers to the questions. Hence, the students in the experimental group performed better than their counterparts in the conventional group being taught using short wait-time. This corroborates the findings of Andrus and Gooding (1983) which revealed that experimental group showed a greater gain in academic achievement than did the control group.

The gains achieved by students in a subject or course could change his attitude positively to the subject being taught. This is likely to be the reason why the t-test of hypothesis 2 reveals a significant difference in the attitude of the students in the experimental and control groups. The attitudes of the students in the experimental groups towards Chemistry are more enhanced than those of their counterparts in the control group. This is shown in post-test scores of SATC.

Conclusion

The result of the study shows that there is significant difference between the experimental and control groups in the academic achievement in Chemistry. The result also revealed that there is significant difference in the attitudes of the students after treatment. The students exposed to extended wait-time showed positive attitude towards Chemistry than their counterparts exposed to short-wait time (control group).

In view of the above, there are some positive outcomes on the part of the students exposed to long wait-time.

- The length of time and correctness of their responses increase;
- The number of volunteered, appropriate answers by larger numbers of students greatly increases;
- The scores of students on academic achievement tests tend to increase;
- The number of "I don't know" and no answer responses of students decreases [1].

Recommendations

It is recommended that teachers should be encouraged to wait in silence for about 10 seconds after their questions and after students responses before directing their questions to other students.

The pre-service teachers should be taught how to use extended wait time strategy to teach their students when they get to the field as this will enhance their efficiency and effectiveness in the classroom.

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