Webology (ISSN: 1735-188X)
Volume 19, Number 3, 2022

# Effects Of Video And Audio-Taped Instructions On Senior Secondary Students' Achievement In Chemistry In Lokoja Metropolis

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**Abstract**

The research focused on how video and audio-taped instructions affected senior secondary pupils' chemistry grades in Lokoja. Two research questions and two hypotheses guided the investigation. With a non-equivalent pre-test and post-test control group, the study was quasi-experimental in character. The study included a multiple-stage sample of 270 SS1 students, with 125 males and 145 females. The researcher-made chemistry achievement test (CAT, r = 0.81) was utilized to collect data. The mean, standard deviation, and analysis of covariance were used to analyze the data (ANCOVA). The study found that video-taped education was the most effective at improving students' chemistry scores. The expository method was determined to be the least effective of the three educational modes, followed by audio–recording instruction. The findings also revealed that male and female chemistry students who were exposed to video-taped, audio-taped, and expository instructional methodologies performed equally well on the chemical accomplishment test. Based on the findings, it was suggested that schools, particularly chemistry teachers, adopt the use of videotaped instruction in chemistry teaching.

**Keywords:** Videotaped Instruction, Audio–taped Instruction, Expository Instructional Strategy, Students' achievement and chemistry.

## Introduction

Chemistry is a pre-requisite science subject for many sciences and technologically based professional courses, such as medicine, pharmacy, engineering, agriculture, and architecture. Despite its importance, Nigerian students have performed poorly in chemistry at the senior secondary school level (Ezekannagha 2008; Aniodoh & Egbo 2013).

Several variables contribute to students' poor performance in chemistry, but one of the most commonly stated issues is the employment of ineffective teaching methods (Ifeakor 2006; Njelita 2005; Achimugu 2013, Udu 2017). In reality, chemistry education researchers found that the classic lecture technique, commonly known as "Chalk and talk," is the most popular mode of instruction in senior secondary school chemistry (Aniodoh & Egbo, 2013). The "chalk and talk" method is mostly teacher-centered, resulting in low student participation in classroom interactions. Chemistry professors must implement creative teaching tactics that are student-centered and allow pupils to actively participate. Achimugu (2013) agrees that students or activity-centered learning incorporating hands-on and mind-on activities can enhance chemistry knowledge acquisition. This will make chemistry more interesting to teach and learn, and will, as a result, improve students' chemistry achievement. The use of instructional media such as video-taped or audio-taped instruction is one of these interactive approaches to teaching chemistry. Audio, visual, and audio-visual aids are the three types of instructional media. According to Adelabe (2000), audio aids are instructional media that only appeal to the sense of hearing (e.g. radios, tape recorders, audio compact discs, etc. ); visual aids are instructional media that only appeal to the sense of sight (e.g. charts, pictures, models, etc. ); audio-visual aids are instructional media that appeal to both the senses of hearing and sight (e.g. charts, pictures, models, etc. ); audio-visual aids are instructional (e.g. videos, televisions, laptops, etc).

The utilization of video and audio-visual instructions is the subject of this research. Video-taped instruction is the use of a videotape to offer information, ideas, and experiences in any subject area, whereas audio-taped instruction is the use of an audio cassette to deliver instruction in any subject area (Uche & Ugwu, 2007). The usage of instructional media has a high potential for strengthening the teacher-student communication channel and, as a result, improving students' learning ability. According to Agommuoh and Nzewi (2003), using vvideotaped instruction increases the likelihood that students would learn more, retain more information, and achieve better results. The benefits of using instructional media for instruction have been established in the literature, and include arousing students' interest, providing fun and entertainment; supplementing the teacher's traditional efforts; it can be viewed many times, as a great study aid, can be duplicated and used by students at their convenience, and so on (Adams 1990; Barford and Weston 1997; Chambers 1997; Adedapo, Salawu and Afolabi 2001; Ugwu and Nzewi 2015).

Many studies on the influence of instructional media on student achievement have been conducted by education researchers. According to research by Adedapo, et al., and Afolabi (2001) on the impact of video-recorded and audio-taped instructions on cognitive outcome in economic performance, the videotaped strategy was most effective, followed by the audiotaped strategy, and the conventional strategy was least effective.

A research by Agommouh and Nzewi (2003) on the effects of video-taped instruction on secondary school students' physics achievement found that students' physics achievement is considerably improved when video-taped instruction is used. Osokoya (2007) investigated the effects of video-taped instruction on secondary school students' achievement in history, finding that students who received video-taped instruction outperformed those who received traditional instruction. In his own study on the effects of videotaped and slide-taped instructions on students' performance in Junior Secondary school social studies, Mudasiru (2006) discovered that students taught using videotaped and slide-taped instructions performed significantly better than students taught using traditional classroom instruction. Uche and Ugwu (2007) investigated the impact of video and audiotaped instructions on students' accomplishments in biology, finding that those taught with videotape did better than those taught with audiotape. Lassisi and Daniel (2009) evaluated the impact of video-taped instructional packages on students' level of practical skill acquisition in physics and found that using video in teaching and learning is just as successful as using traditional teaching techniques. According to a study by Shedrack and Robert, students who taught practical physics using videotaped education fared substantially better than those taught using the traditional method (2016). In terms of student achievement, the majority of the literature reviewed indicates that film education outperforms all other forms of instructional media, including traditional lectures. However, there was an opposing viewpoint, rendering the research on the use of instructional media ambiguous. Aside from that, there is a scarcity of chemistry research in this field. As a result, research on the effects of video and audiotaped teachings on senior secondary school students' chemistry achievement is required.

One issue that is related to the use of instructional media in teaching and learning is the impact of gender on students' progress in science disciplines (Chemistry inclusive). It's worth noting that the problem has elicited a wide range of responses and findings, with no clear winner. Gender had no substantial impact on students' achievement in science subjects when instructional media was employed, according to studies by Agommuoh and Nzewi (2003), Adebayo (2008), Yusuf and Afolabi (2010), and Ugwuanyi, Ikeh, Orji, and Gana. Other science educators, on the other hand, had opposing viewpoints. For example, Ugwu and Nzewi (2014) discovered that when taught with videotaped instruction, male students outperformed female students, while Uche and Ugwu (2007) discovered that male students taught with videotaped instruction outperformed female students, and female students outperformed male students when taught with audio-taped instruction. Because of the contradictory findings, the researcher decided to include gender as one of the variables in this study.

**Purpose of the study**

However, this study investigated the effects of video and audio-taped instructions on senior secondary school students' achievement in chemistry. Specifically, the study sought to find out:

(1) The effects of recorded, audiotaped, and expository instructional methodologies on the achievement of chemistry students.

(2) When filmed, audiotaped, and expository instructional modes are used, the influence of gender on students' mean chemistry achievement scores.

**Research Questions**

The following research questions were formulated to guide the study.

(1) What are the mean achievement scores and standard deviations for students who received the video and audiotaped instructions vs. expository instruction?
(2) What are the average achievement scores and standard deviations for male and female chemistry students who were taught using recorded, audiotaped, and expository instructional methods?

**Hypotheses**

Two hypotheses were formulated and tested at a 0.05 alpha level of significance.

**$Ho_1$:** The mean achievement scores of students taught chemistry using recorded education, audiotaped instruction, and an explanatory instructional style are not significantly different.

**Ho2**: The mean achievement scores of male and female students taught chemistry utilizing videotaped, audio-taped, and expository instructional modalities are not significantly different.

**Methods**

The study used a quasi-experimental approach, with a pre-test, post-test, non-equivalent, control group design. Because the treatment and control groups were not randomly assigned to three intact classes, it is a quasi-experimental design. This design has been adopted by Adene et al (2021), Ejimonye, Onuoha et al. (2020) Ejimonye et al. (2020), Njoku et al. (2020), Offordile et al (2021), Adonu et al. (2021), Odo et al. (2021). The study's entire classrooms were used to avoid disrupting regular classes at the school. The study's target group was all chemistry students in senior secondary one (SS 1) at a co-educational public senior secondary school in Lokoja Metropolis. The population consisted of 1,600 SS 1 chemistry students. The study included a total of 270 SS 1 students, with 125 males and 145 females participating. The participants were chosen using a multi-stage sampling method. Purposive sampling was utilized in the first stage to identify schools with appropriate facilities and well-trained and experienced chemistry instructors. In the second stage, a simple random selection methodology was employed to pick six senior secondary schools by balloting from among the 13 senior secondary schools that satisfied the above requirements. In the third step, a simple random selection technique was used to assign two intact classrooms in each school to experimental group 1, which received videotaped education; experimental group 2, which received audio-taped instruction; and the control group, which received no training (those taught with the expository instructional strategy). The chemistry Achievement Test was the instrument used to collect data (CAT). The researchers created the CAT, which was then tested by

two chemical education professors and two academics from educational measurement and evaluation. The instrument's final production was led by their recommendations and corrections. The CAT included of 50 multiple choice items with four possibilities, each with just one correct answer worth two points, for a total of 100 points available. After determining the difficulty and discriminating index of the items, the instrument's original 75 items were reduced to 50. The students were given the 50 items with an average difficulty and discrimination indices of 0.65 and 0.55, respectively. A total of 60 students who were not part of the main study were employed for CAT trial testing. The internal consistency of CAT was determined using the Kuder– Richardson (KR 20) method, which provided a reliability index of 0.81.

Six research assistants, all of whom were chemistry instructors at the six schools chosen, received training. The training took place over the course of a week. Teachers in experimental group 1 were given a videotaped instruction package and received specific training on how to create and use video-taped instructional strategies, whereas teachers in experimental group 2 were given audio-taped instruction and received specific training on how to create and use audio-tape in teaching chemistry. Finally, the teachers in the control group were taught using the expository strategy with prepared lesson notes, which is a typical teaching method. A pre-test was given to each of the three groups before the experiment began. The classes lasted six weeks. The pre-test was reshuffled and re-administered to all three groups as the post-test at the end of the six-week period. Data obtained were analyzed using means, standard deviation, and analysis of covariance (ANCOVA).

## Results

The results of the findings are presented in line with the research questions and hypotheses.

**Table 1:** Pre-test and post-test mean achievement scores of students taught chemistry using video-taped, audio-taped and expository instructional strategies

| | N | Pre-test | | Post-test | | Mean Gain Scores |
|---|---|---|---|---|---|---|
| | | X | SD | X | SD | |
| Videotaped Instructions | 87 | 49.62 | 5.06 | 77.16 | 5.82 | 26.46 |
| Audio-taped Instructions | 92 | 48.96 | 4.82 | 72.25 | 5.65 | 23.29 |
| Expository Instructions | 91 | 50.17 | 4.98 | 64.83 | 6.13 | 14.66 |

Table 1 reveals that students who were exposed to videotaped teaching had a mean pre-test score of 49.62, a mean post-test score of 77.16, and a mean gain of 26.46. The pre-test mean score was 48.96, the post-test mean score was 72.25, and the mean gain was 23.29 for students who received audio-taped training. Expository teaching strategy pupils, on the other hand, had a pre-test mean score of 50.17, a post-test mean score of 64.83, and a mean increase of 14.66. Students who were taught chemistry utilizing video-taped and audio-taped instructions performed better than students

who were taught chemistry using an expository instructional technique. Students who received audio-taped teaching performed better than those who did not receive audio-taped instruction.

**Table 2:** Pre-test and post-test mean and standard deviation scores of male and female students taught chemistry using video-taped, audio-taped, and expository instructional strategies

| | Gender | N | Pre-test | | Post-test | | Mean Gain |
|---|---|---|---|---|---|---|---|
| | | | X | SD | X | SD | |
| | Male | 38 | 50.34 | 4.97 | 76.45 | 5.94 | 26.11 |
| Videotaped | Female | 49 | 49.55 | 5.02 | 76.16 | 5.69 | 26.61 |
| | Male | 36 | 49.22 | 4.91 | 72.70 | 5.78 | 23.48 |
| Audio-taped | Female | 46 | 48.36 | 4.77 | 71.32 | 5.53 | 22.96 |
| | Male | 41 | 50.63 | 5.00 | 65.04 | 5.89 | 14.41 |
| Expository | Female | 50 | 50.06 | 4.82 | 64.48 | 6.21 | 14.42 |

In video-taped instruction, male students' pre-test, post-test, and mean gain are 50.34, 76.45, and 26.11, respectively, while female students' pre-test, post-test, and mean gain are 49.55, 76.16, and 26.61. In audio taped instruction, male students' pre-test, post-test, and mean gain are 49.22, 72.70, and 23.48, respectively, while female students' pre-test, post-test, and mean gain are 48.36, 71.32, and 22.96. Finally, male students' pre-test, post-test, and mean gain in expository are 50.63, 65.04, and 14.41, respectively, whereas female students' pre-test, post-test, and mean gain are 50.06, 64.48, and 14.42, respectively. This suggests that female students in the video-taped group had a larger mean gain than their male counterparts, whereas male students in the audio-taped group had a higher mean gain. In the expository group, both male and female students gained nearly the same amount of knowledge. The supporting hypothesis, on the other hand, will be evaluated to see if the observed differences are significant.

**Table 3:**Summary of Analysis of Covariance (ANCOVA) for three instructional strategies by gender

| | Sum Squares | Df | Mean Squares | F | Sig. |
|---|---|---|---|---|---|
| Corrected Model | 16844.625 | 6 | 2807.438 | 55.478 | 0.00 |
| Intercept | 17280.581 | 1 | 17280.581 | 34.158 | 0.000 |
| Pre-test | 4449.182 | 1 | 4449.182 | 82.920 | 0.000 |
| Strategy | 14081.984 | 2 | 1040.992 | 139.136 | 0.000 |
| Gender | 99.106 | 1 | 99.106 | 1.958 | 0.146 |
| Strategy * Gender | 40.215 | 2 | 20.107 | 0.397 | 0.422 |

| | | | |
|---|---|---|---|
| Error | 13359.825 | 264 | 50.625 |
| Total | 57922.000 | 270 | |
| Corrected total | 29204.449 | 269 | |

In regard to hypothesis 1, the instructional strategies have a $F(2, 264) = 139.136$, $p < 0.05$, as shown in table 1. Because the p-value of 0.000 is less than the 0.05 level of significance, the null hypothesis is rejected, suggesting a significant difference in the mean achievement scores of students taught chemistry utilizing video, audio, and expository methods. ways for teaching. Schaeffer's post hoc test would then be used to determine the direction of the difference.

The result of hypothesis two, which deals with the influence of gender, is $F(2, 264) = 1.958$; $p > 0.05$. Because the p-value of 0.146 was greater than the 0.05 level of significance, the null hypothesis was not rejected, indicating that there was no significant difference in mean achievement scores between male and female students taught chemistry using video-taped, audio-taped, and expository instructional strategies.

**Table 4:** Scheeffe Post Hoc Test for the Three Mean Achievement Gain in Chemistry

| Strategy | Sample | Means | Video-taped | Audio-taped | Expository |
|---|---|---|---|---|---|
| Video-taped | 87 | 26.46 | | | |
| Audio-taped | 92 | 23.29 | * | | |
| Expository | 91 | 14.66 | * | * | |

Pairs of group significantly different at $P<0.05$.

Table 4 demonstrates that the pairs of filmed instruction and audiotaped instruction, videotaped instruction and expository, audiotaped instruction and expository, and videotaped instruction and expository with asterisks (*) are significant at the 0.05 level. The distinction can also be explained as follows:

1. video- and audio-taped: 26.46-23.29=3.17, statistically significant
2. Expository and videotaped: 26.29-14.66=11.80, statistically significant
3. audio-recorded and informative: 23:29-14.66=6.63, statistically significant

This means that the difference between video-taped and audio-taped instructions, as well as the difference between videotaped instruction and expository teaching style, favors video-taped. Similarly, there is a considerable difference between audio-taped instruction and expository instructional techniques in favor of audio-taped instruction.

## Discussion

Students who were exposed to both video and audio-taped instructions did higher on the CAT than those who were subjected to an expository instructional technique, according to the findings of this study. However, when the academic achievement of the experimental groups was compared,

pupils who received videotaped teaching outperformed those who received audio-taped instruction. Students taught with videotaped instructional packages performed better than students taught with either slide taped or audiotaped instructional packages, according to Adedapo et al. (2007), Mudasiru (2006), and Uche & Ugwu (2007). According to Adams (1990), video-taped instruction is the most influential of all instructional media for teaching because of its power of both sight and sound. This could explain why students exposed to videotaped instruction performed better than those exposed to audio-taped and expository instructional strategies. Furthermore, according to Barford and Weston (1997), the addition of color, music, and motion to video-taped packages will pique students' interest and increase their desire to learn. As a result, pupils' achievement in any academic area will be considerably improved.

The study's findings also revealed that in the videotaped group, female students outperformed their male counterparts, while in the audio-taped group, male students outperformed female counterparts, but there was no statistically significant difference. This demonstrates that gender has no bearing on the usage of video and audio-taped instruction in chemistry classes. This finding is consistent with the findings of Agommuoh and Nzewi (2003), Adebayo (2008), and Yusuf and Afolabi (2010), who found that when instructional media is employed for instruction, gender has no significant impact on student accomplishment. The findings, however, contradict those of Uche and Ugwu (2007), who found that male students fared better with videotaped education while female students performed better with audio-taped instruction. This means that the gender-friendly usage of the two instructional mediums eliminates the need for separate instruction, which wastes teachers' efforts and time.

## Conclusion

The results of this study led the researcher to conclude that students who taught chemistry using videotaped instruction performed better than students who taught chemistry using audio-taped and expository instructional strategies and that students exposed to audio-taped instruction performed better than students exposed to expository instructional strategies. Also, when video and audio-taped instructions are used to teach chemistry, there is no substantial difference in academic achievement between male and female pupils. As a result, gender is not a significant determinant in deciding the instructional material to be used to improve students' chemistry achievement.

## Recommendations

The following recommendations were made based on the findings of this study:

(1) Video-taped instructional strategy should be used by teachers in teaching chemistry since it has been proved to enhance students' achievement in chemistry.

(2) Stakeholders in chemistry education should, on regular basis organize seminars, workshops, and conferences aimed at equipping teachers with the basic skills on how to effectively utilize videotaped instruction in a delivery lesson plan.

(3) Teachers' training institutions should incorporate instructional media strategies (such as videotaped) in their method classes so as to make the trainee teachers more competent in the use of the strategies on graduation.

**Acknowledgment**

The researchers appreciate all the study participants and also acknowledged the special role of **Dr. Ekene Nnonyem Igboegwu** as the corresponding author for this research.

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