



# Analyzing the concept of multimedia and development of instructional package for senior secondary students

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## ABSTRACT

You may describe multimedia settings as digital settings in which materials with visual, audio, or visual-audio features that appeal to consumers' aural and visual senses are presented in a combined manner. Multimedia settings can be found in a variety of settings. These kinds of environments are used in a wide variety of businesses and industries, including the film industry, advertising, tourism, business, and education. The purpose of this research is to investigate the impact that a social studies education that is complemented by a multimedia environment has on the academic performance of students. The explanatory sequential design, which is a component of the mixed approach, was used all throughout the design process of the research. The most important conclusion of the research was that teaching social studies in a multimedia environment had far more favorable impacts on student accomplishment than conventional teaching did; however, the statistical significance of these benefits was not established. There was a high degree of academic preparation among the kids, as well as a high level of noise in the classrooms, according to the qualitative data, which revealed that the cause for it is connected to the packed classroom size. When compared to conventional teaching methods, it is possible to draw the conclusion that teaching that is based on multimedia settings has much more favorable impacts on academic accomplishment. Additionally, it makes the subjects that are being studied much more intelligible and the learning environment makes learning much more enjoyable.

**Keywords:** *Multimedia learning, academic achievement, instructional package*

## INTRODUCTION

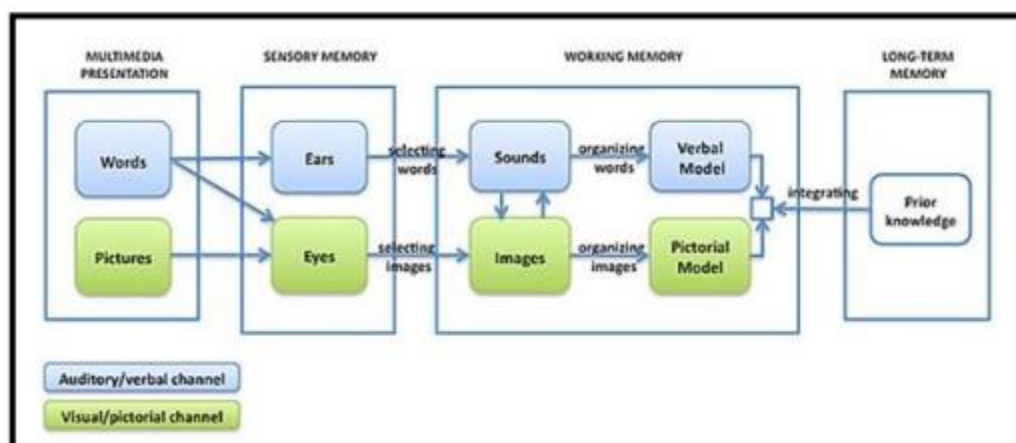
As a consequence of developments in technology, a wide variety of different pieces of apparatus that may be used in educational settings have come into existence. It is believed that technology serves the purpose of generating a variety of materials and tools with the intention of making life much simpler, elevating the standards of living, and managing the environment. According to Ersoy (2013), such instruments are regarded to be an essential component of life and undergo transformation throughout time. To a similar extent, the instruments and equipment that are used for instructional objectives undergo transformations in tandem with the progression of technology. Books, notebooks, pens and pencils, and blackboards are examples of the types of instructional materials and instruments that were used in educational settings in the past. Today, in addition to these classic teaching tools, the following ones are also used when they are available: radio, television, overhead, computers, the Internet, CDs, DVDs, interactive boards, electronic

books, and electronic journals. As has been said before, the changes that have occurred in the use of educational resources are intimately tied to the advancements in technology.

Education is a tool that may be used to influence the ways in which people think, feel, and behave within the context of various social groups. In addition to this, it is the way by which people are provided with the information and abilities necessary to contribute to the development and construction of society. The education system has the potential to make a contribution to the furtherance of a nation's scientific and technical advancements by providing a competent science education. It was pointed out by Samuel and Ukpoh (2021) that no country can afford to ignore the importance of scientific education at any level of schooling and yet have any chance of succeeding in any area of human endeavor. In continuation, Samuel and Ukpoh said that science education is a tool that may be used to generate resources that are essential for the socio-economic, scientific, and technical growth that is required for the improvement of any country. Chemistry is one of the science-related disciplines that are provided to students in secondary school in order to equip them with the information and abilities necessary for scientific research.

One method to describe multimedia settings is as digital settings in which components with visual, audio, or visual-audio qualities are presented in a combined manner. These aspects that appeal to users' aural and visual senses are referred to as multimedia settings. According to Akkoyunlu and Yılmaz (2005), it is also described as an atmosphere that is created by the integration of visual and audio components, such as videos, movies, and animations. As a result, the resources that provide the pupils with the opportunity to engage more than one sense are what constitute the multimedia environment.

Mayer (2002), the person who established the cognitive theory of learning in multimedia environments, indicated that the use of both verbal and visual pictures, as opposed to solely employing verbal images, has far greater favorable impacts on learning. According to Mayer (2009), the phrase "multimedia learning" refers to the learning that takes place as a consequence of the use of both words and pictures. The three theories that form the foundation of Mayer's hypothesis (2009) are the Dual Coding hypothesis, the Limited Capacity Theory, and the Active Memory Theory. All of the components of the cognitive theory of learning in a multimedia environment are shown in Figure 1, which may be found below.



**Figure:1 Cognitive Theory of Multimedia Learning1**

The fact that the sights and phrases that are presented in multimedia instruction are transported to sensory memory via the senses is shown in Figure 1. For example, the eyes are responsible for seeing images, and the eyes are also responsible for perceiving words when they are presented in written form. However, the ears are the ones that receive words when they are presented verbally. Short-term memory is where the words and visuals that are stored in sensory memory are transferred so that they may be processed. The information is processed and stored in the short-term memory for a brief amount of time. It is composed of two primary elements. Voices and visual images in photographs that have not been processed are included in the first category here. According to Mayer (2009), there is a connection between voices and pictures that is symbolized by arrows. This connection relates to the fact that a voice may be changed into a visual image, and that a visual image can be transformed into a voice.

Individual students have claimed that they have shown unsatisfactory, low accomplishment, and shortcomings in Chemistry paper 2 (theory) during the course of the years, as stated in the report that was compiled by Chief Examiners in Years 2016 to 2021. The reason for this is because students have a hard time answering questions that demand explanation and the plotting of a graph, particularly those that pertain to separation processes, atomic structure, chemical industry, Boyle's law, and Charles law. The employment of traditional methods in the instruction of the topic of chemistry is one of the aspects that, according to the findings of certain studies (Obikezie et al., 2020; Ibe et al., 2021) is one of the contributing elements associated with students' difficulties and weaknesses in learning Chemistry. Also, according to the findings of other studies, these deficiencies It is possible to overcome the challenge of teaching chemistry by using novel teaching techniques such as the cooperative teaching method, multimedia instructional packages, and other similar approaches (Obikezie et al., 2021). A number of different educational packages were taken into consideration for the purpose of this research.

A multimedia instructional package encourages the presentation of the lesson using sound, graphics, and visuals in order to cater to the varied educational requirements of students working in the classroom. According to Cyril (2016), the use of multimedia educational packages offers students the chance to encounter the real objects of study via sequences that are in motion. The author went on to say that a multimedia educational package has the ability to deliver knowledge in an engaging environment, which helps the brain to store information in the form of visuals that are simple to recall and readily retain. According to Ayodeji (2021), the multimedia packages consist of the following: instructional software and practice programs, such as Microsoft PowerPoint, which may be used to create lesson presentations utilizing a digital projector. According to Murali and Jaise (2016), the use of multimedia in the classroom helps instructors to target students of varying levels. This is because it enables students to see, hear, and envision what is being taught, which ultimately contributes to an increase in students' academic attainment in any topic.

### **Effect multimedia instructional package on secondary school students'**

The average levels of accomplishment shown by students who were taught Chemistry using a multimedia instructional package as opposed to students who were taught using a traditional teaching technique

1. The mean accomplishment scores of male and female students who were taught Chemistry using a multimedia instructional package in comparison to those students who were taught using a standard teaching technique

2. An investigation of the relationship between gender and the multimedia instructional package and the accomplishment scores of students in the subject of chemistry

#### **Academic achievement in Enugu state. Specifically,:**

- The purpose of this research is to investigate the impact that a sociology education that is based on multimedia environments has on the academic performance of undergraduate students. Additionally, in addition to this objective, the study endeavors to provide answers to the following research questions:
- According to the results of the pre-test, is there a statistically significant difference between the groups who participated in the experiment and those that served as controls?
- In terms of post-test results, is there a statistically significant difference between the groups who participated in the experiment and those that served as controls? Are there any differences that can be considered statistically significant between the scores of the experiment group on the pre-test and the scores on the post-test?
- To what extent does the pre-test and post-test scores of the control group vary from one another in a manner that may be considered statistically significant?
- What are the opinions of the students about the social studies course on the basis of the multimedia teaching approach?

success and ongoing education are both essential. According to the results of the research, the group that participated in the experiment and was given multimedia instruction had considerably higher scores on accomplishment and persistent learning compared to the group that was given control. In addition, almost all of the students said that they enjoyed learning via the use of multimedia. According to Altınışık (2001), Bayırtepe and Tüzün (2007), and Yarar (2010), there are additional research that have reached the conclusion that the use of multimedia in education does not have any impacts that are wanted on the success of students. There were a variety of conclusions that emerged from the study conducted on the impact of multimedia learning on the academic performance of students. With the purpose of adding to the continuing conversations about the subject, this research examined the impact of the multimedia environment on the academic performance of students. Based on the outcomes of the research, it is believed that the activities would be able to aid in raising student accomplishment..

#### **OBJECTIVE**

1. examine the effectiveness of multimedia learning in enhancing students' engagements and attitude towards Biology in secondary schools;
2. investigate the effectiveness of the multimedia packages in enhancing students' academic achievement

#### **METHODOLOGY**

A design that was considered to be quasi-experimental was used for the investigation. According to Nworgu (2015), a quasi-experimental design is an experiment in which it is not feasible to randomly assign people to either the experimental group or the control group. Using a multistage sampling approach, the sample for the research consisted of 415 students who were enrolled in the first year of Chemistry from six different school zones. In order to select two schools from the Enugu educational zone, a technique known as purposeful sampling was utilized. The selection criteria included the following: the schools must have double streams Chemistry class, the majority of the schools must have presented candidates in secondary school senior certificate for at least five years, and the schools must have qualified Chemistry teachers with at least six years of experience. A method known as simple random sampling was used in order to choose four complete classes from the six scientific courses that were offered at these two institutions. These classes were then divided into two groups: the experimental group and the control group. The treatment groups that were exposed to the multimedia instructional package of computer animation consisted of 198 students, with 95 males and 103 females. On the other hand, the control group, which was subjected to the traditional teaching approach, consisted of 217 students, with 99 males and 118 females. the research investigation. A lesson plan that had been produced by the researchers for a multimedia educational package consisting of computer animation and convention teaching approach was used by the educators who were assigned to both groups. A post-test was administered to both the experimental groups and the control group at the conclusion of the fourth week, based on the information that they had been taught. There were twenty (20) multiple-choice questions that were produced for the experiment test groups as well as the control group accomplishment exam. Marks were granted to each question that was prepared for both groups. If the student is able to provide accurate responses to all of the questions, then he or she is eligible to get twenty (20) marks, with one point being awarded for each question. In order to determine the level of accomplishment of the students in the two groups, the pre-test results were recorded. When the students were taught using a multimedia instructional package that included computer animation and the conventional teaching approach, their post-test scores were also recorded as an indication of their level of success. Analysis was performed on the data that was obtained.

## RESULTS

**Table-1: Mean Pre-test and Posttest Achievement Scores of Students taught Chemistry using MIP and those taught using CTM**

Method	N	Pretest Mean	Posttest Mean	Mean Gain	Pretest SD	Posttest SD
MIP	198	38.05	86.31	48.26	6.64	4.35
CTM	217	32.49	60.04	27.55	5.01	3.99

The data that was shown in Table-1 demonstrated that students who were taught Chemistry using a multimedia instructional package had a mean achievement score of 38.05 on the pre-test, with a standard deviation of 6.60. On the post-test, their mean achievement score was 86.31, with a standard deviation value of 4.35, and a mean gain of 48.26. The students who were taught Chemistry using the usual teaching

technique had a mean achievement score of 32.49 on the pre-test, with a standard deviation of 5.01. On the post-test, their mean achievement score was 60.04, with a standard deviation value of 3.99, and a mean gain of 27.05.

The difference in the mean achievement gain between students who were taught Chemistry using a multimedia instructional package and those who were taught using the standard teaching approach was 20.71, with the experimental group achieving a higher level of student accomplishment. According to the findings, students who were taught Chemistry via the use of a multimedia instructional package had a better accomplishment score than those who were taught this subject by traditional teaching methods.

**Table-2: Mean Pre-test and Post-test Achievement Scores of Male and Female Students taught Chemistry using Multimedia Instructional Package and that of those taught using Conventional Teaching Method**

	Gender	N	Pretest Mean	Posttest Mean	Mean Gain	Pretest SD	Posttest SD
<b>MIP</b>	Male	9	30.01	87.08	57.07	5.01	4.47
	Female	10	27.43	76.11	48.68	5.08	4.03
<b>CTM</b>	Male	9	21.05	79.67	58.62	5.76	5.15
	Female	11	19.99	71.81	51.82	5.99	5.38

According to Table 2, the students who were taught Chemistry via the use of a multimedia instructional package had a mean gain achievement score of 57.07, whereas the students who were taught Chemistry by females had a mean gain achievement score of 48.68. The difference in mean achievement increase between male and female students who were taught Chemistry utilizing a multimedia instructional package was 8.39, with male students achieving a higher mark than female students. The findings indicate that male students who were taught Chemistry with the use of a multimedia instructional package had a higher mean gain accomplishment score than their female counterparts.

The difference between male and female students who were taught Chemistry using the traditional technique was 6.8 in favor of male students. According to the findings, male students who were taught Chemistry utilizing the traditional way of instruction had a higher accomplishment mean gain score than their female counterparts. Based on the data, it was determined that male students who were taught Chemistry via the use of a multimedia instructional package and the standard teaching technique achieved a higher mean student accomplishment score than female students.

**Table-3: Mean and standard deviation of interaction effect of gender and multimedia instructional package on students' achievement in chemistry**

	Gender	N	Mean	Standard Deviation
<b>Experimental Group</b>	Male	95	39.44	3.57
	Female	103	35.03	3.40
<b>Control Group</b>	Male	99	31.02	3.27
	Female	118	29.40	3.21

The analysis presented in Table 3 revealed that male students who were exposed to the experimental group (multimedia instructional package) had a higher mean achievement score of 39.44 and a standard deviation of 3.57. This was in comparison to their male counterparts who were exposed to the conventional method, who had a mean achievement score of 31.02 and a standard deviation of 3.27. On the other hand, female students who were exposed to the experimental group (multimedia instructional package) had a higher mean achievement score of 35.03 and a standard deviation of 3.40. This was in contrast to their female counterparts who were exposed to the conventional method, who had a mean achievement score of 29.40 and a standard deviation of 3.21. There is no evidence to imply that there is an ordinal interaction impact between gender and the multimedia instructional package on the accomplishment of students in chemistry, according to the findings. This was due to the fact that the mean accomplishment scores of students in the experimental group were greater than those of students in the conventional group across all levels of gender.

**Table-4: ANCOVA on Difference between the Mean Achievement Scores of Students taught Chemistry using Multimedia Instructional Package and that of those taught using Conventional Teaching**

Source of variation	SS	Df	MS	F	P-value	Decision
Corrected Model	31301.62 2 <sup>a</sup>	2	15650.81 1	433.220	.001	
Intercept	27654.11 7	1	27654.17 7	3082.08 7	.000	
Pretest	.496	1	.496	.089	.765	
Method	20087.11 1	1	20087.11	568.102	.001	Sig.

Error	24779.11 9	76	326.041			
Total	11232.90 1	79				
Corrected Total	16543.40 7	78				

As can be seen in Table 4, the computed F value is 568.102, with a p-value of .001, which is lower than the significance threshold of 0.05. The numerator is 1 degree of freedom, and the denominator is 91 degrees of freedom. As a result, the null hypothesis will not be accepted. Consequently, there is a substantial disparity between the average accomplishment scores of students who were taught Chemistry via the use of a multimedia instructional package and those who were taught through the use of a traditional teaching technique, with the former group achieving much higher results.

**Table-5: Ancova for Testing Significance Difference in the Mean Achievement scores of male and female students taught Chemistry using multimedia instructional package and that of those taught using conventional teaching**

Source	SS	Df	Mean Square	F	Sig.	Decision
Corrected Model	46754.366 <sup>a</sup>	4	11688.592	454.117	.000	
Intercept	33478.654	1	33478.654	3160.120	.000	
Pretest	.076	1	.076	.020	.854	
Gender	38876.235	1	38876.235	917.110	.074	
Method	287.453	1	287.453	8.117	.081	
Method * Gender	8.866	1	8.866	.831	.310	Not Sig.
Error	4090.777	92	44.465			
Total	3981.144	95				
Corrected Total	3753.108	94				

Table 5 demonstrates that the computed F is 0.831 with a p-value of 0.310, which is larger than .05. This is the case when the significance threshold is set at 0.05, the numerator is 1df, and the denominator is 91df. It may be concluded that the null hypothesis was not refuted. It may be concluded that there is no statistically significant difference between the mean accomplishment scores of male and female students who were taught Chemistry via the use of a multimedia teaching package.



**Table-6: Ancova for testing significance of interaction effect of gender and multimedia instructional package on students' achievement in chemistry**

Source	SS	Df	Mean Square	F	Sig.	Decision
Corrected Model	37113.113 <sup>a</sup>	4	9278.278	100.113	.000	
Intercept	45655.515	1	45655.515	2454.141	.000	
Pretest	.245	1	.245	.007	.611	
Gender	34324.113	1	34324.113	710.113	.002	
Method	161.186	1	161.186	5.1690	.010	
Method * Gender	7.008	1	7.008	.443	.167	NS
Error	1767.909	81	19.864			
Total	32146.154	86				
Corrected Total	223433.511	85				

Table 6 demonstrates that the computed F is 0.443 with a P value of 0.167, which is larger than 0.05. This is the case when the threshold of significance is set at 0.05, the numerator is 1df, and the denominator is 91df. It may be concluded that the null hypothesis was not refuted. It may be concluded that there is no significant interaction impact between gender and the multimedia instructional package on the accomplishment of students in the subject of Chemistry.

## CONCLUSION

The results of the experiment also show that the difference between the post-test scores of the experiment group and those of the control group is not statistically significant, despite the fact that the experiment group's scores were higher. There are some earlier finds that are in agreement with this conclusion, but there are also some other things that have been discovered in the past that are not in agreement with it. The findings of Altınışık (2001) indicated that the use of multimedia instruction in social studies classes did not provide a noteworthy impact on the academic performance of the individuals who participated in the experiment. Yazar (2010) came to the conclusion that there was no significant difference between the accomplishment scores of the control group and those of the experiment group, which was the group that was exposed to the multimedia education. In their study conducted in 2007, Bayırtepe and Tüzün discovered that there was no statistically significant difference between the accomplishment scores of the experiment group, which used the multimedia-based software, and those of the control group.

It is possible that the fact that the accomplishment levels of both groups were already high was the reason why there was not a significant difference between the achievement scores of the experiment group and those of the control group in the research. In line with the idea of individual differences that is used in the designs of multimedia teaching, the impacts of multimedia teaching are much more beneficial for those who have lower levels of knowledge in comparison to those who have greater levels of knowledge (Mayer, 1999). As was said before, the administrators of the schools claimed that the students who attended the schools had a strong intellectual foundation. On the other hand, the instructors who were employed at the schools made observations that were comparable. It is

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