

## A New Kind of Visual-Model Instructional Strategy in Physics

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### Abstract

The authors' interest is connected with the application of new technologies in physics education as a means of improving the learning achievement of Physics students at different stages of learning. The New Kind of Visual Model instructional strategy introduced in this research is a computer intelligent-based PowerPoint visual simulation used to investigate learning achievement in physics. The research study adopted the Quasi-Experimental Research design. The population comprised of a sample of 168 Secondary School Class-two Physics students purposively selected and treated to 40 minutes tutorials class on the concept of motion. The instrument used consisted in two parts: PowerPoint Computer-simulated visual models which constituted the treatment; and printed materials used to elicit responses to the treatment. There were two activity groups: Experimental group; and Control group. The research study revealed that New Kind of Visual Model instructional strategy contributed positively to learning achievement in physics; result also show that there is significant effect of treatment on students' retention of learned materials; and has positive significant effect on students' learning attitude. New Kind of Visual Model instructional strategy will reduce the effects of novelty in method of instruction in all areas of teaching-learning, and may constitute a basis for the use of conceptualism in Computer-aided physics education.

**Keywords:** New Kind of Visual Model, Computer Intelligent-Based Learning, PowerPoint Visual Simulation

### Introduction

Tasks that are interactive in nature activate students' understanding and tend to fix the acquired knowledge of learners. The activation of students' understanding, the fixing of the acquired knowledge of learner all tends to influence the form of presentation of learned concepts by students. The authors' interest in presenting New Kind of Visual Model (NKVM) as an instructional strategy is connected with the application of new technologies in physics education as a means of improving the learning achievement of students at different stages of physics education. The New Kind of Visual Model instructional strategy introduced in this research is a computer intelligent-based PowerPoint visual simulation which lets a learner play and view presented concept as desired. It is based on the Random Access Visual Model, which allows the user to select and display a segment of a video at desired speed.

The main aim of the authors' concept of learning and teaching physics is improving the creativity level in students at different stages of education during problem solving process at

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their lessons, especially with the use of ICT tools. It is believed that the results of the research will be used for preparation of theoretical basis for formulating the main assumptions for multimedia in physics education and specifying theoretical premises of conceptualism in computer-aided physics education didactics. The authors prepared the PowerPoint visual simulation with Computer intelligent-based Learning models in connection with improving student's cognitive skills at various stages of physics education.

World-wide, researches show new teaching strategies and tools that integrate ICT with other instructional strategies in an effort to aid and effect student-centred learning (Nahum, 1987; Choi & Gennaro, 1987; Edward, 1996; Kathy et al., 2006). According to these research endeavors, learners are active when teaching is taken out of the learning environment, keeping in mind the demands of the curriculum during the teaching-learning process. This research study is therefore conceptualized on exploring the effects of the use of NKVM instructional strategy in the teaching and learning of the concept of motion using Computer Simulated Models accentuated in PowerPoint presentation. It is a simple computer simulated video models that attempts to reduce the effect of novelty, and offers the teacher to play at desired pace. The research study is aimed at introducing to the Nigerian teaching-learning audience that NKVM instructional strategies is an effective tool in the teaching-learning of physics.

Developing NKVM of motion used in this research study involved developing the PowerPoint visual simulation using the Concept Map of motion earlier developed for a similar research (Akeju, Rotimi & Kenni, 2011).

The following steps were involved in developing NKVM:

- a) Identifying the presented concept of motion
- b) Computer-generating visual model components
- c) Using PowerPoint to animate the visual model components

The typical visual model components used in NKVM are shown in the attached PowerPoint file and which can be replayed using the following basic steps: -

- a. Load the PowerPoint package (on your PC)
- b. Click on the PowerPoint files
- c. Click on 'NKVM' file
- d. Click on the 'slide show' icon (on your PC)
- e. Using the right-hand click, proceed to view the models in sequence as desired

### *Research Hypotheses*

The hypotheses tested in the research study are:

1. H<sub>01</sub>: There is no significant effect of treatment on students' learning achievement
2. H<sub>02</sub>: There is no significant effect of treatment on student's retention of learned materials.
3. H<sub>03</sub>: There is no significant effect of treatment on students' attitude to learning physics.

### **Methodology**

The research study adopted the quasi-experimental research design. Pre-test and post-test were used. The population comprised of Senior Secondary School Class II Physics Students in Ekiti State, Nigeria, and the sample of 168 purposively selected for the research. There were two activity groups of 84 respondents respectively, the experimental group, and the control

group. The instruments used in the research study are of two types, mainly: i) NKVM used as treatment on the experimental groups and ii) Printed matters of two sections, and comprised of section (a) of 20 structured questions used as pretest and posttest for both groups to elicit response to learning achievement respectively; and (b) 10 structured response item used as posttest for the experimental groups only to elicit response behavior to the strategy. The control groups were treated to 40 minutes of tutorial classes, while the experimental groups were treated with NKVM. There was a pre-test for groups, then, treatment, and post-test to both groups two weeks later. The method of statistical analysis used for the research study is the T-test.

## Results

The summary of statistical analysis and test of hypotheses on NKVM is presented in tables below:

**Table 1.** T-test summary of the effect of treatment on students' learning achievement in physics

Variables	Group	N	Mean	<i>t-cal.</i>	<i>df</i>	<i>t-tab</i>	Inference
Treatment on students' learning achievement	Exp.	168	3.28				
	Cont.	168	7.60	29.05	167	1.96	significant

$p < 0.05$

Table 1 above shows that *t-cal* is greater than *t-tab* at significant level  $p < 0.05$ . The null hypothesis is rejected. We therefore conclude that there is a positive significant effect of treatment on the learning achievement in physics.

**Table 2.** T-test summary of the effect of treatment on students' retention of learned materials

Variables	Group	N	Mean	S.D.	<i>t-cal.</i>	<i>df</i>	<i>t-tab</i>	Inference
Treatment on retention	Exp.	84	8.76	1.25				
	Cont.	84	6.41	1.47	11.32	166	1.96	significant

$p < 0.05$

Table 2 above shows that *t-cal* is greater than *t-tab* at significant level  $p < 0.05$ . The null hypothesis is rejected. We therefore conclude that there is a positive significant effect of treatment on the students' retention of learned materials.

**Table 3.** T-test summary of the effect of treatment on students' learning Attitude to physics

Variables	Group	N	Mean	S.D.	<i>t-cal.</i>	<i>df</i>	<i>t-tab</i>	Inference
Treatment Lecture method	Exp.	84	9.78	1.25				
	Cont.	84	8.79	0.57	6.17	83	1.96	significant

$p < 0.05$

Table 3 above shows that *t-cal* is greater than *t-tab*, at significance level  $p < 0.05$ . The null hypothesis is rejected. We therefore conclude that there is a positive significant effect of treatment on the students' learning attitude to physics.

## Discussion

The major findings revealed by the research study shows that post-test mean score is higher than the pretest mean score, thus there is a significant effect of NKVM instructional strategy on physics students' Learning achievement. Result also show that there is a significant effect of treatment on student's retention of learned materials. This is in agreement with research findings by Clarence (1944) and Abimbade (1997). Furthermore, the study showed that the students were favorably disposed towards the instructional strategies, which is in agreement with findings by Kathy, et al. (2006), Jegede, Okebukola & Ajewole (1992), Choi & Gennaro (1987), Dean (2008), Shea, McCall & Özdoğru (2006), and Uniserve Science (2009).

## Conclusion

NKVM instructional strategy tends to have an interactive-lingering effect that prompts recall of learned materials even two weeks after the instruction period. This might not be unconnected with the psychology of learning which is predicated on the fact that what is heard is easily forgotten, what is seen is often remembered, and what is practiced is easily remembered, thus making the NKVM instructional strategy worthy, effective, and complementary to the discussion method of instruction. NKVM also defer from the use of real life situations that are often colorful and can influence novelty.

Findings show that in the learning achievement test, post-test mean score of the experimental group (8.28) is higher than the posttest mean score of the control group (7.60), thus there is a significant effect of the instructional strategy on students' learning achievement. Result also indicated the experimental group was able to recall a higher percentage of learned materials after the two weeks interval than the control group, which shows a positive significant effect of treatment on student's retention of learned materials. This finding is in agreement with research findings by Clarence, (1944). Furthermore, the study showed that students in the experimental group were favorably disposed towards the instructional strategy, as they took active part in the class activity. These findings are in agreement with previous research findings by Kathy et al. (2006), Jegede, Okebukola & Ajewole (1992), Zollman & Robbert (2008), and Wendell (1970) in which they asserted that learners learned better with visual models.

However, the observed singular effect of using NKVM instructional strategy may have been as a result of novelty and the excitement of learning with a new method of instructional strategy, and perhaps these feelings might wear off over time. These effect and the effects of some other intervening variables are arguments to support further future study on the strategy, which will serve to establish the efficacy of NKVM instructional strategy in any method of instruction in the teaching-learning process.

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