EFFECTIVENESS OF ANIMATED VISUALS FOR THE TEACHING OF CHEMICAL BONDING IN JUNIOR HIGH SCHOOL CHEMISTRY

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Abstract

This study sought to investigate the effectiveness of animated visuals in Chemical Bonding. The study used the pretest-posttest in measuring the contribution of the visuals in advancing the knowledge of students in chemical bonding.

The posttest indicated that the students gained average knowledge about the topics. This shows that there was gain in the knowledge of the respondents in this topic. The standard deviation mirrored that the scores in this test remained not widely spread. Therefore, there was little variation in the extent of knowledge that students received after the conduct of the study.

Result showed that animated visuals in Chemical Bonding are effective in teaching the topics. Thus, the researcher rejects the null hypothesis, that there is no significant difference between the pretest and the posttest scores of students in Chemical Bonding in high school Chemistry.

Keywords: effectiveness of animated visuals, teaching chemical bonding.

1. Introduction

Teaching – learning process is the heart of education. Teaching is a complex, multifaceted activity, often requiring us as teachers to juggle multiple tasks and goals simultaneously and flexibly. Teaching requires adapting. We need to continually reflect on our teaching and be ready to make changes when appropriate. Teaching provides opportunity to the learner to produce relatively permanent change through the engagement in experiences provided by the teachers. While learning can be described as permanent change in learners behavior as a result of experience or practice they are engaged.

Learners respond to information differently. Thus, it is often to our advantage as teachers to use many different formats and modes to teach the subject matter of a lesson. This is why teachers normally use some combination of lecture, text and hands-on laboratory for conveying information. With the advent of the Internet and the multiple formats that can be communicated over the World Wide Web, we now have several new and exciting ways to present information. The Web allows the incorporation of animation, moving pictures, and sound into lessons, which extends our abilities to present materials that encourage student interaction with the subject matter. “Animation is one of the computer applications and can have its impact on teaching-learning process” (PN Joshi, 2016).

Williams (2000) articulated that, “Recent changes have occurred in the theories and practices of pedagogy, that is, the basic elements which are considered to make up ‘good instruction’. The computer has potential to contribute to these efforts. But to do so, teachers will need to improve not only their own general computer skills, but also their ‘computer in the classroom’ skills, that is, their use of technologies for improving teaching and learning.”

Thus, the development and further enhancement of multimedia aids in teaching has become a popular topic in innumerable trainings and seminars for educators. As curriculum development and instruction planning geared towards the inclusion of sophisticated equipment in the teaching-learning process, the teachers are left with no other choice but to welcome the invitation for training and retraining.

Molecular models, simulations, and animations could aid in studying chemistry in general and in better understanding the concept of chemical bonding in particular. It was found that web-based interactive animations helped students understand difficult and abstract concept associated with equilibrium, electrochemistry, and chemical solutions, and aided students’ understanding of molecular and dynamic concepts in laboratory experiments. More recently Marbach-Ad, Rotbain, and Stay (2008) concluded from their study that it is advisable to use computer animations when teaching about dynamic processes and abstract concept.

The problems learners meet in understanding the notion of chemical bonding have been the focus of many research. The abstract concept of chemical bonding is considered by teachers, students, and chemical educators to be a very difficult and complicated concept (Taber, 2002). Students' misconceptions regarding the concepts in chemical bonding are based on the fact that they live and operate within macroscopic world of matter and do not easily follow shifts between macroscopic and submacroscopic levels (Gabel, 1996; Harrison & Treagust, 2000). Consequently, they tend to build themselves alternative conceptions and nonscientific mental models (Taber, 2002). Chemical bonding is a concept in which understanding is developed by using models through which the students are expected to interpret a disparate range of symbolic representations (Taber & Coll, 2002). Most teachers use models to help students understand and visualized this concept. In addition, very often teachers use only one type of model (such as ball-and-stick in chemistry), thereby eliminating student acquaintance with the diversity of other models, and leaving students with only a partial grasp of the model or a complete misunderstanding of it (Barnea & Dori, 2000).

With the growing success of improving student academic performance owing to the optimum use of technology in the classroom, it may not be far to achieve better student performance in Chemistry should innovative use of technology be applied in the teaching of the subject. Along with the increasing popularity of animated characters enjoyed by young and adults alike, it is likely that computer-aided visuals for the teaching of Chemistry which integrates an animated character that facilitates the flow of discussion may also win the interest of students in learning the subject.

The objective of this study is to find out if animated visual can be use as a tool for teaching chemical bonding in junior high school chemistry and it would render better understanding of the topic among students.

1.2 Objectives of the Study

The study sought to explore and determine the effectiveness of animated visual in teaching chemical bonding in junior High School level. Specifically, the study sought to answer the following:

1. What is the performance level of the students before and after the use of the animated visual?
2. Is there significant difference between the performance of students before and after the use of the animated visual?

It is hoped that this study would be of help to students, teachers, school administrators and curriculum developers in assessing the achievement of junior high school students in chemistry using the traditional manual method and to adopt innovative teaching-learning aids to improve their performance.

2. Method

This study employed the descriptive approach in research. Descriptive research is primarily concerned with finding out "what is" by describing, explaining and validating findings on events, and/or natural or man-made phenomena (AECT, 2001). This research approach was deemed appropriate in this study since the present undertaking attempted to describe the effectiveness in teaching Chemical Bonding to Junior High School Chemistry students. Descriptions of this phenomenon were aided by the use of frequency counts, percentages, and measures of central tendency such as means and standard deviations.

The effectiveness of the use of the animated visuals for selected topics in Chemical Bonding was measured in terms of gain which was primarily based on the difference between the pretest and posttest scores of the respondents. As such, the study also involved the quasi-experimental research. Woolf (2011) describe that this type of research is very similar to true experiments but use naturally formed or pre-existing groups. For example, if we wanted to compare young and old subjects on lung capacity, it is impossible to randomly assign subjects to either the young or old group (naturally formed groups). Therefore, this cannot be a true experiment. When one has naturally formed groups, the variable under study is a subject variable as opposed to an independent variable. As such, it also limits the conclusions we can draw from such a research study.

The pretest-posttest was developed by the researcher for departmental used. It is in fact the departmental examination in Chemistry which has been constantly subjected to content-validity and reliability testing since its first use in 2009 when departmental diagnostic testing was initiated in the researcher's university. The pretest-posttest consisted of twenty-five items and of multiple-choice type that centered on the three topics of chemical bonding within the scope of high school chemistry.

The respondents were the population of 100 students from the total population of 203 grade 9 junior high school students of La Consolacion University Philippines.

3. Results and Discussion

To test the effectiveness of the animated visuals, it was utilized in the actual teaching-learning process that transpired in two sections of grade 9 junior high school students at La Consolacion University Philippines. These respondents were given by the researcher pretest prior to the utilization of the material. A posttest was personally proctored by the same immediately after Chemical Bonding had been discussed. The results of the pre- and posttest were used to gauge the performance of the respondents before and after the use of the animated visuals. The pretest administered to the respondents was the same posttest given to them. This test consisted of twenty-five multiple choice type questions.

Tables 1 to 3 in the following subsection discuss the performance of the students in selected topics in Chemical Bonding before and after use of the developed animated visuals in the teaching-learning process.

Presented in Table 1 is the analysis of the performance of the respondents in the pretest.

Table 1

An Analysis of the Performance of the respondents in the Pretest

	N	Minimum	Maximum	Mean	Std. Deviation
Pretest	99	0	15	6.55	2.576
Valid N (listwise)	99				

It can be gleaned from Table 1 that the mean score of the respondents in the pretest is 6.55. This indicates that the students had minimal prior knowledge about the topics in Chemical Bonding. The standard deviation, whose value is 2.576, reflects that the scores in this test are not widely spread. This can be interpreted as, such, that there was little variation in the extent of knowledge that students held prior to the conduct of the study.

Table 2 shows the analysis of the performance of the respondents in the posttest.

Table 2

An Analysis of the Performance of the Respondents in the Posttest

	N	Mean	Std. Deviation	CV
Posttest	99	14.21	3.649	.257
Valid N (listwise)	99			

It can be reflected from Table 2 that the mean score of the respondents in the posttest is14.21. This indicates that the students had gained average knowledge about the topic sin Chemical Bonding. In addition to this, there was an observed increase in the means of the tests – pre- and post. This only goes to show that there was gain in the knowledge of the respondents in this topic. The standard deviation, whose value is 3.649, reflects that the scores in this test were widely spread.

Statistical treatment further applied involving the use of the coefficient of variation of the scores resulted to a value of .257. With CV > 10% further supports that the scores were indeed widely spread (Villamoran, 2004) which indicates that there were wide gaps in the extent of knowledge that students received after the conduct of the study. However, limitations of the study made it inconclusive whether the respondents of the study improved in their performance in the topic at almost the same pace or at almost same advantage; as such, the respondents of the study taken as a group could be described to be heterogeneous.

In order to determine whether learning took place in the respondents, the scores that they obtained in the pre- and posttest were compared using t-test for paired samples.

Table 3 on the following page presents the significant difference between the pretest and the post-test of the students. The table below shows the t-test for the significant difference between the pre-test and post-test.

Table 3

An Analysis of the Difference in the Performance of the Respondents In the Pre- and Posttests

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pair 1 Pretest - Posttest	-7.667	4.326	.435	-8.529	-6.804	-17.633	98	.000

**, P<.01 – highly significant

The data in Table 3 show that there was an increase in the students' performance in the subject as indicated by the -7.667 mean gains between the two sets of test. The negative t-value, which is computed to be -17.633, shows that the posttest values were generally higher than the pretest values, which further indicates that there was a marked increase in the performance of the respondents in the topics.

The table also reflects that the t-test value, which is found to be .000, is highly significant. This means that there was a highly significant difference in the scores between the pre- and posttests of the respondents. This gives the researcher all the reason to reject the null hypothesis and to espouse the research hypothesis that there is significant difference between the pretest and posttest scores of students in chemical bonding in junior high school Chemistry. Therefore, the animated visuals was found to be effective in the teaching of selected topics in Chemical Bonding to high school students.

Since the animated visuals were found to be highly acceptable and were effective in the teaching of Chemical Bonding, the following are hereby recommended:

1. That science and other teachers be trained in the development and use of animated visuals to perk up their methods of teaching; and

2. That the study extend the use of animated visuals in the teaching of abstract topics in Chemistry e.g. Kinetic Molecular Theory, Mole Concept, and Gas Laws.

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