EFFECTS OF VIRTUAL LEARNING ON STUDENTS' ACADEMIC PERFORMANCE IN BIOLOGY PRACTICAL AT H.S LEVEL IN WEST-BENGAL: AN EXPERIMENTAL STUDY

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Abstract: *In Biology practical now a day's dissection of some plant and animal materials was completely prohibited due to hamper in our ecosystem and another problem was different chemicals used for different practical purposes was very costly. To overcome these obstacles, a technology-based alternatives procedure called Virtual Lab, is using at present in different subjects. Virtual laboratories simulate a real laboratory environment and processes, and are defined as learning environments in which students convert their theoretical knowledge into practical knowledge by conducting experiments. An attempt has been made in this paper to examine the impact of working with Virtual Lab CD on students' achievement in practical skills in biology subject. An objective type Biology Performance Test (BIOPET) including 20 multiple choice items was administered on 50 students of class XI under WBCHSE were selected randomly from a schools in the district south 24 pgs on a selected topic i.e. 'Test for the presence of sugar, starch, protein and fates, to detect them in suitable plant and animal materials'. In this study a pre-test, post test design was applied on two different groups namely controlled group & experimental group. With the help of t-test it was concluded that there is a significant differences between mean test score of control and experimental group. Another study showed that impact of Virtual Learning on male & female students' achievement have no significant difference. It was found that teaching with Virtual Lab biology CD helped students to improve their practical skills and knowledge. Implication of this study is virtual learning will facilitate the teacher to introduce different practical work towards the students without wasting chemicals or affecting plant and animal kingdom. Their learning could be in a safe & healthy environment.*

Key Words: *Virtual Learning, Virtual Lab CD, Students Achievement in Biology Practical.*

1. INTRODUCTION:

Biology as one of the science subjects offered in senior secondary schools deals with the scientific study of living things, their relationship with one another and with the natural environment among other things. It is important to note that biology curriculum offered in higher secondary schools has the objectives of preparing the students to acquire adequate laboratory and field skills in biology; acquire meaningful and relevant knowledge in biology; acquire ability to apply scientific knowledge to everyday life in matters of personal and community health and agriculture; and acquire reasonable and functional scientific attitude (FME, 2009). Biology occupies a unique position in the school curriculum. Biology is central to many science related courses such as medicine, pharmacy, agriculture, nursing, biochemistry and so on. It is obvious that no student intending to study these disciplines can do without biology. These factors, among others, have drawn attention of researchers and curriculum planners towards biology as a subject in the school curriculum (Kareem, 2003). The desire to know the causes of the poor performance in biology has been the focus of researchers for some time now. It has been observed that poor performance in the sciences is caused by the poor quality of science teachers, overcrowded classrooms, and lack of suitable and adequate science equipment, among others (Abdullahi, 1982; Bajah, 1979; Kareem, 2003; Ogunniyi, 1979). Students perform poorly in biology because the biology classes are usually too large and heterogeneous in terms of ability level. In addition, the laboratories are ill-equipped and the biology syllabus is over loaded (Ahmed, 2008; Ajayi, 1998). Now a day's dissection of different plant and animal materials was completely prohibited due to hamper in our ecosystem. To overcome these obstacles, a technology-based alternatives procedure called Virtual Lab, is using at present in different subjects. Virtual laboratories simulate a real laboratory environment and processes, and are defined as learning environments in which students convert their theoretical knowledge into practical knowledge by conducting experiments. Virtual labs are popularized as a visual tool that could add advantages to students and instructors towards reducing the laborious procedures in a more effective manner. It offers diverse analysis through different components like user- interactive animations, simulations, remote-triggering of real laboratory equipment and haptic

devices. The actual feel and visualization of a real laboratory can be delivered through graphical animations to a greater extent. Animations provide a diagrammatic understanding of the concepts of an experiment in a better way that cannot be easily conveyed through text based or passive illustrations. By means of virtual laboratories, students have the opportunity of repeating any incorrect experiment or to deepen the intended experiences. Moreover, the interactive nature of such teaching methods offers a clear and enjoyable learning environment. The potential benefits of virtual learning cannot be underestimated in the contemporary world. There are now several virtual learning packages on different subjects. It is obvious that the current trend in research all over the world is the use of computer facilities and resources to enhance students' learning. In a review of empirical studies on CAI, Cotton (1997) concluded, among others, that the use of CAI as a supplement to conventional instruction produces higher achievement than the use of conventional instruction alone, research is inconclusive regarding the comparative effectiveness of conventional instruction alone and CAI alone, and that computer-based education (CAI and other computer applications) produce higher achievement than conventional instruction alone. In addition, students learn instructional contents faster with CAI than with conventional instruction alone, they retain what they have learned better with CAI than with conventional instruction alone, and CAI activities appear to be at least as cost effective as and sometimes more cost-effective than other instructional methods, such as teacher-directed instruction and tutoring. Furthermore, computer assisted instruction has been found to enhance students' performance than the conventional instructional method in counselor education (Karper, Robinson, & Casado-Kehoe, 2005). This new approach enriches the biology practical study without pollution and hazardous condition and also without affect in our ecosystem. Virtual Lab Biology CD was designed & developed by National Council of Science Museums Ministry of Culture, Govt. of India. The new strategy is administrator friendly as it greatly reduces expenditure on laboratory materials and there is no breakage & pollution

2. PURPOSE OF THE STUDY:

The objectives of the present study are:

- To study the effectiveness of Virtual Learning in teaching biology practical at the higher secondary level of students.
- To compare the Student's achievement in biology Practical using traditional and Virtual learning method.
- To compare the students' achievement in biology Practical between male and female student.

3. RESEARCH HYPOTHESES:

The following hypothesis were formulated and tested at both 0.05 level and 0.01 level of significance.

- Ho1: There is no significant difference between the mean achievement scores of students taught biology practical by virtual learning CD and traditional method.
- Ho2: There is no significant difference between the mean achievement scores of male and female students taught the biology practical using virtual lab CD.

4. RESEARCH METHODOLOGY:

Sample:

- The study was conducted on a sample of 50 students drawn from one Government co-ed Senior Secondary School in south 24 pgs of West Bengal State. The selection of school was made through simple random sampling method. For Ho1, a control and experimental group design was used. The senior secondary students in school were divided into an experimental group (25 students) & a control group (25 students). The distribution of students was done randomly so that the mean score at the entry level (based on teacher made pre-achievement test) was same in both. Both the experimental and control groups conducted the same laboratory exercises as per the prescribed syllabus and practical classes. Here a teacher made achievement test on 'Test for the presence of sugar, starch, protein and fates, to detect them in suitable plant and animal materials' topic was administered to the students. Both the groups were given simultaneously the same multiple choice type test. For hypotheses Ho2, experimental group was divided based on gender. In experimental group 9 students are female and 16 students are male was present.

- **Independent variable**- ■Method of teaching: ●Traditional chalk & talk method.
  ● Virtual Learning method (CAI).
- **Dependent Variable**- Students learning out come.
- **Intervening Variable**-Certain variables which couldn't be manipulated or measured directly, may have an important effect upon the outcome of learning. In an experimental study, some major intervening variables should also be considered viz. Socio-economic status, Grade level, School variable, Learner variable, Physical

environment of the class room. During the planning of experiment it was necessary to identify as well as to control those variables other than the independent variables that may affect the dependent variable. The following measures may be considered to control the intervening variables:

■ Socio economic status : This were controlled by the process of random selection of sampled students, especially belonging to the families approximately of the same socioeconomic status in view of their livings viz. the semi urban areas of one district.

■ Grade level: In the present study, the grade level would hold constant by taking students from the grade XI only.

■ School variable: Investigator was taken randomly one school from one district. Thus the effect of schools was controlled through randomization.

■ Physical environment of the classroom: The experiment was conducted in the normal classroom situation in school. Students were always taught under the same seasonal condition. The primary variation due to physical environment of the classroom, seasonal condition of learning was controlled by direct physical manipulation, as far as practicable.

5. RESEARCH INSTRUMENTS:

Data were collected using the Biology Performance Test (BIOPET) and classroom observations. BIOPET was administered by the researcher as a pre-test and subsequently as a post test. The class room observations would also carry out in order to determine what the students would actually do during the lessons. The tools were constructed to use in the study are teacher made achievement test were prepared by the researcher for entry level achievement test in biology practical. Standardized Instructional material prepared on the basis of Virtual Learning Method was applied. The teacher made achievement test in biology practical after treatment was prepared by the researcher.

6. RESEARCH DESIGN:

Pre test- post test experimental group design was applied for this study. The experimental group were taught biology practical by Virtual Lab CD whereas the controlled group by traditional chalk-talk method. Comparison of the academic performances of the learners in biology practical was drawn by comparing the scores of achievement test of the learners in the two groups. In depicting the design of experimental research, usually adaptations from Campbell and Stanley's symbols were used.

These are:

- X denotes the independent variable which is to be manipulated.
- O denotes the observation, i.e., the measurement or scores on tests.
- Random groups are denoted by R.
- E denotes the experimental group
- C denotes the control group.
- The temporal sequence is from left to right.
- X's and O's which are in vertical sequence happen at the same time.

The pre-test post-test experimental design may be depicted thus:

E O1 X O3

R

C O2 O4

The above design means that two groups, the experimental and control have been chosen randomly. While the treatment X has been imposed on the experimental group E, it is absent from the control group C, O1 and O2, are the observations prior to the treatment and O3 and O4 are the observations after treatment. Comparison of these observations indicates the extent of the effect of X.

For Ho2, to know the effect of gender a comparative study was done on the achievement scores of male and female student present in experimental group.

Male O5 X O6

E

Female O7 X O8

E: Experimental group
X: Independent variable which is to be manipulated.
O5& O7: Observation prior to the treatment
O6 & O8: Observation after treatment

7. PROCEDURE FOR DATA COLLECTION:

Quantitatively, statistical test such as Mean, Standard deviation, t- test, were employed to measure the effect of virtual learning on students achievement in practical skills using data derived from a multiple choice test consisting of 20 items on content knowledge related to practical. The topic focused in the questionnaire was 'Test for the presence of sugar, starch, protein and fates, to detect them in suitable plant and animal materials' at XI class.

8. RESULTS:

CHART 1: COMPARISON OF STUDENTS MEANS SCORES OF EXPERIMENTAL AND CONTROL GROUP

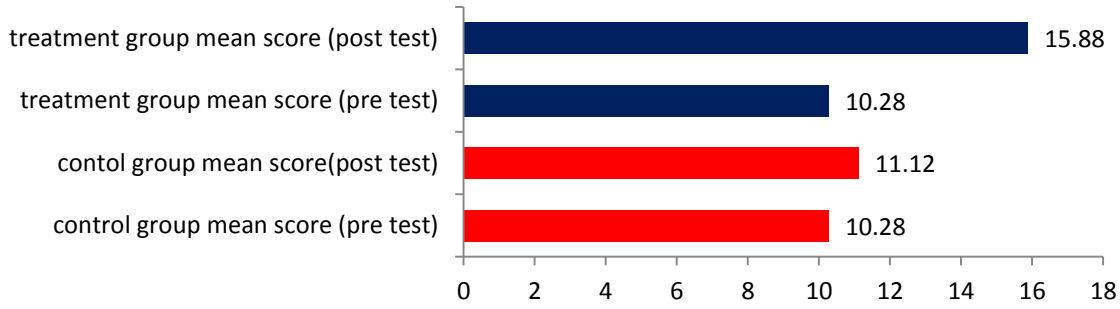

CHART 2: COMPARISON OF MEAN SCORES OF MALE AND FEMALE STUDENTS OF EXPERIMENTAL GROUP:

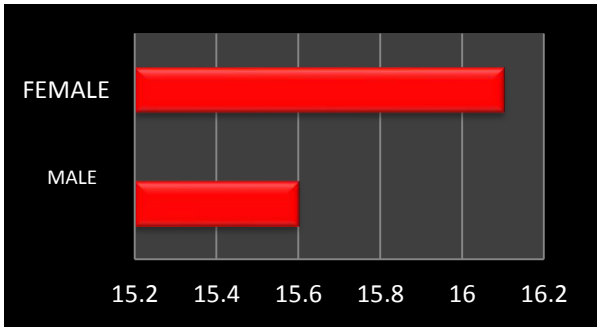

TABLE 1: RESULT OF DESCRIPTIVE STATISTICS OF EXPERIMENTAL AND CONTROL GROUP:

Experimental group	
Mean	15.88
Standard Error	0.272763634
Median	16
Mode	17
Standard Deviation	1.36381817
Sample Variance	1.86
Kurtosis	-0.453318417
Skewness	0.234128049
Range	5
Minimum	14
Maximum	19
Sum	397
Count	25

control group	
Mean	11.12
Standard Error	0.272763634
Median	11
Mode	10
Standard Deviation	1.36381817
Sample Variance	1.86
Kurtosis	-0.861759704
Skewness	0.301486998
Range	5
Minimum	9
Maximum	14
Sum	278
Count	25

TABLE 2: THE RESULT OF THE STUDY ON EFFECTIVENESS OF TEACHING STRATEGY SHOWED IN THE TABLE BELOW:

GROUP	MEAN	S.D	t-value		
EXPERIMENTAL	15.88	1.36	CALCULATED VALUE	TABLE VALUE	
				0.05	0.01
CONTROL	11.12	1.36	12.33	2.01	2.68

TABLE 3: THE RESULT OF THE STUDY ON EFFECT OF GENDER SHOWED IN THE TABLE BELOW:

GROUP	MEAN	S.D	t-value		
MALE	15.6	0.95	CALCULATED VALUE	TABLE VALUE	
				0.05	0.01
FEMALE	16.1	0.78	1.29	2.068	2.80

9. DISCUSSION ON FINDINGS:

From Table -2 it was found that there is a significance differences between the mean score of control and experimental group (as calculated t-value is greater than t-table value at both 0.01 and 0.05 level). So null hypothesis is rejected. The result of the present study suggests that learning with Virtual Lab C.D during the classes helped the students to develop stronger subject skill. Here Virtual lab method is more effective than traditional chalk talk method. The result of the t-test on the performance of student's taught biology using virtual learning method and those taught with traditional chalk and talk method indicated a significance differences in favour of the students in the experimental group. It is to be noted that students exposed to virtual learning method did better than those exposed to traditional chalk and talk method, as reflected in higher group mean. These findings agree with earlier findings of Phillips and Moss (1993) and the findings of Jegede, Okebukola and Ajewole (1992) which are directly on biology. Similarly, the findings agree with the studies of Ajelabi (1998) on social studies, Egunjobi, (2002) in geography, (Udousoro, 2000) in mathematics, and Okoro, and Etukudo, (2001) in chemistry, conducted in Nigeria which confirmed that CAI has been effective in enhancing students' performance in other subjects than the conventional classroom instruction.

From table -3 it is suggest that there was no significant difference between male & female students (as calculated t-value is less than t-table value at both 0.01 and 0.05 level.). Hence effects of virtual learning on both male & female students were same. These findings on gender agree with the earlier findings of Bello (1990) on gender and performance in biology. It also agreed with the conclusions of Kirkpatrick and Cuban (1998) based on their review of studies on computer and gender, and also the findings of Spence (2004). Thus, it can be deduced that the use of computer assisted instruction enhanced the performance of both male and female students.

10. CONCLUSION:

From this study it is clear that virtual learning can be used as a creative tool for a better and more advanced educational environment in biology teaching at school level. Using a virtual tool to overcome the above mentioned problems provides more potential benefit for students. The most important benefit of using virtual world is to provide more learning options than the normal face to face classes and we know different plant and animal without affecting them. This will provide not only an effective learning environment but will also minimize school expenditures and the time spent on such activities to a large extent.

RECOMMENDATIONS:

Based on the findings of this study, the following recommendations are made.

- Necessary attention should be accorded computer literacy and operation in the schools and relevant computer assisted instructional packages should be developed for use within the school systems in West Bengal.
- Using virtual learning C.D as much as possible in the classroom situation.

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