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Practical Note

Comparison of Traditional Lecture Using Slideshow and Teaching with Virtual Manipulations Software

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This paper deals with the study on the use of *Froguts* as an edtech tool for teaching anatomy in a grade 9 online class which aims to examine the effectiveness of teaching with virtual manipulations software. In this study, a quasi-experimental design only with posttest was utilized. Twenty-four students participated in the study, with the control group receiving a traditional lecture using slideshow and the experimental group taking the same lesson with navigating *Froguts* virtual dissection. Two-tailed *t*-test for the posttest results revealed no significant difference in the learning acquisition between the use of *Froguts* virtual software and the traditional online lecture using slideshow. Basic anatomical structures of the frog can be learned easily by attending a traditional lecture with a slideshow setup in an online environment. It is recommended to conduct a similar study on assessing a higher level of learning in the Bloom's taxonomy with more participants and applying a time series design.

Key words*: anatomy, dissection,* Froguts *virtual software, knowledge acquisition, technology integration*

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INTRODUCTION

The sudden switch to online mode of learning delivery of many high schools due to the COVID-19 pandemic has left the teaching personnel wondering about effective means of delivering science lessons to high school students in a purely online mode. Facilitating a science lesson is faced with many challenges, which include how to craft well-guided practical experimentations, effectiveness of the laboratory activities, and measuring the learning outcomes of these activities. Ensuring students' safety in the execution of experiments is also a primary challenge. Performing anatomy experiments online has similar challenges so online anatomy applications were used as an alternative option.

Computer-based simulations offer an appropriate constructive learning environment (Apkan, 2002) as it provides "Contrived Experiences", which are considered second to the most concrete experience in Dale's Cone of Experience (Janoska, 2017). Simulations also present several sensory modalities such as touch, sight and hearing, altogether at one time (Pérez-López and Contero, 2013). This enables learners to be actively involved in the learning process (Fleming and Mills, 1992). Since learners can experiment and make mistakes in this flexible, risk-free setting, learning is made more interesting and engaging thereby increasing retention (Ibrahim and Al-Shara, 2007).

Virtual Simulations were used in secondary schools as well, such as *Froguts* Virtual Frog Dissection, a software that can be downloaded for free (The Science Bank, n.d., see Websites list). *Froguts* was found to be an effective alternative to actual dissection (Apat, 2019) under the assump-

tion that use of the application could increase knowledge acquisition, at least at the Remember stage of learning, by enabling the students to do the dissection in an online setup (Figure 1).

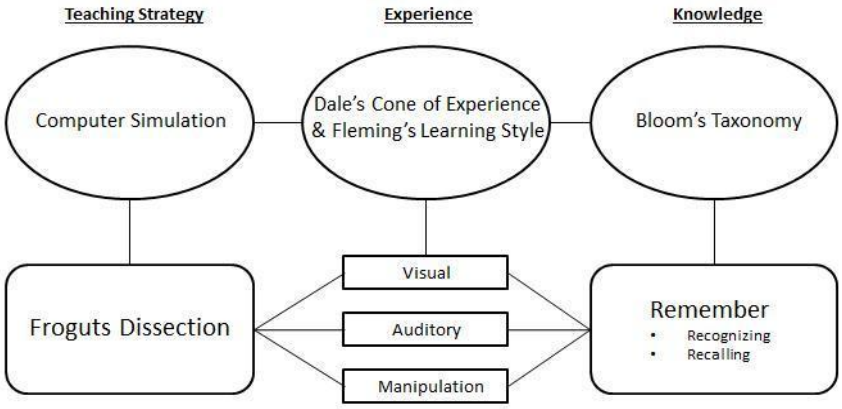

Figure 1: Knowledge acquisition through virtual manipulation

PROCEDURE

In this study, we applied *Froguts* in teaching anatomy in a grade 9 Science class that was being delivered in a pure virtual setup to test the null hypothesis that there is no significant difference between the scores of students who learned frog's anatomy through *Froguts* virtual dissection and those who attended a regular online lecture. Twenty-four grade 9 students from a private high school from San Mateo, Rizal, Philippines, participated in this study. The students were categorized according to their average grade (AG) in Science from the previous school year: top group (AG ≥ 90%), middle group (AG = 84% - 89%), and bottom group (AG ≤ 83%). We selected eight learners from each group. Aided by randomized grouping, students of each category group were equally divided into control and experimental groups. The anatomy class sessions for the control and experimental groups were facilitated separately. During the class period, the groups were assigned to separate online breakout rooms. Both groups were given one hour to complete the lesson and 20 min to complete the assessment.

The control group was given a regular lecture where the lesson was delivered by the teacher using a slide presentation about the basic external and internal parts of a frog. The contents of the slide presentation were essentially figures adopted from *Froguts*. On the other hand, the experimental group was given the same lesson with navigating *Froguts* in their own device.

The students in the experimental group were instructed to download the *Froguts* application at the start of class to make sure it is their first time using the application during the discussion of the topic and to put everyone on a baseline of knowledge and familiarity. Both groups were given the same assessment that contains a 15-item multiple-choice question (MCQ) quiz with one mark for each question. The assessment was administered right after the lesson (Figure 2).

RESULTS

A posttest-only comparison group design was utilized in this research to examine whether there is a difference between test scores of students who learned frog's anatomy through *Froguts* virtual dissection and those who attended a regular online lecture class.

The mean scores of the posttest presented in Table 1 show a negligible difference between the control and experimental groups and across all AG

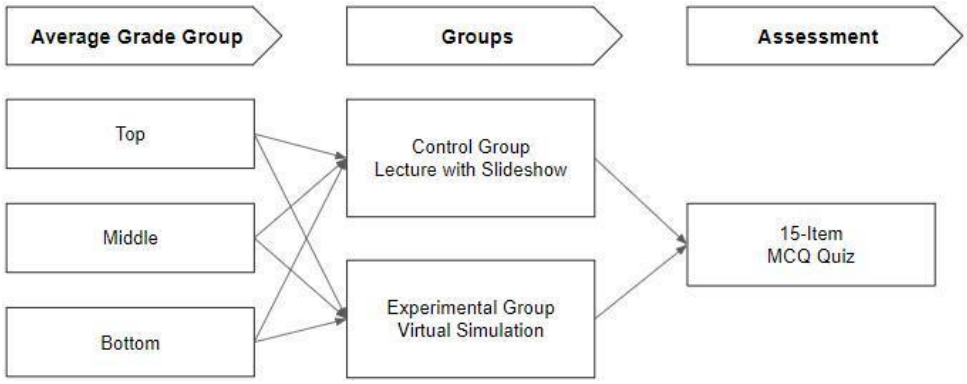

Figure 2: Procedure of learning delivery

Table 1: Results of the posttest* of the control and experimental groups

AG group	Control group (Ave)	Experimental group (Ave)
Top	15	15
Middle	13	13
Bottom	12	12
Mean ($\bar{X}$)	13	13

*The highest possible score was 15.

groups. The overall mean score for both the control group and the experimental group was 13. The computed *t*-value (0.095) is less than the critical value (2.074), so the null hypothesis was not rejected. The result also shows that there is no is no sufficient evidence that there is a significant difference between the assessment scores of the control and the experimental groups the control and the experimental groups at the 0.05 level of significance (Table 2).

The internal validity of the assessment was checked based on its content, relevance, and relatedness to the set objectives anchored at the aim of gaining an immediate recall of important concepts in frog's anatomy at the "Remember level of learning" in Bloom's taxonomy. To check the reliability of the items, Kuder-Richardson Formula 20 (SPSS for Windows, Version 16.0, SPSS Inc., Chicago) was used to measure internal consistency. The computed reliability coefficient was 0.72, which is indicative that the instrument was reliable.

DISCUSSION

From the findings of this study, it was concluded that there is no significant difference between the performance, at least at the remembering level of the organs and their functions, of the students who have undergone an anatomy class using *Froguts* and those who have attended a lecture-only class with slideshow of anatomical details of a frog. This is similar to the results of William *et al*. (2016) and Akhu-Zaheya *et al*. (2013) where no significant difference was presented between the students who used the technology-assisted simulations and those who were immersed in the traditional method. Furthermore, Pérez-López and

Table 2: Two-tailed t-test analysis of the results

Degrees of Freedom	*t*-value	*p*-value	Critical Value	Level of Significance
22	0.095	0.925	2.074	0.05

Contero (2013) also found out that the differences in grades were random and had no statistical significance between the learning unit taught using a simulation and one taught traditionally.

In the present study, the students from the control group performed in the formative assessment just as fair as those who have used the *Froguts*. It could be inferred that learning acquisition of basic anatomical structures of the frog can be done easily by simply attending a traditional lecture with a slideshow setup in an online environment. Flashing the photos of organs while explaining their functions may suffice for retaining anatomical details.

Although there was no significant difference in the overall scores between the control and experimental groups, there was time constraint in the use of the *Froguts* as the students had to follow the pace of the discussion without staying on a certain part of the dissection activity to gain more hands-on experience. With the findings we have gathered as well as the observations while conducting this study, it is recommended: *(a)* to apply a higher level of assessment for measuring learning acquisition other than remembering anatomical details; *(b)* to conduct a similar study in other private and public schools with multiple grade levels where anatomy is part of Science lessons for enhancing the validity and reliability of the results; and *(c)* to factor in the time between the exposure to the treatment and the assessment by applying a time series design.

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