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Actual Frog Dissection Versus Froguts Virtual Dissection as Performed by Grade 10 Students

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ABSTRACT

This study investigated the perception of Grade 10 students on actual frog dissection and Froguts dissection to identify the factors affecting student participation in and the acceptability of both dissection options. The participants recruited in this study are 14 male and 9 female students from Kids' World Christian Academy in San Mateo, Rizal had no experience in dissecting a frog. Froguts dissection software was used to discuss the parts of the frog during the first day of the study. Actual dissection was administered for the same topic to give a full experience of both dissection options. Interviews were conducted after the lesson using both dissection variants. Students' responses were coded using Unidimensional Description for qualitative purposes. The findings across the categorized responses point to the students' perceptions of both dissections as *effective learning tools*, *visually appealing*, and as *motivation for selecting future careers*. Students viewed Virtual Dissection as a tool that could be used as *alternative* or *preparatory* to Actual Dissection, which was found to be advantageous for the *tactile experience* and *clear exploration*. Students gave more accounts of their encounter during Actual dissection than Froguts dissection, indicating that they were more perceptive about actual dissection and less interested in Froguts. It is recommended that further studies be conducted to quantify the effectiveness of actual and virtual dissection on students' information retention.

KEYWORDS:
Dissection; Actual; Virtual; Perception; Alternative

I. INTRODUCTION

Dissection is defined as the action of cutting something open, especially a dead body or plant, in order to study its structure (Cambridge Dictionary, 2019). It is a learning tool in Biology that is used in studying the anatomy and physiology of animals and humans. Dissection gives students a realistic learning experience as they get to see and hold the specimen which makes learning science more evidence-based and connected to reality. A biology class will never be complete if there is no animal dissection of a real specimen in the laboratory as it is an important tradition in biology education (Osenkowski et al, 2015). Today, there are two commonly used variants of dissection in biology education: the traditional or actual dissection and the virtual dissection.

Actual dissection employs the use of real animal specimens for anatomical and physiological experiments. For a long time now, actual dissection has been the traditional way to expose and learn about animal structure (de Villiers and Monk, 2005). Proponents of traditional dissection elect to use this variant for its numerous advantages such as providing concrete, hands-on learning experiences with anatomy; giving first-hand experience in seeing and holding the specimen; heightening the attention of students; and making their learning registered as real (Offner, 1993). Majority of teachers and students were in favor of animal use and dissection in biology education. It was found that animal use was considered a source of motivation allowing better understanding and long-term knowledge (Amahmid et al, 2019). Overall, there is a strong support to the continued use of animal dissections from students because they were interested in experiencing, firsthand, the anatomy of the organ they were studying (Kavai et al, 2017).

Virtual dissection is another option for dissection. This newer variant utilizes alternative ways of studying animal anatomy and physiology with the aid of technology. This kind of dissection is usually in the form of simulation application or software. It is advantageous in terms of being time-efficient; non-costly; decreases confusion and frustration since the user can redo the procedure all over again; and is easy in procurement and disposal (de Villiers and Monk, 2005). It was found that virtual dissection was perceived by students to be either useful or essential for their learning and

understanding of both the structure and functions of body systems (Franklin et al, 2001). Students' performance was also affected positively by exposing the students to a dissection simulation, offering a suitable cognitive and constructive learning environment (Akpan, 2002). On the contrary, virtual dissection also has perceived disadvantages such as lack of sensory experience; lack of visual-spatial thinking; lack of realism; and lack of dissection skills honed in the process (de Villiers and Monk, 2005).

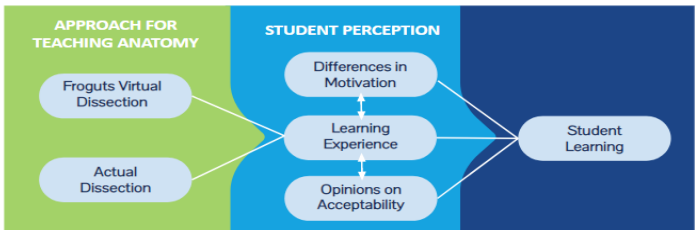

Figure 1. Conceptual Framework

The emerging interest of different stakeholders on the utilization of virtual dissection methods in classrooms opens a bigger cause for studies and research. There are perceptions coming from education and biology experts in the field, students training to become future educators, animal welfare campaigners, and the students who are the immediate beneficiaries of the possible outcomes in the course of teaching anatomy and physiology in biology classes. These studies and research aiming to acquire more perceptions of students, primarily, is deemed necessary in order to put a venue for students' voices to contemplate what is helpful to their learning (De Villiers and Monk, 2005 as cited in Edwards et al, 2014).

The free will of the students on this matter is valued as it may impinge negatively on their learning experience if they have hesitations in doing a certain task. Learning experience is defined as a wide variety of experiences across different contexts and settings which transforms the perceptions of the learner, facilitate conceptual understanding, yield emotional qualities, and nurture the acquisition of knowledge, skills and attitudes. In an educational setting, learning experiences which are ideally challenging, interesting, rich, engaging, meaningful, and appropriate to learner needs are considered to be key factors predicting further learning (UNESCO IBE, 2013).

Students are the main beneficiaries of choosing which variant of dissection will be used in classrooms. It is worth noting that their perception about how topics are delivered is of prime consideration because it may affect their learning experience (Oakley, 2012).

This qualitative research aims to investigate the perceptions of Grade 10 Students on Actual versus Froguts Virtual Dissection guided by the following research questions:

(1) How do Grade 10 students describe their learning experiences in both actual and virtual dissection?

(2) What are their motivations in participation and opinions on acceptability of actual and virtual dissection?

II. METHODOLOGY

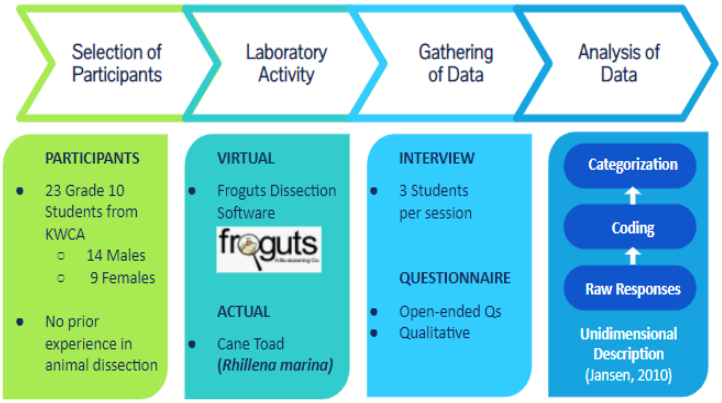

Figure 2. Methods and Design

This research made use of a case study for qualitative research. Participants were exposed to both Actual and Froguts dissection and were interviewed using open-ended questions to get their perceptions on both dissection variants. Responses were analyzed using the unidimensional description for categorization purposes (Figure 2).

Convenience sampling was used by selecting the entire Grade 10 students of Kids' World Christian Academy from San Mateo, Rizal, who were bound to perform a laboratory activity about the human reproductive system. The class was composed of 23 students (14 males and 9 females) with an age range of 15-17 years old. The lesson plan used for the dissection was a modified version of their topic, "*Parts of the Reproductive System*". All students employed in the study had no experience on actual dissection of frogs or any animal prior to this research.

The Laboratory Activity

The study consisted of a three-day lesson on anatomy and physiology in the laboratory focusing on human digestive and urogenital systems in the laboratory.

A. *Froguts Dissection*

Froguts was a Bio-eLearning company that used to offer animal dissection software for teaching and learning animal anatomy and physiology. Froguts dissection was facilitated during the first day of the laboratory activity. Froguts application software was installed in the computer units inside the computer laboratory. The teacher served as the facilitator while the students were working in pairs. The students alternately tried out the procedure in the module while the teacher had her laptop screen projected onto the classroom TV monitor to guide the students through the process. The students were instructed according to the lesson plan for virtual dissection, going through the module on the Frog and its urogenital system, and they were given ample time to finish the module. The entire process was guided by a written and audio instruction on the application while the teacher was roaming around to entertain questions.

B. *Actual Dissection*

The actual dissection was performed during the second day of the laboratory activity. The specimen used was *Rhinella marina* or the cane toad due to availability and ease of procurement. Frogs are generally used for dissections and literature. Hence, the term frog was used in this study. The class was divided into three groups and each group was led by a facilitator acting as guide through the whole process. The activity was patterned after the flow of dissection in Froguts.

To ensure the humane process of dissection, the frogs were sedated with 95% ethanol and pithed. The importance of sedation and pithing was explained to the students and was followed by the inspection of the frog's external parts. Then, they proceeded with skinning and cutting the frogs open to expose the internal organs. The students were asked to accomplish the labeling activity after the dissection.

Gathering of Data

The students were asked to answer a four-item questionnaire containing our self-developed

open-ended questions focusing on their experiences, perceptions, and reactions. The questions aimed to let the students describe their overall experience in both dissection variants; identify their level of involvement in the activity; determine their motivation in participating and/or not participating; and discern the aspects that makes both methods an acceptable means to learn anatomy.

The interview was facilitated in groups of three where each question was read by the facilitator before letting the participants write down their answers.

Q1. Describe how the activity affected your learning experience:
Ilarawan kung paanong nakaapekto ang gawain sa iyong karanasan sa pagkatuto:

Q2.1.1 How did you participate in…? *Paano ka nakilahok sa…?*

Q2.1.2 What was your motivation to participate or not participate?
Ano ang nakahikayat sa iyo na makilahok o hindi makilahok?

Q2.2. In your opinion, what aspects of the activity makes it an acceptable way to learn anatomy?
Sa iyong opinyon, anu-anong aspeto mayroon ang gawain upang ito ay maging katanggap-tanggap na paraan ng pag-aaral ng anatomy?

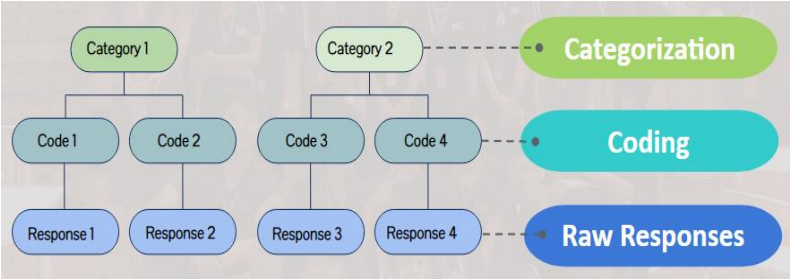

Figure 3. Unidimensional Description Process (Jansen, 2010)

Analysis of Data

The first step in treating the data was checking the answers to determine if their responses were aligned with the questions. The responses were read per line item in one blow so that the interpretation of the ideas is not affected negatively and to avoid deviation from the question being answered. The same procedure was followed in checking the responses in the succeeding questions. Responses expressed in the Filipino language remained untranslated to avoid losing its raw idea and context. After the encoding process, the responses were analyzed using an upward coding system (Figure 3) where commonalities in individual responses were distinguished in order to find any correlation between the students' perceptions (Jansen, 2010). Also known as the unidimensional description, the students' responses were categorized by assigning a certain description that represents the response in a concise manner called code, which has produced the first set of categories. After coding all individual responses, the first set of categories were regrouped by putting similar labels in one broader group, which became the main category. Due to an upward categorization scheme, the initial category became Category 2 and the main category, Category 1. Category 1 was then used to group the responses before tabulating the results in a manner that would allow us to compare and contrast Froguts and Actual dissection.

III. RESULTS

23 students were interviewed per group of 3 to accommodate everyone under a limited time. Some students wrote down more than 1 answer per question so we had to divide them into separate fragments of ideas that correspond to a distinct description. It resulted in a greater number of responses as compared to the number of respondents.

Q1. Describe how the activity affected your learning experience: Actual Dissection

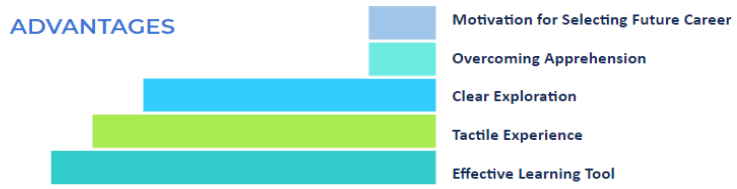

Figure 4. Advantages of Actual Dissection

Advantages. 23 students provided an advantage of Actuat dissection and a total of 39 individual responses were gathered from them. 15 responses were given by the female respondents and 24 responses were from the males. *Effective Learning Tool* garnered 12 responses; *Tactile Experience* got 11 responses; and *Clear Exploration* had 10 responses (Figure 4).

Figure 5. Disadvantages of Actual Dissection

Disadvantages. A total of 26 individual responses were gathered from the class where only 1 student (male) did not provide a disadvantage of Actual dissection. 10 responses were given by the female respondents while 16 were from the males. The top disadvantage was *Apprehension* (7 responses) followed by *Disgust* (6 responses) and *Posing Harm* and *Specimen Irregularities* both having 4 responses (Figure 5).

Q1. Describe how the activity affected your learning experience: Froguts Dissection

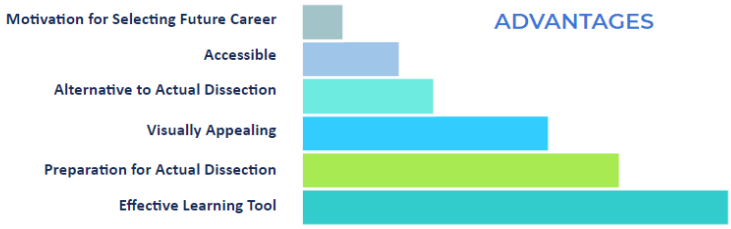

Figure 6. Advantages of Froguts Dissection

Advantages. 23 students who participated in the interview provided an answer on the advantage of Froguts. A total of 36 individual answers were collated in which 15 came from female respondents and 21 were from the males. Resulting categories were: (a) *Accessible*, (b) *Alternative to Actual Dissection*, (c) *Effective Learning Tool*, (d) *Inspirational*, (e) *Preparation for Actual Dissection*, and (f) *Visually Appealing*. 12 responses showed that students see Froguts dissection as an *Effective Learning Tool*; 9 responses for *Preparation For Actual Dissection*; and 7 responses as *Visually Appealing* (Figure 6).

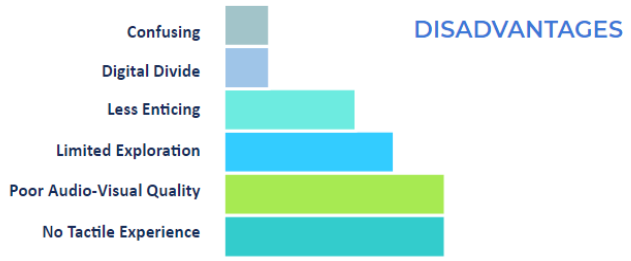

Figure 7. Disadvantages of Froguts Dissection

Disadvantages. A total of 21 individual responses regarding the disadvantages of Froguts were collected, where 4 students (female) did not provide any. Out of 21 responses, 10 were from female respondents and 15 were from males. *No Tactile Experience* and *Poor Audiovisual Quality* tied at 6 responses each while *Limited Exploration* sits on the second place with 4 responses and *Less Enticing* on third with 3 responses (Figure 7).

Q2.1.1 / Q2.1.2 How did you participate in…? What was your motivation to participate or not participate?

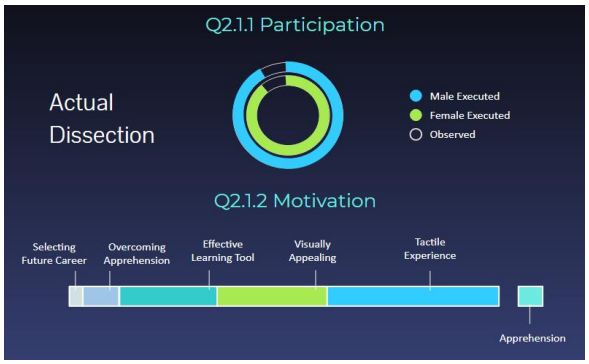

Figure 8. Participation and Motivation in Actual Dissection

Figure 9. Participation and Motivation in Froguts Dissection

Participation and Motivation in Actual Dissection. Students were asked how they participated in the actual dissection to identify their level of involvement in a descriptive manner whether they participated in terms of sharing the legwork of the dissection (not limited to answering the worksheet) or just merely observed their peers (spectators). 21 students answered that they took part in the dissection (executed) and only 2 students (1 male and 1 female) expressed that they merely observed (Figure 8).

Participation and Motivation in Froguts Dissection. Froguts dissection garnered a lesser number of individual responses about students' motivation to participate as compared to the responses for Actual dissection. Out of 23 students who answered the survey, 20 were able to execute the dissection using the application while 3 merely observed (Figure 9) in which 1 was a male student and 2 were females. A total of 26 individual responses were gathered from the students and the top motivation for participation was *Effective Learning Tool* (11 responses) which is more than twice as much as the second highest (*Modern Technology* with 4 responses). The consistent reasons for Froguts being seen by students as an *Effective Learning Tool* were curiosity and their interest to learn the parts/organs of a frog.

Q2.2. In your opinion, what aspects of the activity makes it an acceptable way to learn anatomy?

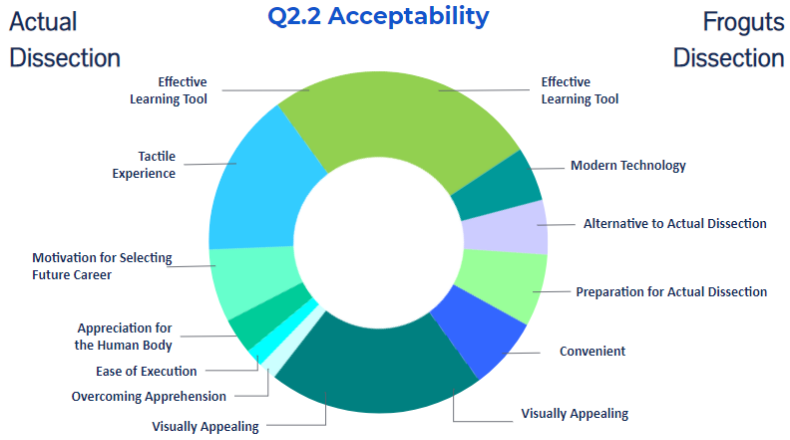

Figure 10. Acceptability of Actual and Froguts Dissection

The perceptions of all the students regardless of their participation in the dissection activity (executed or observed) were included. The combination of all the categories in general gave us a total of 58 individual responses, 29 from Actual and 29 from Froguts. The data revealed that there were categories present in both dissection options, being *Effective learning Tool* and *Visually Appealing*. The top category was *Effective Learning Tool* with 8 responses from Froguts and 7 responses from Actual (15 responses). Next was *Visually Appealing* with 5 responses from Actual dissection and 7 responses from Froguts dissection (12 responses). The third highest was *Tactile Experience* with 9 responses coming solely from Actual dissection (Figure 10).

IV. DISCUSSION

Several themes that emerged from recurrent categories of responses for all interview questions, were found to be similar to findings of De Villiers (2005), Apat (2019), Akpan (2002), Franklin et.al. (2001), and Amahmid (2019):

Grade 10 students described their learning experiences by characterizing both modes of dissections as ***Effective Learning Tool***s. Actual dissection was considered advantageous as it provided ***Tactile Experience*** and ***Clear Exploration***. While Froguts was preferred since it was considered as ***Visually Appealing***.

The students' opinion on acceptability of Actual Dissection was influenced by ***Selecting Future Career*** related to the medical field. Whereas, students identified ***Overcoming Apprehension*** was a challenge they faced during participation.

The students' motivation for participation and opinion on acceptability of Froguts was that it could be used as ***Alternative to*** or ***Preparation for Actual Dissection.***

Overall, there was a ***greater number of responses for Actual dissection compared to Froguts dissection.***

V. CONCLUSION

The categories and themes in this study provided a generalization on how the students perceived their learning experience through Actual and Froguts dissections, namely:

- Both dissection variants were perceived by students to be *Effective Learning Tools, Visually Appealing,* and *Motivations for Selecting Future Careers*.
- Actual dissection was considered advantageous over Froguts since it offers *Tactile Experience* and *Clear Exploration*.
- Froguts was regarded as an *Alternative* to and a *Preparation For Actual Dissection*, particularly since apprehensions arise in doing actual dissections.
- Overall, students were more perceptive about actual dissection since they gave more accounts about

their engagement in this mode..

Recommendations

In the course of the research, students were first allowed to experience Froguts dissection before Actual dissection. Further studies must be conducted to find out the differences in student perception had it been done the other way around. It could likewise be investigated how student learning is affected when each type of dissection is done on its own, as compared to being done in a succession, and in reverse order.

Moreover, to confirm the students' claim that both types of dissection are effective learning tools, a follow-up quantitative study could be conducted to test the retention of the terms and concepts in the anatomy lesson when the series of dissections are done with the Froguts dissection first compared to performing the Actual dissection first.

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