Contextual Framing Approach and Student's Performance and Attitude in Biology

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Abstract *– Transfer-of-learning is one of the most important educational phenomena. To understand how to teach students how to learn, we have to understand something. This paper determines the effects of contextual framing approach and students' performance and attitude in Biology. Two comparable classes of Grade 10 students were the subjects of the study. One group was exposed to conventional teaching approach and the other to contextual framing approach. The single-blind experimental method of research was utilized. The findings reveal that the performances of the students exposed to different approaches were not comparable as shown by the students' post-test performance exposed to contextual approach which is higher than the students' post-test performance exposed to conventional approach. However, the performance of students exposed to the conventional approach and contextual approach has no significant difference. Moreover, the students in the control and experimental group developed a highly favourable attitude after their exposure to the conventional and contextual approach. The performance and attitude of the students has significant relationship after their exposure to two different approaches. The following recommendations are offered: the contextual framing approach could be used as part of the teaching-learning process; the contextual framing approach can be integrated in the curriculum of the pre-service students; a case study should be investigated, on the factors affecting improvement of performances of students exposed to contextual framing approach; and the use of contextual framing approach should be further experimented in other disciplines, for a wider range of topics and for a longer period of time.*

Keywords *– Attitude, Contextual framing approach, Conventional approach, Posttest performance, Pretest performance*

INTRODUCTION

Biology is one of the courses that explain natural events (Gercek & Ozcan, 2015). However, in literature there are studies claiming that the association level of students between daily life events and biology subjects is very low. Contextual framing approach is described as the starting point for the development of scientific ideas in science teaching. In this approach real-life contexts are used to introduce concepts.

Achieving understanding of nature is one of the aims of science. Transfer-of-learning, or the application of something that has been learned in one context to another context, is one of the most important educational phenomena. Without it, what students learn in school and elsewhere would have little effect on the rest of their lives.

It's safe to say that most teachers have an intuition about the importance of contextual framing approach in the classroom. It is important that teachers should strive to provide real world examples for their students. There's something about a richly contextualized example that seems to help student interest and performance more than if it were delivered without real world details. If the contextual framing of a problem helps bolster student understanding, then the presence of the context may actually affect student performance on assessments as well (Fout, 2009).

There is an international trend in science education towards context-based approaches. Teaching concepts in relationship to real-world contexts is expected to make science education more meaningful, relevant and motivating for students (Gilbert, 2006 cited by Weiringa, Janssen & Driel, 2012).

Although influencing everyday life more and more, natural sciences and mathematics still belong to the least popular subjects in school (Sjoberg & Schreiner, 2010). As often discussed, the inherent complexity of scientific topics as well as low relevance felt by students might be two of the main reasons for this issue. Accordingly, several approaches were developed over the past two decades to make scientific topics more understandable, interesting and relevant for students. A very popular and widely implemented attempt in this regard is the contextual framing approach. Despite being a quite heterogeneous field, different approaches of contextual framing approach are unified by the core idea of putting scientific concepts, models or topics in some kind of frame connecting science to everyday life, societal issues, or technological innovations (Podschuweit & Bernholt, 2018).

Compared to traditional programs, student's understanding of scientific concepts obtained from context-based programs is at least as good, while the interest, motivation and attitude towards science is usually improved (Vos, 2014).

Leaners become authors who share their knowledge, making them more likely to contribute what they know. When a contextual framing is in effect, leaners learn under the assumption that they will be expected to transfer what they have learned to other.

OBJECTIVES OF THE STUDY

Generally, this study, an excerpt, aimed to determine the effects of Contextual Framing Approach and Students' Performance and Attitude in Biology.

Specifically, this excerpt of a study, aimed to answer the following specific questions:

1. What is the performance of students in biology exposed to

a. conventional approach, and

b. contextual framing approach?

2. Is there a significant difference in the performance of students exposed to the two different approaches?
3. What is the attitude of the students toward biology after their exposure to the two different approaches?
4. Is there a significant relationship between the performance of the students and their attitude towards biology after their exposure to the two different approaches?

MATERIALS AND METHODS

Methods

The single–blind experimental method of research was used in this study to determine the effects of the two approaches in the performance of the students in Grade 10 Biology. This design involves two groups of students, the experimental and the control group (Angeles, 2013 cited by De Guzman, 2015).

The pre-test – post-test control group design was employed. The students in the experimental group were exposed to contextual framing approach, while the students in the control group were exposed to conventional approach.

Materials

The instrument used to measure the effect of the two teaching approaches on the performance of students is a researcher-made test question. It was a 50–item multiple choice type and was based from the table of specifications. The test was submitted for content validation in order to ensure that the final version of the test would be useful and functional. The criteria set by Meimban (2005) as cited by Carungay (2015) were used to validate the pre-test/post-test in Biology.

Meanwhile, the Biology Attitude Questionnaire of Russell and Hollander (2011) were used to assess the attitude of the students towards Biology after their exposure to their respective approaches. It comprises a 14-item scale/statement with 5-point loading ranging from Strongly Agree (A), Agree (B), Undecided (C), Disagree (D), to Strongly Disagree (E).

To maximize the speed and to ensure reliability of all necessary computations, statistical treatment of data was done using the Statistical Packages for the Social Sciences (SPSS).

The pre-test and post-test performance of the students exposed to the two different approaches were determined using mean, standard deviation, coefficient of variation, and skewness and kurtosis. The Wilcoxon W was used to test for the significance of the difference in the pre-test and post-test performance of the students within each teaching approach. The significance of the difference between the performances of the students exposed to the two different approaches was tested through the t-test for the independent sample means.

The Spearman Rho test of relationship was used to determine whether there is a significant relationship between the performance of the students and their attitude after their exposure to conventional and contextual framing approach.

RESULTS AND DISCUSSION

Performance of Students Exposed to the Two Different Approaches

Tables 1A and 1B shows the summary of the performance of students exposed to contextual framing and conventional approach.

Table 1A. Descriptive Measures of the Pre-test Scores of Grade 10 Students in Biology

Approaches	Performances	F	%	$\bar{x}$	s	Cv	Skewness			Kurtosis		
							Sk	Se	D	Ku	Se	D
Contextual Framing	Poor (11 - 20)	3	9.7	25.29	3.70	14.63	-.985	.421	NND	1.03	.821	ND
	Average (21 - 30)	28	90.3									
	Total	31	100.0									
Conventional	Poor (11 - 20)	6	20.0	25.10	4.55	18.13	-1.27	.427	NND	.290	.833	ND
	Average (21 - 30)	24	80.0									
	Total	30	100.0									

Table 1A presents the distribution of the pre-test scores of the students in contextual framing approach and conventional approach. Mostly of the students exposed to contextual framing approach scores 21 – 30 with a frequency of 28 or 90.3%. Likewise, majority of the students exposed to conventional approach scores 21 – 30 as supported by the frequency 24 or 80%.

The table also shows the computed coefficient of variation (cv) of the scores of the students exposed to conventional and contextual framing approach. The students exposed to conventional approach have higher coefficients of variation (18.13) than the students exposed to contextual framing approach (14.63). This implies that the distribution of the scores of the students exposed to conventional approach is more scatter about the mean than the students exposed to contextual framing approach.

The table presents also the skewness and kurtosis of the distribution of scores on both conventional and contextual framing approach groups. The computed skewness of each group is negative. The negative skewness index is tailing – off to the left which illustrates that the scores are mostly distributed above the mean value. The computed skewness of the scores of the students are not fall within the interval (-2Se) – (2Se). This means that the distribution of the scores of each group approximately not normally distributed in terms asymmetry. However, the computed kurtosis for each group is positive, indicates that the distribution of the scores of each group have longer tail than the normally distributed data. The computed kurtosis of the scores of each student are

not fall within the interval (-2Se) – (2Se). This means that the distribution of the scores of each group approximately normally distributed in terms of peakedness. Since, each group are not normally distributed in terms of skewness this means that the distribution of the scores is not normal.

Table 1B. Descriptive Measures of the Posttest Scores of Grade 10 Students in Biology

Table 1B shows the distribution of the post-test scores of the students exposed to conventional and contextual framing approach. Majority of the students exposed to contextual framing approach scores 21 – 30 or 31 – 40 as supported by the frequency of 11 or 35.5%. While, students exposed to conventional approach majority of them scores 21 – 30 with a frequency of 13 or 43.15%. It also fascinating to note that, there were no students exposed to contextual framing approach scores less than 21. Moreover, students exposed to contextual framing approach have a higher number of students' scores 41 – 50 than the students exposed to conventional approach.

The table also shows that coefficient of variation (cv) of the scores of the students exposed conventional and contextual framing approach. The students exposed to conventional approach have higher coefficients of variation (23.41) than the students exposed to contextual framing approach (22.48). This implies that the distribution of the scores of the students exposed to conventional approach is more scatter about the mean than the students exposed to contextual framing approach.

Performance	Approaches	Mean Rank	Wilcoxon W	p-value	Description
Pre-test	Contextual Framing	30.02	930.500	0.658	Not Significant
	Conventional	32.02			
Post-test	Contextual Framing	33.03	867.000	0.363	Not Significant
	Conventional	28.90			

The table presents also the computed skewness and kurtosis of the distribution of scores of the experimental and control group. The computed skewness of each group is negative. The negative skewness index is tailing – off to the left which illustrates that the scores are mostly distributed above the mean value. The computed skewness of each group is fall within the interval (-2Se) – (2Se). This means that the distribution of the scores of each group is normally distributed in terms of asymmetry. Likewise, the computed kurtosis for each group is negative, indicates that the distribution of the scores of each group have a smaller tail than the normally distributed data. The computed kurtosis of the scores of each group are not fall within the interval (-2Se) – (2Se). This implies that the behaviour of the distribution of the scores of each group is wider than the normal curve in terms of peakedness. This means that distribution of the scores of each group is approximately not normally distributed.

Approaches	Performances	F	%	$\bar{x}$	s	cv	Skewness			Kurtosis		
							Sk	Se	D	Ku	Se	D
Contextual Framing	Average (21 - 30)	11	35.5	34.87	7.84	22.48	-.229	.421	ND	-1.16	.82	NND
	Satisfactory (31-40)	11	35.5									
	Very Satisfactory (41 - 50)	9	29.0									
	Total	31	100.0									
Conventional	Poor (11-20)	1	3.3	33.10	7.75	23.41	-.199	.427	ND	-1.26	.833	NND
	Average (21 - 30)	11	36.7									
	Satisfactory (31-40)	13	43.3									
	Very Satisfactory (41 - 50)	5	16.7									
	Total	30	100.0									

This finding agrees with some studies regarding the performances of the students exposed to the two different approaches. The study revealed that the performance of the students is slightly inclined after the change.

Difference in The Performance of Students Exposed to The Two Different Approaches

Table 2 presents the summary of the results regarding the test of comparison between the two groups.

Table 2. t-Test between the Performance of the Students Exposed to the Two Different Approaches

The data reveals that the computed W – value of the pre-test scores is 930.50 with p-value of 0.658. Since the computed value is higher than the expected 0.05 value, the null hypothesis is accepted. This implies that there is no significant difference between the scores of the students exposed to conventional and contextual framing approach. This means that two groups are comparable with each other in terms of their pre-test performance.

Table 2 also shows the computed W – value of the post-test scores which is 867.00 with p-value of 0.363 higher than the alpha level 0.05. With this, it is apparent that the null hypothesis stating that there is no significant difference in the post-test performance of the students is accepted. This means that the post-test performance of the students exposed to conventional and contextual framing approach are the same from each other.

The finding agrees with some studies that there is no significant difference between the scores of the students exposed to two different approaches. This implies that contextual framing does not impact performance.

Attitude of the Students After their Exposure to the Two Different Approaches

Table 3 shows the summary of the attitudes of the students after their exposure to the two different approaches.

Table 3. Attitude of the Students After their Exposure to the Two Different Approaches

Statements	Contextual Framing Approach		Conventional Approach	
	Mean	Description	Mean	Description
1. Biology is very interesting to me.	4.3548	VHF	4.1000	HF
2. I like biology, and it doesn't scare me to have to take it.	3.6452	HF	3.9000	HF
3. I am not always under a terrible strain in a biology class.	3.8065	HF	3.6667	HF
4. Biology is fascinating and fun.	4.1290	HF	3.9667	HF
5. Biology makes me feel secure, and at the same time it is stimulating.	3.9677	HF	3.8333	HF
6. Biology makes me feel comfortable, easy, and patient.	3.9355	HF	4.0667	HF
7. In general, I have a good feeling toward biology.	4.0645	HF	3.9333	HF
8. When I hear the word biology, I have a feeling of liking it.	4.2903	HF	3.8000	HF
9. I approach biology without a feeling of hesitation.	3.8387	HF	3.5333	HF
10. I really like biology.	3.8065	HF	3.7000	HF
11. I have always enjoyed studying biology in school.	3.9677	HF	3.7333	HF
12. It doesn't make me nervous to even think about doing a biology experiment.	3.5161	HF	3.4000	F
13. I feel at ease in biology and like it very much.	4.0000	HF	3.7000	HF
14. I feel a definite positive reaction to biology; it's enjoyable.	4.2258	HF	4.0000	HF
Over – All	**3.9677**	**HF**	**3.8095**	**HF**

It can be gleaned from the table 3 that majority of the students expresses positive attitude toward Biology after their exposure to the two different approaches. They rated themselves to have "agreeable" attitude as it is indicated by the overall mean of 3.9677 for contextual framing approach and 3.8095 for conventional approach.

Students' attitude exposed to contextual framing approach shows more highly favourable response than those in the conventional group. One reason for this is that the used of contextual framing approach is effective in the formation of students' favourable attitude towards Biology because it engages their attention and interest.

The finding agrees with some studies that contextual framing approach increases the motivation and attitude of the students. This implies that students' attitude exposed to contextual framing approach shows more highly favourable response than those in the conventional group.

Relationship Between the Performance of the Students and Their Attitude After Their Exposure to the Two Different Approaches

Table 4 shows the relationship between the performance of the students and their attitude after their exposure to the two different approaches.

Table 4. Spearman Rho test of Relationship between Attitude and Performance of the Students after Exposure to the two Different Approaches

Approaches		Attitude		
		Correlation Coefficient	Sig. (2-tailed)	Description
Performance	Contextual Framing	0.556**	0.001	MHPC
	Conventional	0.506**	0.004	MHPC

**. Correlation is significant at the 0.01 level (2-tailed).
MHPC = Moderately High Positive Correlation

Table 4 indicates a Spearman Rho values for contextual framing and conventional teaching group of 0.556 and 0.506 with a significance of 0.001 and 0.004 respectively, which are obviously less than the alpha level of 0.05. With this, it is apparent that the null hypothesis stating that there is no significant relationship between the post-test performance and Attitude in Biology of each group of students is rejected. Since, the computed Spearman Rho value between post-test performance and Attitude in Biology of each group are 0.556 and 0.506, indicates that post-test performance and Attitude in Biology are directly proportional with each other. Moreover, the strength of relationship between the indicated variables from each group of students is Moderately High Positive Correlation. Therefore, the students with higher attitude towards the subjects tend to have a higher performance.

One reason for this is that students engage actively because they like the subject, it becomes more enjoyable and interesting for them.

The finding agrees with some studies that there is significant relationship between the performance of the students and their attitude after their exposure to the two different approaches. This implies that the students with higher attitude tend to have a higher performance.

CONCLUSIONS AND RECOMMENDATIONS

Based on these findings, the researcher concludes the following in this study:

1. The performances of the students exposed to conventional approach and contextual framing approach were not comparable as shown by the students' post-test performance exposed to contextual framing approach which is higher than the students' post-test performance exposed to conventional approach.
2. The performance of students exposed to the conventional approach and contextual framing approach has no significant difference.
3. The students in the control and experimental group developed a highly favourable attitude after their exposure to the conventional and contextual framing approach.
4. The performance and attitude of the students has significant relationship after their exposure to the conventional and contextual framing approach. The students with higher attitude tend to have a higher performance.

Based on these conclusions, the following recommendations are provided in this study:

1. The contextual framing approach could be used as part of the teaching – learning process.
2. The contextual framing approach can be integrated in the curriculum of the pre-service students.
3. A case study should be investigated, on the factors affecting improvement of performances of students exposed to contextual framing approach.
4. The use of contextual framing approach should be further experimented in other disciplines, for a wider range of topics and for a longer period of time.

REFERENCES

[1] Gercek, C. & Ozcan, O. (2015). Views of Biology Teacher Candidates About Context Based Approach at https://doi.org/10.2016/j.sbspro.2015.07.190

[2] Weiringa, N., Janssen,F. &Driel JV. (2012). Biology Teachers Designing Context-Based Lessons for their Classroom Practice – The Importance of Rules-of-Thumb at https://hal.archives-ouvertes.fr/hal-00692181/document

[3] Vos, R. (2014). The Use of Context in Science Education. Accessed at https://dspace.library.uu.nl/bitstream/handle/1874/297294/The%20Use%20of%20Conext%20in%20Science%20Education.pdf?sequence=2

[4] Fout, A. (2009). The Role of Contextual Framing: Assessments, Classroom Practice, and Student Perceptions. Accessed on November 18, 2018 from https://pdfs.semanticscholar.org/791a/8ef8df3d8509a5bd301b3137daed44abb674.pdf

[5] Engle, R. A., Nguyen, P. D., & Mendelson, A. (2011). The Influence of Framing on Transfer: Initial Evidence from a Tutoring Experiment. *Springer Netherlands, Volume 39, issue 5, pp. 603-628.*

[6] Funke, A. R. & Oyewuni, F. K. (2016). Students' Attitude and Interest as Correlates of Students' Academic Performance in Biology in Senior Secondary School. *International Journal for Innovation Education and Research, Volume 4, issue 3.*

[7] Hussaini, I., Foong L. M., & Kamar, Y. (2015). Attitudes of Secondary School towards Biology as a School Subject in Birninkebbi Metropolis, Nigeria. *International Journal of Research and Review, Volume 2, issue 10, pp. 596-600.*

[7] Khan, G. N., & Ali, A. (2012). Higher Secondary Pesman, H. &Ozdemir, O. F. (2012). Approach – Method Interaction: The Role of Teaching Method on the Effect of Context – Based Approach in Physics Instruction. *Int J SciEdu, 34, pp. 2127-2145.*

[8] Podschuweit, S. &Bernholt, S. (2018). Composition-Effects of Context-based Learning Oppurtunities on Students' Understanding of Energy. *Res SciEduc, Volume 48, no. 4, pp. 717-752.*

[9] Russell, J. & Hollander, S. (2011). A Biology Attitude Scale. National Association of Biology Teachers, 271.

[10] Sadler, D. (2009). Situated Learning in Science Education: Socio-Scientific Issues as Contexts for Practice, *Stud SciEdu, 45, 1-42.*

[11] Susantini, E. et. al. (2018). Engaging Pre-Service Teachers to Teach Science Contextually with Scientific Approach Instructional Video, IOP Conference Series: Material Science and Engineering, 296.