

## PowerPoint-based quizzes in wave motion: Performance and experiences of students

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### ABSTRACT

The effect of PowerPoint Presentation-based (PPPb) quiz to the students' scores has been rarely studied. It is the intention of this research to understand the effect of PPPb quiz to students score in wave motion and the students' experiences under such a strategy. This research used a mixed approach: quasi-experimental to learn if scores gain was significant, and thematic analysis was used to know the experiences of the students. The results confirmed that PPPb quiz has indeed increased the scores of the students. Statistical analysis verified that this increase was significant. On the thematic analysis, students manifested comparing oral quiz to PPPb, caught their attention, and vivid communication. Therefore, the effect of PPPb was significant to the students because it positively impacted their scores in wave motion and promoted vivid communication among students.

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## 1. INTRODUCTION

The new century requires teachers to find ways for students to learn. In fact, teachers need to have computer literacy skills in order to use these in meaning-making inside the classroom. These skills will be very vital since the majority of the learners are into computer games, online networking sites, and smartphone applications. Hence, teachers need to keep face with the current trend of pedagogy or else be outdated.

Basic skills in computer include working with Microsoft Office like Word, Excel, Publisher, and PowerPoint. There are many applications of the said mentioned technology inside the classroom. One of those is the PowerPoint Presentation (PPP). Inside the classroom, PPP can be a modern tool while the discussion or activity is ongoing.

According to [1], PPP is a beneficial tool for lecture-discussion. [2] emphasized that improved students' attitude to the teacher and class can be observed in using PPP in the classroom. [3] saw high retention rates among students from PowerPoint Presentation as compared to the traditional lecture method.

However, it was noticed that few pieces of research are into the effect of PowerPoint Presentation-based (PPPb) quizzes to students' attitude and performance. Therefore, this study ventured into this rarely explored field. This research utilized PPPb quizzes in order to determine its effect on students' performance and attitude during quizzes in wave motion. This research is valuable to teachers and academicians who have apprehension in utilizing PPPb in the classroom.

Students' Performance in Wave Motion: This variable means the result of quizzes in wave motion. The performance was measured using a three-tier formative test instrument made by the researcher. The researcher encountered that students see wave motion as a very abstract topic and students have already a pre-conceived notion that the topic will be difficult. According to the Physics Education Research Group of

the University of Maryland, students have difficulties in describing how the wave is created and how the wave propagates through the spring. While [4] observed that students have difficulty in explaining the difference between diffraction and interference in the basic wave model.

Experiences in PPP-based Quiz: Researcher around the globe will agree that performance and attitude are improved in using PowerPoint Presentation [5, 2, 6]. Through there are many types of research on the effect of PowerPoint Presentation towards performance and attitude, it is unclear if these studies utilized PPPb quiz. They are mainly concerned about the utilization of PowerPoint as a tool to lecture method and its effect on performance and attitude but not as a method of testing. This study focused now on the experiences of students during PPPb formative test as compared to the traditional method of testing.

Statement of the Problem: This study will determine the performance and attitude during PowerPoint-based quizzes in wave motion. Specifically, this study sought answers to the following questions: what is the performance of the students during PPPb quizzes in wave motion; what is the performance of students during traditional testing in wave motion; is there a significant difference between the performances of students during PPPb quizzes and traditional testing in wave motion; what are the experiences of the students during the PPPb quiz.

## 2. RESEARCH METHOD

This study utilized mixed methods of quantitative and qualitative research. In quantitative style, this study used quasi-experimental design with two-group-posttest-only design. According to [7], this design will eliminate some external threats to validity like maturation and history since there is no exposure to pretest. Figure 1 is the diagram of this design.



Figure 1. Diagram of research design

The symbol X means the treatment used in this experiment which is the PPPb quiz while symbol N is the experimental group and N<sub>1</sub> is the control group. As seen, only the experimental group (N) received PPPb quiz (X). The control group (N<sub>1</sub>) is the traditional mode of testing without the aid of modern technology.

Moreover, this research utilized thematic analysis in a qualitative study to investigate the experiences of the participants during the PPPb quizzes. According to [8], the goal of thematic analysis is to produce themes which reflect the experiences of the participants of a research study.

### 2.1. Participants

Four classes were utilized by this study as participants. Two classes were exposed to the treatment and two class were considered as the control variable. These students were enrolled for the second semester of the school year 2017-2018 for the course Application of Science 202 or Waves, Sound, Light, Electricity, and Magnetism. Since the study cannot pursue pure experimental design due to intact class schedule, all members of the said classes were utilized. Meanwhile, for the interview phase of the study, there was no limitation to the number of interview-participants just until the saturation of the data was fulfilled.

### 2.2. Instrument

The main instrument of this study is the three-tier multiple choice formative test for wave motion. The first tier is the main question with four options. The second question asked the reason for the answer in the first tier. Finally, the last tier will determine the confidence level of the participants. This instrument underwent validation and standardization.

First, a list of topics and objectives were gathered. The topics included in the test instrument were kinds and types of waves, characteristics of waves, and properties of waves. Initially, 15 questions were constructed for each topic in the formative test for wave motion. Second, the instruments underwent experts' analysis and revision. Their comments and suggestions were incorporated into the instrument. Then, the instruments were subjected to pilot testing to other students who were taking a similar course code.

The result of the pilot testing was gathered and utilized for internal consistency using Cronbach's Alpha. Finally, the formative test for wave motion was trimmed down to 10 questions per topic as result of the internal consistency testing. The instrument has internal consistency of 0.85.

### 2.3. Interpretation of data

The answers of the participants to the three-tier multiple choice formative test for wave motion were categorized into three levels: No Understanding, Partial Understanding, and Full Understanding. Students who commit no understanding will have a score of 0, partial understanding will have 1, and full understanding with 2 points. The statistical tool to be used are frequency count, mean, t-test for independent sample mean, and t-test for dependent sample mean.

Furthermore, the interview data will be analyzed using thematic analysis following the steps provided by [9]. The interview data were gathered using full audio-recording. The study used researcher-derived codes in order to be familiar and get attached to the interview transcripts.

## 3. RESULTS AND ANALYSIS

### 3.1. Performance in wave motion

The performance in wave motion was measured using the three-tier multiple choice formative test and were categorized into: no understanding, partial understanding, and full understanding, it can be seen in Table 1.

Levels of Performance	Experimental Group f	%	Control Group f	%
Full Understanding (1.35 - 2.0)	63	60.00	25	23.81
Partial Understanding (0.68 - 1.34)	38	36.19	65	61.90
No Understanding (0.00-0.67)	4	3.81	15	14.29
Total	105	100	105	100
Mean	1.42	--	1.11	--
Evaluation	Full Understanding	--	Partial Understanding	--

Based on Table 1, there were 63 participants or 60% gained a full understanding of wave motion using PPPb quizzes while only 25 participants or 23.81% fully understand the topic using traditional method of quizzes. In addition, there were 38 participants or 36.19% partially understand the topic using PPPb quizzes as compared to 65 participants or 61.90% under the traditional method of the given quiz. Finally, four students or 3.81% have no understanding of the topic using PPPb quizzes and 15 or 14.29% did not have understanding of the topic using traditional quiz.

On average, the experimental group has a mean score of 1.42 which means that on the average, the participants fully understood the topic using PPPb quizzes. On the other hand, the average score of the control group was 1.11 which mean "partial understanding". This result is found to be similar to the findings of [1]. They stated that PPPb quizzes can enhance students' scores on the exam using its basic version. Hence, this result implied that PPPb quizzed can help get bigger scores as compared to the traditional model of giving a quiz. In was also noted that there are more students who fully understood the topic due to the effect of PPPb quiz.

### 3.2. Significant difference between the performances of students during pppb quizzes and traditional testing in wave motion

Based on Table 2, the p-value was computed as 0.00 with t value of 6.34. This p-computed value is lower compared to the 0.05 test level value. Therefore, the null hypothesis which says "there is no significant difference between the performances of students during PPPb quizzes and traditional testing in wave motion" is rejected. This means that there was a significant difference between the scores of the students.

This data implied that the score of the students under PPPb quizzes are better compared to the scores of the control group.

Table 2. Difference between the performances of students during PPPb quizzes and traditional testing in wave motion

	Experimental Group	Control Group
Mean	1.42	1.11
SD	0.36	0.35
t	6.34	
p	0.00	

### 3.3. Thematic analysis

The following themes emerged from the experiences of the participants: n *Comparing Traditional Quiz and PPPb Quiz*, *Caught Student's Attention*, and *Vivid Communication*.

#### 3.3.1. Comparing traditional quiz and PPPb quiz

The students manifested the theme “*Comparing Traditional Quiz and PPPb Quiz*” as they compare traditional mode of giving a quiz and PPPb quiz. They experienced a new mode of giving a quiz and they compared it to their new experience. The statements below support this theme.

- (1) [“In my experience, PowerPoint quizzes are more effective than the oral quiz because I can see the words rather than listen to it. In an oral quiz, we listen to our teacher, if you cannot listen attentively, you will surely fail to answer that particular item.”]
- (2) [“Many times in traditional quiz, I get low scores because I am not a good listener. With the PPPb quiz, I can say that I can have a visualization of the answer and help me think the correct answer.”]
- (3) [“During the traditional quiz, I listen and then think simultaneously to answer the question. In PPPb quiz, I can answer the question in a more efficient way. Actually, I sometimes fail in oral quizzes of my teacher because I am distracted by my classmates. This time, I have the moment to have a glimpse into the question.”]

The students explained that PPPb is better as compared to oral quizzes since PPPb allowed them to visualize the questions rather than listen to it. According to [10] and [11] majority of learners around the globe are visual learners. These authors support this theme. In the study of [12] and [13] traditional oral quizzes may not significantly impact on the scores of students, hence, these studies support the claim of this first theme. It can be implied that PPPb quizzes can visualize the questions fit to the learning style of many learners since studies suggest that learners are visual.

#### 3.3.2. Caught students' attention

The participants' attention was caught by the implementation of PPPb in the class. Students were interested and challenged by the mode of the quiz they were given.

- (1) [“My attention was caught by the good colors and effects. I can say that I find the quiz on PowerPoint interesting and more challenging than the oral quiz.”]
- (2) [“My attention was into the quiz because I can see the words and think about the answer just one at a time.”]
- (3) [“I answer attentively to the PPPb quiz in wave motion because it might be turned to the next slide. With efficiency, I have answered the question since I visualize the questions on the PowerPoint.”]

Based on the experiences of the participants, their attention was hooked by the PPPb quiz. This made them answer the items correctly due to its interesting and more challenging mode of giving the quiz. Therefore, this implies that PPPb quiz has the potential to be utilized as an alternative to traditional oral quiz due to its appeal to the 21<sup>st</sup> century students.

This result is supported by the study of [14, 15]. Both cited that graphics and animation in the PPPb can enhance the visualization of the learners. Furthermore [16] argues that PowerPoint can enhance recall of information students.

#### 3.3.3. Vivid communication

The students manifested *Vivid Communication* on the implementation of PPPb quiz in wave motion. They were clearly provided with the questions without the teacher's own command in an oral quiz. They also cited that in an oral quiz, language barrier permitted an incorrect answer for them. The following statements support this theme.

- (1) ["The way the quiz was given was clear and smooth. We need not listen very much to our teacher since the question is posted on the slides. Sometimes the language barrier between us and our teacher can prohibit us to correctly answer the quiz."]
- (2) ["I have more time to think about the answer because the questions were posted on the slides of the PowerPoint. It was clearly a vivid way of communicating to us the questions."]
- (3) ["It was a clearer way of given a quiz. We were given a quiz on a PowerPoint. It more interesting and challenging."]

The study of [17] supports the claim of this study. He argued that PowerPoint as tool for learning is most powerful when speaking to large number of people in order to create an effective and fruitful teaching. However, [18] emphasized that if the PPPb was made visually poor, students might be confused instead of helping them to learn. Moreover, [19] argued that irrelevant information presented in the slide during the quiz may hinder their comprehension of the items on the quiz. Hence, semi-formal to formal learning avenues must be providing to teachers in making good PowerPoint presentation [20].

#### 4. CONCLUSION

The 21st century is based on applying modern educational technologies to teaching and learning process in order for the current technology-inclined students to learn effectively. This study conducted a quasi-experiment on determine the effect of PPPb quizzes among students.

This study found out that PPPb quizzed can help get bigger scores as compared to the traditional model of giving a quiz. There is also a significant difference in the score of the students between PPPb quiz and oral quiz which means that PPPb quiz was significant in increasing the scores of the students.

The students elicited themes of comparing traditional quiz and PPPb quiz, caught student's attention, and vivid communication. They have compared PPPb quiz to oral by which they cited that PPPb quiz promoted a new style of interesting and challenging mode of quiz delivery. The students' attention was caught by the PPPb quiz through the vivid communication and technique provided.

It was therefore concluded that PPPb quiz has a significant effect on the scores of the students in wave motion. It has also improved communication in the classroom during quiz and caught the attention of the students. Therefore, it is recommended that physics and science teachers' may utilize PPPb quiz in the class to enhance the scores of students.

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