



Peer Review Among Undergraduate Students on Their Individual Fundamentals of Research Project During Pandemic Online Learning

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Abstract. The Pandemic has brought about resiliency of students and their teachers. This paper aimed to learn the capability of undergraduate students to perform research during pandemic with a fully online setting and do peer review of other student's work. Each student was assigned an individual topic to work on for three months. The students were told to perform experiments using easily bought materials. Out of the 41 students, 7 perform the actual experiments. This indicates majority of the students lack motivation to perform experiments through online setting. Nevertheless, they were more akin to writing review papers. Moreover, peer evaluation showed excellent rating to about 80%.

Keywords: Peer review · undergraduate · research

1 Introduction

As a result of the COVID-19 Pandemic in 2020, academic institutions stepped to transform their teaching to an online or blended learning delivery modalities, every ready to adapt to the changes that the new normal brings [1]. Flexible learning approaches are often design using a full range of teaching and learning theories, philosophies, and methods to provide students with opportunities to access information and expertise, contribute ideas and opinions, and corresponds with other learners and mentors [2]. Mentoring research during pandemic is still very important [3]. The mentors and mentees during this time have improved relationship even at online settings. Virtual mentorship mentees can look on other aspects of research aside from data collection and to find a sense of interaction with other researchers and find great purpose on this time of great uncertainty.

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In this paper, a study on a purely online learning set up during post pandemic by assigning a class to perform research and asked to evaluate their classmate's work. This paper showed the rating of students towards each other's work. This study have trained the students on how to perform research and critique other researcher's work. This may be the first time to report on the research and peer evaluations among students during online pandemic setting.

2 Methodology

2.1 Assignment of Research Topic

Forty one (41) students from the Bachelor of Science in Chemistry enrolled in the fundamentals of research subject were assigned individual topics to work on as hands on research project for three months. The list of topics was shown in Table 1. The students were asked to pick their topic among the 41 listed topic. All of the discussions were done online.

2.2 Duration and Method of Execution

The students were told to perform experiments using easily bought materials or for computational topic, they should search online for data extensively.

2.3 Evaluation of the Individual Researches

The students presented their work online and submit manuscript and poster. Their classmates were given research questions to rate each student.

The Research questions were based on the following:

1. Was the Methodology clearly and effectively designed, executed, and represented in the paper, appropriately addressing the hypothesis/thesis?
2. Did the paper forwarded a valuable, appropriately narrowed, and well-articulated research hypothesis/thesis?
3. Did the paper effectively integrated well-chosen secondary sources and appropriate primary research to define, test, and/or support the project's findings in light of the hypothesis/thesis?
4. Did the paper not only presents primary research findings, but breaks them down and examines them to determine patterns, anomalies, function, structure, and/or cause and effect. Additionally, the paper leads the reader effectively through the process used to understand the issue and test the hypothesis/thesis?
5. Did the writer offered insightful interpretation of the primary research, effectively leading the reader toward the writer's final perspective on the issue?
6. Did the writer asserted a clear thesis that controls all other ideas in the paper. It provides transitions and explanations indicating the relationships among ideas as well as their link to the thesis?
7. Were there only few mistakes, the writer indicated sources used for the study, following the guidelines of the field-appropriate documentation style?

Table 1. List of individual research topics assigned to BS Chemistry students

Individual Research Question/Topic
1. Do chemicals in plastic consumer products contribute to obesity?
2. Ocean acidification in Asia
3. Solar energy
4. New battery materials chemistry
5. Plastic recycling chemistry
6. Plant natural products chemistry
7. Marine natural products chemistry
8. Innovative fish products chemistry
9. Energy storage
10. Production of Fire resistant paper for battery explosion prevention
11. Microbial fuel cell
12. Effective waste water purification techniques
13. Effective indoor air pollution purification techniques
14. Effective river water purification techniques
15. Effective combustion of used cooking oil as fuel
16. Pyrolysis as waste reduction technique vs clean air act
17. Effective Preservation of books and papers
18. Degradation and recycling studies of old and new papers with ink
19. Pollution control practices and laboratory waste management in the Philippines
20. Methane and fertilizer and production chemistry using food waste
21. Study of river pollution from domestic and industries in the Philippines with the aid of google earth
22. Textile recycling product chemistry
23. Study on recovering PUP lagoon
24. Nutrient loading in Philippine rivers
25. Paper based chemical detection and analysis beyond pH measurement
26. Sensors for water quality
27. Sensors for air quality
28. Medicine expiration and effectivity study
29. Face mask recycling and upcycling
30. Commercial Products from waste fruits aside from fertilizers
31. Bioethanol production
32. Chemistry of a new Innovative food products from Tahong
33. Chemistry of a new Innovative food product from river shellfish
34. Energy products from seawater
35. Production of Cosmetic hydrogel products - quality control and chemometrics
36. Capacitive deionization of seawater
37. Hydrogel production in energy research
38. Study on the chemical components of biodigested products
39. 10 years and beyond water quality study of DENR/LLDA/EMB/PENRO/CENRO/LGU/NGO on water quality
40. 10 years and beyond air quality study of DENR/LGU/Clean air asia/NGO on air quality
41. Activated carbon paper or cloth production from an abundant Philippine crop, quality control and chemometrics

8. Did the paper employed scholarly tone and style (or in the fine and performing arts, whichever tone and style is deemed appropriate for the project) to build the writer's ethos and generate desired impact?
9. What is your overall rating to the paper?

The questions were asked in multiple choice type of questionnaire.

3 Results and Discussion

3.1 Experimental Research vs Review Paper

The students were assigned to perform actual experiments. However, among the 41, only 7 performed their experiment. This is roughly 17% of the class was able to abide with the research instructions. About 83% did a review paper despite instructing them to perform experiments. This is exactly the opposite of the results of studies pre-pandemic on online instructions. Means et al., 2010 [4] mentioned in their work that students have better understanding on the instructions when assigned online.

Of the 41 topics, the topics that students were able to perform hands on were as follows: Plant natural products chemistry, Energy storage, Degradation and recycling studies of old and new papers with ink, Face mask recycling and upcycling, effective waste water purification techniques, Marine natural products chemistry and 10 years and beyond water quality study of DENR/LLDA/EMB/PENRO/CENRO/LGU/NGO on water quality. Based on observations, the character and the ability of the students were the main driver of actual work performed. For other topics, the assigned research student did a review paper. This indicates that the students prefer doing paper works than experimental work at online mode of learning.

3.2 Introduction, Objectives and Methodology Evaluation

As K-12 graduates, the students were akin to performing research [5]. research introduction, objectives and methodology. These are important in writing a research paper. The evaluation of students to other researches were shown in Fig. 1 and 2. Highest scores were given to more than 80% of the responses.

Out of the 41 students, 1 chose to have his own research topic despite being told to only stick on the topics provided. It was emphasized that when a topic was given, they should stick to it as research community have their own scope and insisting on the topic that is not related to the scope might results to rejections or failure. A scope creep would result to waste of time and resources [6]. It is important to follow instructions.

3.3 Main Thought of the Research

Aside from the results shown in Fig. 3, 4, 5 and 6 where the majority of the students rated their research as highest score, the main take aways were also asked. The main take aways were mainly comments on the technical aspect of the research topic. For example, for the solar energy research, it was written with the title "The relationship of butterfly wings light absorption to its structure: a basis for developing solar panel design" and the take aways were based on the design.

Introduction, objectives
1,419 responses



Fig. 1. Student's peer review on introduction and objectives.

Methodology
1,419 responses

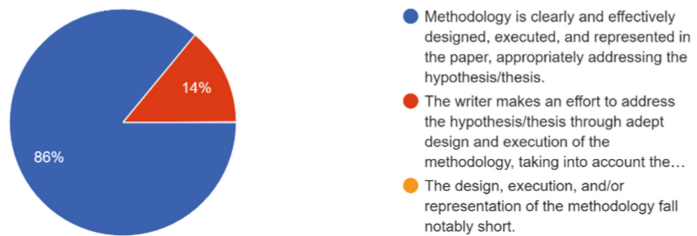


Fig. 2. Student's peer review on methodology

Clear and Effectively-Crafted Hypothesis/Thesis (with appropriate scope)
1,419 responses

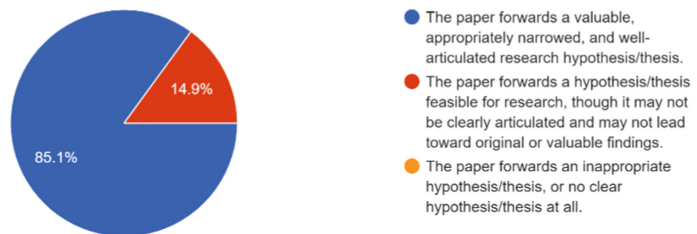
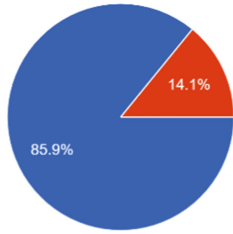


Fig. 3. Student's peer review on the hypothesis

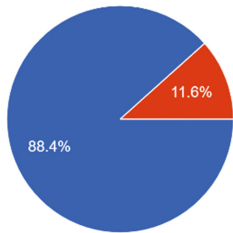
Integration of Research
1,419 responses



- The paper effectively integrates well-chosen secondary sources and appropriate primary research to define, test, and/or support the project's findings...
- The paper integrates generally pertinent secondary sources and primary research in an effort to define, test, and/or support the project's findings in high...
- The paper fails substantially to integrate pertinent secondary and primary research to define, test, and/or support...

Fig. 4. Student's peer review on integration of research

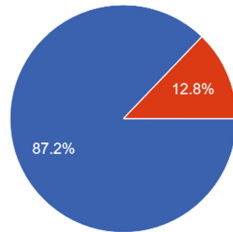
Analysis
1,419 responses



- The paper not only presents primary research findings, but breaks them down and examines them to determine patterns, anomalies, function, structure, and/or cause and effect. Additionally, t...
- The paper not only presents primary research findings, but breaks them down and examines them to determine patterns, anomalies, function, structur...
- The paper fails to provide adept analysis of primary research findings.

Fig. 5. Student's peer review on the research findings

Discussion
1,419 responses



- The writer offers insightful interpretation of the primary research, effectively leading the reader toward the writer's final perspective on the issue.
- The writer offers interpretation of the primary research, exhibiting an effort to lead readers toward his/her final perspective on the issue, though failing to do so with the desired impact.
- The writer fails to interpret the primary research clearly and/or convincingly.

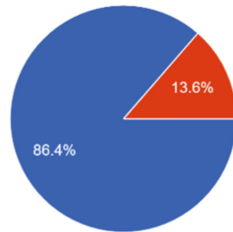
Fig. 6. Student's peer review on the discussions

3.4 Writing Skills Evaluation

The evaluation of the students towards their peers were shown in Figs. 7, 8 and 9. Consistent with the previous evaluation about 80% of the rating were highly commended.

Coherence (Thesis controls entire discussion.)

1,419 responses

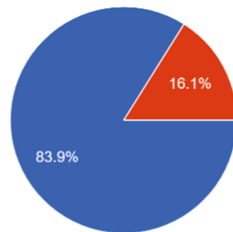


- The writer asserts a clear thesis that controls all other ideas in the paper. It provides transitions and explanations indicating the relationships among ide...
- The writer asserts a relatively clear thesis that generally controls the paper. He/she attempts to tie all ideas in the paper to the thesis, though the effort...
- The writer fails to assert a clear thesis and/or to indicate clearly the relationships among ideas discussed i...

Fig. 7. Student's peer review on the clarity of the paper

Documentation

1,419 responses

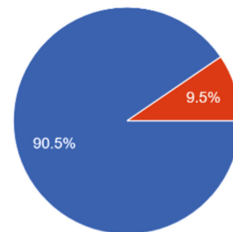


- With few mistakes, the writer indicates sources used for the study, following the guidelines of the field-appropriate documentation style.
- With some lack of control or effort, the writer documents sources used in the paper according to the field-appropriate documentation style. This effort at lea...
- Writer fails to document sources used in the paper according to the field-appropriate documentation style. The...

Fig. 8. Student's peer review on how the research was documented

Tone and Style (including grammar, syntax and diction)

1,419 responses



- The paper employs scholarly tone and style (or in the fine and performing arts, whichever tone and style is deemed appropriate for the project) to build the writer's ethos and generate desired impact.
- The writer attempts to employ an effective tone and style for the purpose of the paper, but falls short of that goal.
- Tone and style undermine the goals of the paper.

Fig. 9. Student's peer review on how the research was written

3.5 Grading Among Peers

The overall ratings of the students were from excellent to very satisfactory grades. None of the scores were satisfactory or poor (Fig. 10).

Overall grade
1,419 responses

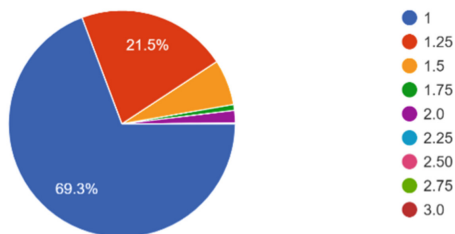


Fig. 10. Student's rating of their classmate's work overall. With 1.0 being the highest passing score and 3.0 as the lowest passing score

Peer review is an established method to expertly subject research work to scrutiny [7]. Although the peer review done by the undergraduate students were not extensive, this can hopefully make an impact on their resiliency on doing research despite challenges such as the pandemic.

4 Conclusion

This work shows the response of students based on the exercise given on a topic on fundamentals of research. The students were able to provide on the average, highest score to each other each category of rating a student research. Overall rating, on the other hand would show diverse scores from the highest to the middle high grades.

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