

Cottorganic Buds: A Tool to A Higher Conceptual Understanding of Carbon Compounds

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Abstract

The focus of the study is to know whether the use of an innovative tool such as the cottorganic buds will increase the conceptual understanding of the topic in chemistry specifically the carbon compounds. The purpose of the study is to determine if the use of cottorganic buds can improve the conceptual understanding of students in learning organic chemistry. The researcher used the pretest-posttest design that involved the experimental group and the control group which were carefully selected through a randomization procedure. This design allowed the researcher to evaluate the impact of independent variables under naturally occurring conditions. Grade 9 Laozi, the advisory class of the researcher, was the subject but divided into two groups and assigned randomly, to determine the effectiveness of the cottorganic buds. The result of the t-test showed that if the p-value is less than 0.05, then there is a significant difference between the performance of the students who used the cottorganic buds and the students who did not use them. Findings recommend the following: It is suggested that the Science teachers should use the cottorganic buds to deeply explain the topic of organic chemistry or carbon compounds to the students; and teachers are encouraged to use the cottorganic buds in other topics under chemistry such as chemical bonding, atoms and balancing equations.

Keywords: Carbon compounds; Conceptual understanding; Cottorganic buds; Organic chemistry

1. Introduction

Literacy is challenging to achieve today after the learning gaps brought on by the pandemic. Learners are distracted by various factors that may directly affect their chances to learn easily and efficiently; such as numerous applications and social sites online. Aside from these distractions, most students are having a hard time understanding technical subjects such as science which some students consider difficult, therefore decreasing science engagement (Yang et.al, 2017).

In order to enhance students' performance in chemistry, Science teachers should adopt innovative teaching approaches, such as implementing teaching strategies based on the conceptual change model, presenting historical concepts and theories, and incorporating technology. For example, multimedia tools, such as molecular model animations, video clips of chemical equilibrium, and real-time graphics, provide students with diverse opportunities to visualize chemical processes at the molecular level. Although research supports the benefits of using teaching science models and technological tools to facilitate learning in chemistry, there is limited understanding of how teaching tools assist students' learning (Shabiralyani et.al, 2015). Additionally, it remains unclear how students utilize these tools over time in classroom settings and

what characteristics of technological tools aid students in developing a conceptual understanding of chemical representations.

CONTEXT AND RATIONALE

To effectively solve chemistry problems, students must acquire fundamental skills related to the particulate nature of matter, interpreting symbols, and visualizing the spatial arrangement of atoms in molecules. These abilities are crucial in enabling students to comprehend and navigate the complexities of chemistry problem-solving.

One area that students find difficult to comprehend is organic chemistry, which is the study of carbon compounds. This topic is incorporated in Grade 9 Science as part of chemistry. The most essential learning competency that the students need to achieve is to explain how the structure of the carbon atom affects the type of bonds it forms (S9MTIIg-17). From the perspective of many students, organic chemistry poses a significant challenge, particularly when considering the three-dimensional aspect of molecular structures. Consequently, effective teaching strategies that incorporate appropriate teaching aids are necessary. To this end, this action research employed cottorganic buds as a suitable teaching tool for naming organic compounds, aimed to achieve higher conceptual understanding and academic performance among learners by using the International Union of Pure and Applied Chemistry (IUPAC) System for naming organic compounds. The use of cottorganic buds sets aligns with the principles of constructivism, which emphasize the importance of practical work, skills acquisition, and first-hand information.

INNOVATION, INTERVENTION, AND STRATEGY

This research used a pretest-posttest design that involved the experimental group and the control group which were carefully selected through a randomization procedure. This design allowed the researcher to evaluate the impact of independent variables under naturally occurring conditions. A pre-test was administered to measure the performance of the students regarding their previous knowledge of the topic and was used to classify the students into two groups. Students who got below the pass mark were put in Group B, as the experimental group, and those above the pass mark were placed in Group A, as the control group. The experimental group was subjected to a treatment session for three weeks, where they were exposed to the construction and naming of different hydrocarbons and other functional groups using cottorganic buds. The control group was taught using the traditional method of teaching within the same period.

The tool that was used in this study is called “cottorganic buds” made from cotton buds since it will represent the organic molecules used in the study of carbon compounds. This tool was considered an innovative way to

assess the students' conceptual understanding of organic compounds in Grade 9 students under the Special Program in Foreign Language (SPFL).

RESEARCH QUESTIONS

The purpose of this study was to determine the effectiveness of the Cottorganic Buds as an aid in achieving a higher conceptual understanding of carbon compounds among Grade 9 SPFL students in Organic Chemistry. Specifically, this research seeks to answer the following questions:

1. What is the status of the academic performance of Grade 9 SPFL students in chemistry before and after using cottorganic buds?
2. What is the mean level of effectiveness of using the cottorganic buds as a tool in enhancing the conceptual understanding of organic compounds in Grade 9 SPFL students?
3. Is there a significant difference between the performance of Grade 9 SPFL Students in organic compounds before and after using cottorganic buds as a teaching tool?
4. Is there a significant difference between the post-test results of both the control and experimental groups?

CONCEPTUAL FRAMEWORK

This research will be executed to assess the effectiveness of cottorganic buds in increasing the conceptual understanding of grade 9 SPFL students in organic chemistry.



The purpose of the study was to increase the conceptual understanding of Grade 9 SPFL students of carbon compounds. The study aimed to test if the cottorganic buds positively affect the grades of learners of Grade 9 SPFL students in the topic, carbon compounds.

2. Methodology

A. Sample

There was one section used in this study. Grade 9-Laozi, the advisory class of the researcher for the School Year 2023-2024, under the Special Program in Foreign Language (SPFL), since the researcher is handling additional research subjects other than Science 9.

There were thirty-four (34) grade 9-Laozi students, consisting of fourteen (14) Males and twenty (20) Females who were the main subjects of the study.

Data was collected during the designated date of teaching Carbon Compounds and was consolidated and analyzed to give an initial solution to the identified problem.

Cottorganic buds were facilitated, employed, and utilized to collect data from each student's assessment tool. Cottorganic buds were used to attest to the increase in conceptual understanding of Grade 9 SPFL students regarding organic chemistry.

B. Plan for Data Analysis

The teacher-researcher collected the data from the assessment tool and was subjected to statistical treatment.

The mean and standard deviation of the assessment tool of the students before and after utilizing the cottorganic buds were employed to determine the variations and distribution of responses compared to the normal curve.

The study used Microsoft Excel Data, to process quantitative data and descriptive statistics. The t-test was used to determine the effectiveness before and after using the cottorganic buds in the topic of carbon compounds.

C. Timetable / Gantt Chart

This research was conducted within the planned date and activity as shown in table 1.

Table 1. Timetable and Schedule of Tasks in Accomplishing Action Research

ACTIVITIES Shade the corresponding month per Activity (Add rows if necessary)	Sep 2023	Oct 2023	Nov 2023	Dec 2023	Jan 2024	Feb 2024	Mar 2024	Apr 2024	May 2024
1. Planning, Conceptualizing, and Collecting Information about the topics in Chemistry.									
2. Writing a Proposal and Letter of Communication, and Presentation									
3. Conducting A Survey to the Parents									

and Students and administering of Pre-test.									
4. Utilizing the cottorganic buds in the discussion.									
6. Administering a Summative Test/Post-test, Calculating the Academic Performance (Science 9 Record)									
7. Consolidation of the Collected Data									
8. Presentation of Findings and Result									
9. Finalization of the Result and Preparation of Terminal Report									
10. Sharing and presenting in the LAC Session									

3. Results and Discussion

This chapter presents the presentation, analysis, and interpretation of the data based on the research questions.

Status of Academic Performance Before and After the Use of Cottorganic Buds

To answer the research question, what is the status of the academic performance of Grade 9 SPFL students in chemistry before and after using cottorganic buds? the following results were interpreted. Table 2 below shows the result before using the cottorganic buds, the students who were not using the cottorganic bud (controlled group) and those students who used the cottorganic buds (experimental group) have the same result showing both groups as fairly satisfactory, with mean levels of 10.06 (with an SD of 3.24) and 10.51 (with an SD of 3.59) respectively. During the administration of the pre-test, the topics of carbon compounds were not discussed. The result of the post-test showed significant results. The control group showed a mean of 21.94 with an SD of 4.71 with a satisfactory result while the students who used the cottorganic buds showed an increased understanding, as evidenced by the mean of 30.54 with an SD of 4.16 with a very satisfactory result.

Table 2. Status of performance of 9-Laozi students before and after using the cottorganic buds

	Control			Experimental		
	Mean	SD	Interpretation	Mean	SD	Interpretation
Pre	10.06	3.24	Fairly Satisfactory	10.51	3.59	Fairly Satisfactory
Post	21.94	4.71	Satisfactory	30.54	4.16	Very Satisfactory

Legend: 33-40 Excellent
 25-32 Very Satisfactory

17-24	Satisfactory
9-16	Fairly Satisfactory
1-8	Poor

Mean Level of Effectiveness of Using Cottorganic Buds

The second research question is about the mean level of effectiveness of using the cottorganic buds as a tool in enhancing the conceptual understanding of organic compounds in Grade 9 SPFL students.

To address this, the following data were interpreted. The mean of the pre-test and post-test results of the students who did not use the cottorganic buds (controlled) is 10.06 (with an SD of 3.24) and 21.94 (with an SD of 4.71) respectively with an interpretation of slightly effective and moderately effective. The students who used the cottorganic buds showed a mean level of 10.51 and 30.54, with an SD of 3.59 and 4.16 respectively, with an interpretation of slightly effective and very effective, respectively. The result showed that the cottorganic buds are very useful in retaining the concept of organic chemistry to 9-Laozi students as evidenced by the very effective result.

Table 3. The mean of the pre-test and post-test results of both the controlled and experimental groups.

	Control		Experimental	
	Pre	Post	Pre	Post
Mean	10.06	21.94	10.51	30.54
SD	3.24	4.71	3.59	4.16
Interpretation	Slightly Effective	Moderately Effective	Slightly Effective	Very Effective

Legend:	33-40	Extremely Effective
	25-32	Very Effective
	17-24	Moderately Effective
	9-16	Slightly Effective
	1-8	Not at all effective

Significant Difference Between the Performance of Grade 9-Laozi Before and After Using Cottorganic Buds

For the third question, Is there a significant difference between the performance of Grade 9 SPFL Students in organic compounds before and after using cottorganic buds as a teaching tool? Since the p-value is less than 0.05, therefore there is a significant difference between the performance of 9-Laozi before and after using the cottorganic buds as a teaching tool. There is a difference of 11.88 for the control group, while a difference of 20.03 for the experimental group.

Table 4. T-test result for the controlled group

	Mean	SD	df	t value	p-value	Interpretation
Pre	10.06	3.24	34	11.418	<0.00001	Significant
Post	21.94	4.71				

*p<0.05

Table 5. t-test result for the experimental group

	Mean	SD	df	t value	p value	Interpretation
Pre	10.51	3.59	34	21.212	<0.00001	Significant
Post	30.54	4.16				

*p<0.05

Significant Difference Between the Posttest Result of Controlled and Experimental Groups

To address question 4, a T-test was used to determine the significant difference between the post-test results of the controlled and experimental groups. Since the p-value is less than 0.05, therefore there is a significant difference between the post-test results of both the controlled and experimental groups. Based on Table 6, there is a difference of 8.6, showing an increased understanding of the students who used the cottorganic buds as a tool in learning organic chemistry.

Table 6. A significant difference between the posttest with and without the use of cottorganic buds

	Mean	SD	df	t value	p-value	Interpretation
Control	21.94	4.71	34	-7.583	<0.00001	Significant
Experimental	30.54	4.16				

*p<0.05

Summary of Findings

The statistical treatment of data revealed the following findings:

Status of Academic Performance Before and After the Use of Cottorganic Buds

1. The mean of students' academic performance before the use of Cottorganic Buds was "Fairly Satisfactory".
2. The mean of students' academic performance after the use of Cottorganic Buds was "Satisfactory" for the control group while "Very satisfactory" for the experimental group.

Mean Level of Effectiveness of Using Cottorganic Buds

1. The mean level of the pretest for the controlled group is 10.06 with an SD of 3.24 which is interpreted as “Slightly Effective”.
2. The mean level of the posttest for the controlled group is 21.94 with an SD of 4.71 which is “Moderately Effective”.
3. The mean level of the pretest for the experimental group is 10.51 with an SD of 3.59 which is interpreted as “Slightly Effective”.
4. The mean level of the posttest for the experimental group is 30.54 with an SD of 4.16 which is interpreted as “Very Effective”.

Significant Difference Between the Performance of Grade 9-Laozi Before and After Using Cottorganic Bud

1. The p-value for the controlled group is lower than 0.05 which is interpreted as significant.
2. The p-value for the experimental group is lower than 0.05 which is interpreted as significant.

Significant Difference Between the Posttest Result of Controlled and Experimental Groups

1. The p-value of the posttest between the controlled and experimental value is lower than 0.05 which is interpreted as “Significant”. Therefore, there is a significant difference between the students who use cottorganic buds and students who do not use cottorganic buds.

Conclusion

Since there is a significant difference between the results of the posttest of the students who used the cottorganic buds and those who did not use the cottorganic buds, the researcher concludes that in order to increase the conceptual understanding of organic chemistry, it is important to innovate and create tools such as the use of cottorganic buds as evidenced by the p-value which is lower than 0.05 with an interpretation of “Significant”.

Recommendations

1. It is suggested that the Science teachers should use the cottorganic buds in order to explain the topic of organic chemistry or carbon compounds to the students.
2. Teachers are encouraged to use the cottorganic buds in other topics under chemistry such as chemical bonding, atoms, and balancing equations.

References

_____ (2023). The Importance of Molecular Set in Schools. Retrieved April 20, 2023 from <https://www.scienceequip.com.au/blogs/news/the-importance-of-molecular-set-in-schools>

Shabiralyani, G., Hasan, K., et. al (2015). Impact of Visual Aids in Enhancing the Learning Process Case Research: District Dera Ghazi Khan. Retrieved January 16, 2023 from <https://files.eric.ed.gov/fulltext/EJ1079541.pdf>

Yang, G. et.al (2017). Science as Interests but not for Career: Understanding High School Students' Engagement in Science in Abu Dhabi. Retrieved May 25, 2023 from <https://www.ejmste.com/download/science-as-interests-but-not-for-career-understanding-high-school-students-engagement-in-science-in-4847.pdf>