

The Use of Contextualized Activities on Acquisition of Chemistry Concepts in Science

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Abstract

The study of chemistry is considered to be the most important discipline of study because of its significant impact on both the individuals who study it and society as a whole. Because of this, many academicians now believe it to be an important area of study. This study mainly focused on the use of contextualized activities in the acquisition of Chemistry concepts in Science 7. Quasi-experimental, particularly the non-equivalent dependent variable, was utilized as the research design. The scores during pre- and post-tests served as the primary source of data from the 41 Grade 7 students. Total enumeration was implemented. The study revealed that there is a significant difference in the results of the pre-test and post-test of the Grade 7 students since the calculated t-value (52.84) exceeded the critical value (2.02). The scope and focus of the study were limited only to the use of contextualized activities intended to determine its effects on the acquisition of Chemistry concepts in Science 7. It was also restricted only to 41 students of the Calamba Bayside National High School who are enrolled in the school year 2017-2018. The results of the study could help the division in encouraging teachers to be more creative and innovative and craft more contextualized learning materials in science.

Keywords: *Contextualized activities; Acquisition; Chemistry Concepts; Science*



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INTRODUCTION

Teaching is satisfying. When student performance is good or better, this is the situation. If not, it is bothersome. Despite the teachers' best efforts to instruct children effectively, many of them continue to do poorly. On the basis of quizzes and tests, it has been determined that pupils' poor performance may be attributable to a lack of a solid foundation; it is very evident based on the result of the National Achievement Test, the school year 2015-2016, wherein Calamba City obtained only 39.94% MPS in Science - far behind the 75% target of the division; therefore, teachers should do more interventions to improve the performance of the students (World Education Forum, 2015).

It has been established that the lecture-style science training employed in the past has been ineffective. Students are not permitted to think and participate in the learning process. Since teachers today are dealing with 21st-century learners, it is expected that they are innovative enough to get the full attention of learners during the teaching process. According to Oteyza (2012), students nowadays are no longer confined to reading the concepts written in books, but they are more visual and body kinesthetically. Students tend to learn more if they are the ones who experience what really needs to be discovered. However, although students today are explorative

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still, many of them lack essential knowledge and the ability to be independent and inquiry learners. It is difficult for them to get the real concepts of what is to be taught if teachers will not tell them what it is really all about.

In the framework of the K-12 program, the science curriculum must be learner-centered, inquiry-based, and emphasize the application of scientific research in explanation construction. It encourages instructors to employ diverse educational approaches, such as multi/interdisciplinary, science technology society, contextual, problem/issue-based, and inquiry-based (National Research Council, 2012). The strategies are founded on strong educational methodologies, such as constructivism, the social cognition learning model, the idea of learning styles, and brain-based learning. In addition, science teachers must eliminate the abstract quality of science by utilizing true, fundamental, and grounded instructional resources derived from the natural environment (Zhou & Brown, 2017). Learners typically have the impression that chemistry is a challenging subject, as stated by Cainto (2009), which was referenced by Sagcal and Maquiling (2017). This is because chemistry is one of the scientific disciplines. In order for students to attain their full potential in terms of scientific learning and to improve their practical and laboratory abilities, the study of chemistry requires them to immerse themselves actively in laboratory activities. The education of chemistry, on the other hand, is plagued by problems stemming from inadequate laboratory materials and facilities, as well as inefficient teaching.

Likewise, according to the findings of a study carried out by Bugaje (2013), Edomwonyi-otu and Avaa (2011), and Sanchez (2017), a sizeable proportion of students enrolled in secondary schools have the misconception that chemistry is a difficult field of study due to the abstract nature of the subject, as well as the mathematical nature, the terminological nature, the symbolic nature, as well as the modeling and syllable complexity. It required chemistry instructors to instruct their students in chemistry ideas based not only on what the instructors knew but also on how they knew it and what the instructors thought about how they knew it.

Context-based science education, according to Giamellaro (2017), is the teaching of science based on the local environment and students' experiences. Because knowledge with these tools makes science appealing and meaningful to students' lives and the nation as a whole, extending students' comprehension using locally accessible resources is incredibly straightforward. Educators, teachers, and politicians have embraced contextualization as a constructivist method and inquiry-based teaching technique that bridges the gap between abstract concepts and real-world experiences.

This study was anchored on Motivation Theory, Social Learning Theory, and Constructivism Learning Theory (Fernando & Marikar, 2017). According to Bright and Anastasia (2019), process theories of motivation are an attempt to explain why certain behaviors are initiated. These theories center their attention on the process by which we select a target and the amount of effort that is required to successfully "strike" the target. On the other hand, it was also founded on social learning theory. It is a key component of sustainable natural resource management and behavior modification. This hypothesis says we learn from social interactions. People develop similar tendencies through observing others. People copy others' conduct after witnessing it, especially if their observations are pleasant or include rewards. Bandura (1977) says imitation involves copying observable motor actions.

Moreover, Bada (2015) emphasized constructivism in his paper. Constructivism is an observation-and-science-based theory regarding how people learn. People achieve worldly consciousness and wisdom via experience and introspection. When we discover anything new, we must reconcile it with our prior views and experiences, either altering our beliefs or discarding them as irrelevant. We generate our own knowledge anyway. We must explore and evaluate our expertise. Constructivism can lead to a variety of instructional practices in the classroom. It involves encouraging students to generate new information through active methods (experiments, real-world problem solving) and then having them reflect on and discuss their actions and how their understanding is evolving. The educator ensures that pupils comprehend their prior knowledge and then build upon it.

Because of the problems that have been mentioned, the Department of Education, particularly in the Division of Calamba City, is trying to implement significant innovations in the teaching and learning process as part of its unwavering dedication to fostering a high-quality education that lasts a lifetime. The process of learning is made more fun and meaningful through the application of a variety of different methods of evaluation and tactics. In order to motivate science instructors to persevere in the face of these challenges, measures have already been taken, such as holding seminar workshops to develop contextualized and localized instructional and intervention strategies. The next step is for the teachers to respond to these needs in order to get more information from the learners about the skills they haven't mastered yet.

Similarly, several studies have already been conducted in science, particularly in biology, on contextualization and the development of contextualized material; however, only a few have discussed the effectiveness of contextualization in the acquisition of concepts in chemistry. The present study addressed the necessity for its utilization in order to improve the performance of students in science, particularly in chemistry.

Research Questions

This study aimed to determine the effects of Contextualized Activities on the acquisition of Chemistry concepts in science.

Specifically, the study sought to answer the following questions:

1. What is the result of the pre-test of the experimental group?
2. What is the result of the post-test of the experimental group?
3. Is there a significant difference between the pre-test and post-test of the experimental group?

LITERATURE REVIEW

According to Picardal and Sanchez (2022), contextualized instruction has improved science learning. It also improved scientific performance, but its effects on future science learning may be minimal. Contextualization can improve student learning and performance across all context groups. Incorporating contextualization, localisation, and indigenization into the nation's K-12 basic education system is vital for exposing pupils to relevant experiences that promote science learning.

Similarly, contextualization in the IRW classroom, according to the study done by Reynolds and Sarker (2017), promotes students to blend literacies from various aspects of their lives. The

significant study required to obtain the DCA also fosters student participation in the academic community.

In contrast, Sanchez et al. (2018) proposed a contextualization procedure based on seven contextualization principles, with the aim of providing opportunities for Indigenous Mexican youths to learn science in a manner that supports their rights to an education aligned with their own culture and values. The contextualization principles precisely derived the social perception, socialization, and social narratives of Nahua students, thereby assisting Indigenous students in exploring the contrasts between their way of life and the school's way of life and dialect while learning complex scientific concepts, such as characteristic choice.

The proposed contextualization technique was empirically defined, taking society and socialization into account by utilizing product sources; it is based on the principles of Culturally Relevant Pedagogy and Indigenous Education. These guidelines were used to improve the social relevance of a middle school science curriculum on natural selection for Nahua students.

The use of contextualized education in problem-solving is the third most popular strategy identified by the research. Obiedo and Jugar (2017) illustrated an integrated maritime setting for physics education. Moreover, laboratory activities demonstrate contextualization. Sagcal et al. (2017) provided criteria for developing context-based lab activities; these criteria are aligned with K-12 objectives, are relevant to students' everyday life, utilize low-cost or readily available resources, and permit improvisation with particular supplies. The laboratory exercises devised by Sanchez (2017) replicate the difficulties that students face in their daily lives.

According to Fortus and Krajcik (2020), however, contextualized learning environments must be constructed efficiently to prevent incorrect contextualization. Inappropriate contextualization may result in confusion and activate irrelevant knowledge.

Contextualization is a collection of various instructional methodologies aimed to more fluidly integrate the learning of important skills with academic or professional information by focusing teaching and learning on student-relevant, real-world applications. A teaching and learning approach that enables teachers to connect subject matter knowledge to real-world applications and the teaching of fundamental skills within the framework of disciplinary subject matter (Meledy, 2015). She underlined in her study that contextualized learning focuses on problem-solving and is rooted in adjusting training to the many life circumstances of pupils. Teachers must give encouragement and motivation for students to learn from one another cooperatively.

Similarly, Giamellaro (2017) emphasized the necessity and significance of contextualizing Science education. According to the results of his study, there was a significant difference between the student's pre-test and post-test scores on the structure knowledge test. This suggests that learning science in a realistic environment can enhance conceptual understanding. In addition, the extent to which students contextualized their learning had a direct influence on how much they learned. This was affected by identifiable methods of interacting with the learning environment. Primary contextualization did much more than let students realize how a concept could be applied in the real world; it also assisted students in understanding the concepts and constructing knowledge structures that were more akin to how professionals organized their information.

Also, Bonganciso's (2016) study reveals that contextualized teaching and learning have a significant impact on enhancing students' reading comprehension. Moreover, he asserted that contextualization's application in the classroom had once again proven the concept of adult

learning. This notion suggests that students will be more motivated to learn, will be able to use their schema to comprehend the text, will be able to establish connections between the text and its context, and will have better confidence if reading instructions are consistent with their framework.

In addition, Ballesteros (2015) discovered that a localization and contextualization approach to Science activities had a positive effect on the engagement, motivation, and attitude of ninth-grade students. Students' performance in Earth Science improved after being exposed to localization and contextualization of science activities at the "proficient" level, according to the study.

Finally, it was revealed that contextualization is used in conjunction with other strategies. For instance, Borre (2019) utilized contextualization of biology instruction and flipped classroom delivery, skills development, and the use of visual material, whereas Sanchez (2017) integrated contextualized activities in macroscopic, symbolic, and microscopic modes for teaching chemistry.

The prevalence of contextualization as an educational intervention necessitates additional research into the extent to which it assists students in achieving learning outcomes, as do the various contextualization instructional methodologies. The aforementioned works described the characteristics of contextualized instruction that are likely to result in student achievement. This study was undertaken to determine if it is useful in boosting pupils' academic performance. Here, the research paradigm of the study is explained to help better understand how it works.

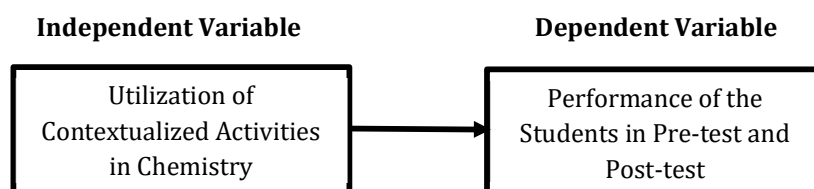


Figure 1. Research Paradigm

The research paradigm for this study is depicted in the figure that can be found above. As can be observed, the usage of contextualized activities in chemistry serves as the study's independent variable, while the performance of the students on the pre-test and post-test serves as the study's dependent variable. The researcher developed context-specific exercises for the subject of chemistry. It was used for the purpose of determining whether or not it had an effect on the academic performance of the students in the seventh grade in the subject of science, particularly in acquiring concepts in the subject of chemistry. Both a pre-test and a post-test were used to evaluate the students after they had gone over the information mentioned above.

RESEARCH METHOD

A quasi-experimental study was used. This method of study uses pre-and post-tests to discover if a program or intervention has the desired effect on study participants (White & Sabarwal, 2014). This applies to the current study, which aimed to investigate the effects of contextualized learning activities on the academic performance of grade seven students in science.

The participants of the study were seventh-grade students now enrolled at Calamba Bayside National High School- Special Program in the Arts for the 2017-2018 school year. There were 41 students in one class. Since there is just one class of seventh graders at SPA, a total count was

conducted. It is the sole section dealt with by the Grade 7 researcher. The research employed a quasi-experimental design, focusing on the non-equivalent dependent variable. This sort of evaluation uses pre-and post-tests to establish whether a program or intervention has the desired effect on study participants. This is pertinent to the current investigation, as its purpose was to investigate the impact of contextualized activities on the acquisition of Chemistry concepts in science.

To evaluate the performance of the respondents, a testing instrument was developed. The pre-test was administered to the students prior to the teaching-learning process, with the outcome of the pre-test serving as a baseline for establishing if the Science curriculum had an influence on the student's acquisition of Chemistry topics. Five specialists confirmed the contextualized actions. They were Master Teachers and Head Teachers from the selected schools in Calamba City. The validators were master's degree and doctorate degree holders. Similarly, the Headteacher and the Science Coordinator of the Division approved the pre-test and post-test questions. The specialists held a master's degree and specialized in chemistry. In order to validate the contextualized activities, the DepEd Evaluation Rating Sheet for Print Supplemental Materials was adopted.

After administering the validated contextualized activities, a post-test with the same material as the pre-test was administered. In every class, non-graded formative assessments were administered to determine the number of students who did not master the material. The post-examination was based on the planned first-quarter exam. The topic instructor, who was also one of the researchers, administered the examination.

As prescribed by the Department of Education (2015), the performance of students during the pre-test and post-test in both groups was interpreted according to the following scale based on DepEd Order No. 73, s. 2012 and DepEd Order No. 31, s. 2012

Mean Score	Descriptive Rating	Descriptive Interpretation
41.00 – 50.00	Advanced	This means the learner's knowledge and understanding transcend fundamental standards and may be transferred automatically and flexibly. Learner scored 90.4% ahead.
31.00 – 40.00	Proficient	This signifies the student has basic information and core understandings. Learner averages 80-90%.
21.00 – 30.00	Approaching Proficiency	This signifies the learner has developed basic knowledge and core understandings with little teacher direction and/or peer help. Learners averaged 60.04-79.95%.
11.00 – 20.00	Developing	This signifies the learner has the minimum knowledge, abilities, and fundamental understandings but requires help performing. Learner averages 50-60%.
0.00 – 10.00	Beginning	This signifies that students at this level have difficulties with comprehending; prerequisite and core knowledge are lacking. Less is learned. Learner averages below 49.96%.

The collected data were processed and analyzed in preparation for a tabular presentation. The statistical tools utilized for data interpretation include the mean and paired t-test. Mean was

used to establish the academic performance level of the students, while the paired t-test was performed to evaluate if there was a significant difference between the academic performance level on the pre-test and post-test. The significance level was established at a 0.05 level of confidence. All of the outputs listed above, as well as a summary of results and conclusions, were given to the Department Head and sent to the school principal and Division office.

Ethical Issues

Since the researchers obtained the pre-test and post-test results of the students as the primary instrument, proper treatment and handling of the said data were considered. The researchers assured the correctness and authenticity of the data of the respondents.

FINDINGS AND DISCUSSION

This part discusses the results and findings of the study.

Table 1. Results of Pre-test of the Experimental Group

EXPERIMENTAL GROUP	MEAN	SD
Pretest Result	14.19	6.58

Table 1 shows the pre-test result of the students. Results revealed that the performance level of the students in the pre-test is at the developing level (D=14.19, SD=6.58).

The experimental group's pre-test results indicate that the pupils' performance is at a developing level. This indicates that the student at this level possesses the bare minimum of information, abilities, and fundamental understandings but requires assistance throughout the performance. The learner has achieved an average between 50 and 60 percent.

According to Calmorin (1994), as stated by Cabardo (2015), the primary goal of a pre-test is to determine the current direction of the students in relation to the topic to be addressed or learned. This will assist the instructor in determining the amount of effort to exert during instructional contact time. As a result, their claims will be supported if the same level of proficiency is observed on the pre-test. Also, Kelly (2019) stated that the purpose of pre-testing is to give students a preview of what to expect from a new unit. These tests are often the first time that a student is exposed to new terms, concepts, and ideas. Pre-tests grades, therefore, will not negatively affect students' performances, but they should be encouraged to do their best.

Table 2. Results of Posttest of the Experimental Group

EXPERIMENTAL GROUP	MEAN	SD
Posttest Result	30.47	7.39

As disclosed in the table, the experimental group gained a mean score of 30.47 and a standard deviation of 7.39, which can be interpreted as a proficient level of performance.

It means that after using Contextualized Activities in Science, the performance level of the students reached the proficient level, as indicated by the post-test results. This indicates that the learner's achievement at this level demonstrates the development of foundational knowledge and core understandings. The learner has achieved an average between 80 and 90 percent.

The study by Bonganciso (2016) demonstrates that contextualized teaching and learning have a substantial impact on increasing the reading comprehension ability of students. In addition, he claimed that contextualization's usage in the classroom had once again validated the notion of adult learning. This idea posits that students will be motivated to learn, will be able to use their schema to comprehend the text, will be able to make connections between the text and its context, and will have greater confidence because reading instructions are within their framework.

Furthermore, Bedaure (2012) found that employing modular instruction in Biology results in higher student performance than using the lecture-discussion technique because students can learn at their own pace and according to their own talents. Despite the fact that students in the modular approach surpassed those in the lecture-discussion method, there are still aspects to consider about student performance, such as their prior grasp of the subject's fundamentals.

Table 3. Test of difference between the Pretest and Posttest Performance of Grade 7 Students using the Contextualized Activities in Science 7

Parameters	Experimental Group	
	Pre-test	Post-test
Mean (M)	14.19	30.47
Mean Percentage Score (MPS)	29.76%	62.05%
Standard Deviation (SD)	6.58	7.39
Number of Students (n)	41	41
P-value	0.001	
t-value	-52.84	
critical value	2.02	
Conclusion	Significantly different at 5% level of significance.	

Table 3 displays the statistical analysis of the 7th graders' pre-and post-test results. The outcomes of tests where the MPS increased from 29.76% to 62.05%; demonstrate a substantial difference. In addition, the estimated t-absolute value's value (52.84) surpassed the crucial value (2.02). This demonstrates that the performance of students before and after the application of contextualized activities on the acquisition of Chemistry concepts in Science 7 differs significantly.

There is a substantial difference between the students' pre-and post-test scores, which is significant at the 0.05 level. It was determined that the mean score on the post-test is higher than the mean score on the pre-test.

The investigation undertaken by Ballesteros (2015) confirms the aforementioned conclusions. His research demonstrated that a localization and contextualization approach to Science activities was helpful in boosting the performance of students and had a favorable impact on their involvement, motivation, and attitude toward the lessons. The study concluded that learners' performance in Earth Science improved after being exposed to localization and contextualization of science activities as stated for a "proficient" level.

Moreover, the conclusions of this investigation are comparable to those of Picardal and Sanchez (2022). According to them, contextualized instruction has aided in the enhancement of science learning. It also enhanced science performance, but it may not significantly influence future

science learning. Contextualization is applicable to all context groups and can enhance student learning and performance. Incorporating contextualization, localization, and indigenization into the country's K-12 basic education system is essential for exposing children to relevant experiences that result in enhanced science learning.

Moreover, when pre- and post-tests are compared, teachers are able to track their students' growth not only from one class to the next but also from topic to topic and even from day to day. The vast majority of evaluation methods simply identify whether or not a student satisfies expectations once the student has been taught; however, most methods fail to take into consideration prior knowledge or gradual development. In addition, even if a student does not perform to the level of proficiency expected on a post-test, their performance on earlier examinations can reveal how much they have improved. No amount of development should be disregarded, and evaluation of a student's performance should not be restricted to a simple "yes" or "no" regarding whether or not they satisfy expectations. (Kelly, 2017)

Furthermore, in a similar study, Sagcal et al. (2017) used materials that are widely used and easily accessible to the local population to carry out laboratory procedures that were applicable to everyday life. In addition to this, he developed a set of criteria for the construction of context-based laboratory activities. These criteria are similar to the goals for kindergarten through twelfth grade. They are also relevant to the student's everyday lives, use cheap or easy-to-find materials, and make do with some materials.

CONCLUSION

Learning in the scientific disciplines has been helped along by contextualization. The prior statements regarding the efficacy of contextualization were shown to have some basis in reality, thanks to the findings of this investigation. It was concluded that the majority of students have a "developing" level of proficiency in science based on the results of the pre-test. Therefore, there is a dire need for pupils to be exposed to methods other than the standard manner of instruction. Also, the performance of the students in science improves after being exposed to contextualized science activities as stated for the "proficient" level. Therefore, teachers can utilize contextualized activities to assist students in acquiring chemistry ideas and building conceptual comprehension. Moreover, it was determined that there is a considerable difference between the pre-test and post-test performance of the students. Consequently, teachers are urged to construct contextualized learning materials in science for the other grade levels in order to attain the intended outcome. However, when producing contextualized activities, it is also important to ensure that they adhere to the DepEd Science curriculum guide.

Moreover, because it was such a significant assistance in the process of teaching and learning, the use of contextualized activities was, without a doubt, relevant and helpful for both the instructor and the students who participated in the class. This proved to be an effective and appropriate intervention item for use in assisting with the mastery of the learning competencies. However, the material that has been generated should be revised and modified on a regular basis in order to meet the learning requirements and capacities of the students and to close any learning gaps that may exist across all learning modalities.

Recommendations

The subsequent recommendations are provided:

1. The school may continue to provide training on the design and production of contextualized learning materials to teachers in order to encourage them to be more creative in how they provide instruction.
2. Teachers might pledge to employ contextualization and localization in the classroom.
3. Before being used in other parts, contextualized learning materials may undergo evaluation.
4. The institution may adopt the action plan.
5. In the future, researchers may undertake additional research on the utilization of contextualized learning activities at other grade levels.

LIMITATION & FURTHER RESEARCH

The scope of this study was restricted solely to the application of the contextualized learning materials that were generated as well as the evaluation of the student's academic performance in chemistry after they had used the contextualized learning materials. Only students from Calamba Bayside Integrated School participated in the research that was done. It does not concentrate on determining whether or not the material is reliable. In light of this, individuals who are interested in doing research on contextualized materials can find it important to verify the material's credibility prior to employing it in their studies. They might also look into the possibility of specializing in a subfield of science, such as earth science, biology, or physics.

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