IJAMS
INTERNATIONAL JOURNAL OF ADVANCED MULTIDISCIPLINARY STUDIES
Volume III, Issue 2 February 2023, eISSN: 2799-0664

Problem Based Inquiry Approaches in Enhancing the Grade Seven Scientific Discovery Skills

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Abstract -This study evaluates the efficiency of Problem Based Inquiry Approaches in enhancing the Grade 7 scientific discovery skills. The study utilized the quasi-experimental method of research to evaluate the effect of the teaching method Problem Based Inquiry Approaches to enhance the Grade 7 scientific discovery skills. The finding of the study were the basis of a proposed intervention plan. Based from the results given, it can be shown that the pretest performance of the Grade 7 students which is equal to 29.25 is lesser than the posttest performance of the respondents which is equal to 37.58 that resulted to the computed t value which is equal to 4. 422 which is greater than the critical t value which is 1.636. This further explains that the null hypothesis which states that there is no significant difference between the pretest and posttest performance of the Grade 7 students after the integration of the problem based inquiry approaches in enhancing the students' scientific discovery skills is rejected.

The test results implied that since the computed t value is greater than the critical t value, the integration of the problem based inquiry approaches in enhancing the Grade 7 scientific discovery skills is significant. Scores are expected to be higher on the post-test because the students have already studied the tested material. It also make sense to conclude that the treatment is responsible for the improvement.

Keywords- Problem Based Inquiry Approaches; Enhancing Scientific Discovery Skills

I. Introduction

The Philippines' Grades 1-10 Science Curriculum envisions the development of scientifically, technologically, environmentally literate, effective communicators, strong interpersonal lifelong learning skills as well as scientific values and attitudes. These will be acquired in a program that focuses on knowledge relevant to real world and encompasses methods of inquiry. A learning environment that is designed to enhance three learning domains which are performing scientific processes and skills, understanding and applying scientific knowledge, developing scientific attitudes and values. (DepEd Order No. 43, s. 2013). The education of the young from every social background has to be undertaken, to produce not only young men and

women of refined talents, but those great-souled persons ready to take responsibility. Thus as what former DepEd Secretary Leonor Briones cited *Sulong EduKalidad* program as DepEd's aggressive reforms to globalize the quality of Philippine Basic Education in response to a 'world drastically changing.' "We should start teaching not in the university but in the basic education level." She underscored that innovations in teaching learning strategies; to upgrade capacity of teachers; and to improve facilities and equipment (Department of Education, 2020) were necessary to address the challenge. Sulong EduKalidad DepEd's battlecry for educational reform carries KITE as its four key reform areas: (1) **K** to 12 Curriculum review and update; (2) **I**mprovement of learning environment (3) **T**eachers' upskilling and reskilling; and (4) **E**ngagement of stakeholders for support and collaboration.

In the context of the effects of COVID 19 pandemic; it was evident that we cannot return to the world as it was before. New educational landscape was a pearl of great value as a consequence of the COVID 19 pandemic. With the integration of digital learning platforms the potentials of technology was unleashed. The realization that the used of social media in the learning process was very important. Parents, teachers and other school personnel were encouraged to embrace technology. The 2030 Agenda for Sustainable Development by UNESCO provided many of the necessary signposts and guidelines. In this report, the International Commission on the Futures of Education (UNESCO, 2019) presented nine ideas for concrete actions today that will advance education tomorrow. Among the nine areas the Commission calls on all educational stakeholders to prioritize scientific literacy to ensure a curriculum with strong humanistic objectives that explores the relationship between fact and knowledge and is capable of leading students to understand and situate themselves in a complex world (UNESCO, 2020). In line with the above-mentioned statements, enhanced learning strategies should be developed to get the students excited, motivated and engaged as Science requires broad understanding. With the rapid advance of technology the traditional method of teaching is no longer very effective where learning happens within the four walls of the classroom. The teacher is the sole source of knowledge. It is a teacher-centric method that promotes the supremacy of the teacher within the classroom setup. Also, every aspect of learning proceeds as per their will. Has full control over the learning environment. Thus, the use of problem based inquiry approach (PBIA) in enhancing the Grade 7 scientific discovery process skills will be used to find out its effectiveness. It also provides the basis for which teachers can assess the progression of soft skills such as teamwork, responsibility, and initiative. Using problem based inquiry approaches to enhance scientific discovery skills with technological literacy that will instill critical thinking and share the joy of science. The constant connectedness gives the students opportunities to make choices about their learning. Group collaboration allowing different points of view in decision-making, problem-solving and making sense of information.

I would like to support the program the K to 12 Basic Education Program were the curriculum shall be learner – centered, inclusive, developmentally relevant and appropriate. It is responsive and research – based, bio-geographical and socio-cultural sensitive. Taking into

account the demands of the national and global community. The pedagogical approaches are constructivist, inquiry – based, reflective, collaborative, differentiated and integrative.

Furthermore, the researcher would like to find out whether the use of problem based inquiry approaches in enhancing the grade seven scientific discovery skills will find its effectiveness in the classroom and will benefit my school and Ormoc City division. The findings of the study were the bases for a proposed intervention plan.

Specifically, this study sought to answer the following questions:

1. What is the pretest performance of the Grade 7 students in Science before the integration of Problem Based Inquiry Approaches?
2. What is the posttest performance of the Grade 7 students in Science after the integration of Problem Based Inquiry Approaches?
3. Is there a significant difference in the pretest and posttest performance of the Grade 7 students in Science before and after the integration of Problem Based Inquiry Approaches?
4. What intervention plan can be proposed based on the findings of the study?

NULL HYPOTHESIS

There is no significant difference on the pretest and posttest performance of the Grade 7 students in Science before and after the intervention of problem based inquiry approaches to enhance scientific discovery skills.

II. Methodology

Design. This study used the quasi-experimental method of research to evaluate the effect of the teaching method Problem Based Inquiry Approaches to enhance the Grade 7 scientific discovery skills. Moreover, the pretest and posttest is the preferred method to compare and measure the degree of change occurring as a result of treatment or intervention. The researcher utilized the complete enumeration or complete count in identifying the respondents of the study since the population is small and not scattered. The information was obtained drastically from the only section in the Grade 7 level. The results served as basis for an intervention plan.

Sampling. There are 36 Grade 7 students who are the respondents of the study. They are now in a face to face classes and the Google Classroom is used to send digital learning materials, announcements, activities and video conferencing.

Research Procedure. The researcher formulated the following procedures in conducting the research study. The study was conducted in two phases the pretest and the posttest. In the first phase; the researcher asked permission from the WLC President and the Principal of the High School Department to conduct a research study. The researcher discussed with the Grade 7 Science

Teacher on the topics to be covered during the research study. Then the researcher made the Table of Specification (TOS) with a 40 item test and conducted the pretest. The researcher computed the Mean Percentage Score (MPS). The pretest results gave the teacher an overall background knowledge of the student on each given topic. In the second phase; the researcher immediately implemented the intervention for a given period of time by using the Problem Based Inquiry Approaches on the identified topics included in the pretest. Then the posttest is given to the respondents and computed the Mean Percentage Score (MPS). The posttest gave the teacher an idea how much the students have improved in the subject matter. In the intervention plan; the researcher used the iterative cycle so that students have the opportunity to revise their solutions and explanations based on utility, analysis, and feedback. In the use of problem based inquiry approach; students worked in a collaborative manner and follow a series of phases or specific discipline-based practices to take them through an intentional process. These phases or practices are not necessarily completed in a linear or lock-step manner, but provided some structure for students to address a question, issue, problem, or need. The stages include: Step 1: Orientation of the other subject teachers, students and the parents. Step 2. Several practices on the method. Step 3. Explore the issue. Gather necessary information; learn new concepts, principles, and skills about the proposed topic. Step 4: State what is known. Individual students and groups listed what they already know about the scenario and listed what areas they are lacking information. Step 5: Define the issues. Frame the problem in a context of what is already known and information the students expect to learn. Step 6: Research the knowledge. Find resources and information that helped create a compelling argument. Step 7: Investigate solutions. List possible actions and solutions to the problem, formulate and test potential hypotheses. Step 8: Present and support the chosen solution. Clearly state and support the conclusion with relevant information and evidence. Step 9: Review of performance. Often forgotten, this is a crucial step in improving the problem-solving skills. 10. Students must evaluate their performance and plan improvements for the next problem. 10. Report performance.

Ethical Issues. The right to conduct the study was strictly followed to through the approval of the principal and the school president. The orientation of the respondents and the teachers was done separately.

Treatment of Data. The answers of the Pretest and Posttest was tabulated using the Microsoft Excel. Descriptive and inferential statistical tools was used in analyzing the data. The Mean Percentage Score was used to determine the pretest and posttest scores of the Grade 7 students. The t-test for mean difference. This method was used to measure the significant difference between the pretest and posttest.

III. Results and Discussion

Table 1
Pre-Test Performance Of Grade 7 Students

Score Range	Description	Experimental Group	
		Frequency	%
33-40	Excellent	11	30
25-32	Very Good	19	53
17-24	Good	6	17
9-16	Fair	0	0
1-8	Poor	0	0
Total		36	100
Weighted Mean		29.25	Very Good

Table 1 shows Pretest performance of the Grade 7 Students in Science. It illustrates on how the pupils are being rated according to their level of performance in the above mentioned subject. Based on the results of the study, the Grade 7 Students showed a majority performance on the very good level which is equal to 53 percent or 19 total number of respondents which belong to the score ranging from 25 – 32. Only 6 students or 17 percent are on the good level with a score ranging from 17-24 out of the 36 students being tested. Moreover, in the excellent level, there were 11 students or 30 percent which belong to the score ranging from 33- 40.

Based from the pretest data, it indicates that students have gained knowledge, concepts and skills in different competencies in science in the second quarter. In addition the results also implies that the Grade 7 students are learning independently maybe because they were already exposed to the different medium of learning instruction such as clever integration of technology; has demonstrated higher engagement and increased motivation towards learning especially among younger students, making them truly fall in love with learning. Moreover, since they are now in a face to face classes the pretest outcome showed that the Grade 7 Students thrive when given opportunities to collaborate and converse with peers. They grow from classroom discussions and social interactions with classmates, both academically and socially. With the goal of teaching mindful learners who actively pursue knowledge and level up learning of pupils who are in the good and very good level; teachers need to become more actively engaged in how they teach the curriculum in particular Science and how they develop each student's learning potential. They mix and match a variety of tactics that are interdisciplinary a great way to improve student engagement, teamwork skills and get excited for class. To ensure that students not only learn more, better, and faster they also learn smarter.

Table 2
Post-Test Performance of Grade 7 Students

Score Range	Description	Experimental Group	
		Frequency	%
33-40	Excellent	36	100
25-32	Very Good	0	0
17-24	Good	0	0
9-16	Fair	0	0
1-8	Poor	0	0
Total		36	100
Weighted Mean		37.58	Very Good

Table 2 presents the Posttest performance of the Grade 7 students in Science. This table tells us on how the students are being rated according to their level of performance after the integration of Problem Based Inquiry Approaches in Chemistry for a given period of time of the Second Quarter. The Posttest results showed that all 36 respondents equal to 100 percent are performing excellently with a score ranging from 33-40.

The Posttest results explained that the used of problem based inquiry approaches in chemistry was meaningful to the students. The students learned faster and perform better since it was just a smaller class of 36 students. It gave the students the opportunity to really get to know their peers on an individual basis. This help foster a highly collaborative classroom environment, as students become more comfortable with one another. They feel confident enough to share their ideas. It also spark lively debates over some topics. Better communication between the instructor and students. Though the pretest results was already very good; there were still 6 students who belonged to the good level and 19 students in the very good level. It was worthy to note that the groupings was into mix abilities. The 11 students in the excellent level during the pretest was distributed in the different groups to have a challenging role in group management; to help the 6 struggling students who are in the good level and to encourage the 19 students who are at the very good level to aim high. Students lift one another up and create an atmosphere where it is the norm to take risks, ask questions, make mistakes, and learn collaboratively. The vacant periods of the students were being utilized to have ample supply of time for collaborative work to continue their Science lessons using the problem based inquiry approaches since it is time consuming. Interdisciplinary or cross-curriculum connections make learning more meaningful for students. When they see the connections between individual subject areas, the material becomes more relevant. In English by introducing key vocabulary in the beginning and encourage students to practice the vocabulary in a variety of contexts to enhance their understanding. The use of math in chemistry, such as using ratios for mixing solutions. Taking measurements, determining temperature, density, and so on are all things that cannot be done without Math. In agriculture; chemists develop new chemicals to increase crop production and yield, defend against pests, and

protect the environment. In medicine, chemistry plays a crucial role in predicting drug interactions and many diseases or diseases are diagnosed and cured.

Table 3
Test of Difference Between the Scores in the Pre-test and Post-test of Grade 7 Students

Groups	Test Scores		Computed T	Critical T	Decision	Interpretation
Experimental	Pre Post	29.25 37.58	4.422	1.636	Reject Ho	Significant

Table 3 shows the Test of Difference between the pre-test and post-test scores of the Grade 7 students before and after the integration of the problem based inquiry approaches in enhancing their scientific discovery skills. Based from the results, it can be explained that the pre-test performance of the Grade 7 students which is 29.25 is lesser than the post-test performance which is 37.58. It further shows that the increased resulted to the calculated t value of 4.422 which is greater that the critical t value of 1.636. This illustrates that the integration of problem based inquiry approaches in enhancing the scientific discovery skills is significantly effective. The null hypothesis which states that there is no significant difference in the pre-test and post-test performance of the Grade 7 students before and after integrating problem based inquiry approaches is rejected. Students' scores were lower on the pre-test because they have not yet studied the material which is tested. Scores are expected to be higher on the post-test because the students have already studied the tested material. It also make sense to conclude that the treatment might be responsible for the improvement. It was very important that before the integration of problem based inquiry approaches the teacher has to do an orientation among other subject teachers and students. The parents were also called to a meeting before the implementation of the method since there were times students need to work during the weekends. Several trials and practices of the method must be conducted before the implementation. Collaboration of teachers in integrating the science concepts in other subjects was a great factor in the increased of posttest scores among the learners. On the other hand, since the method was time consuming the free periods of the students were being utilized. The used of the computer laboratory, science laboratory and the online resources of the library was very helpful. The more knowledgeable other thru the expertise of our college professors where the students can freely approach them as their resource persons in finding solutions to the problem. Other factors for why the post-test scores are better could be history and maturity. History would refer to other things might have happened between the pretest and the posttest. For example a particular program or advertisement related to the topic on chemistry aired on television and many of the students were able to watch it. Maturation; participants might have changed between the pretest and the posttest in ways that they were going to because they are growing and learning. Students' scores are lower on the pre-test because they have not yet studied the material which is tested. Scores are expected to be higher on the post-test because the students

have already studied the tested material. It also make sense to conclude that the treatment might be responsible for the improvement.

IV. Conclusion

Based from the findings of the study, the Grade Seven students were performing excellently; which means that the pedagogy on problem based inquiry approaches in enhancing scientific discovery skills was effective because it is self-directed. Students learned how to apply content knowledge to real-world problems and developed their aptitudes for critical thinking, problem-solving, enjoyable collaboration, self-management, perseverance, creativity, take accountability, sharpens communication and promotes transferrable interdisciplinary and lifelong learning habits. It keeps an individual competitive and indispensable in job markets.

V. Recommendations

The proposed intervention plan should facilitate interdisciplinary collaboration among faculty, parents and students.

The students with the guidance of the parents and teachers must be creative and vigilant in the integration of technology in problem-based learning. It creates flexibility of exploring concepts and acquiring skills through the learning process and co-create problems and solutions. Student engagement increases because of the wide range of tools available as they are active participants in their own learning.

School Principal should adjust teacher schedules to allow time for collaborative interdisciplinary planning. Without common planning time, teachers may struggle to integrate their disciplines within a unified framework.

Teachers should design instructional spaces for maximum flexibility and to encourage student collaboration. Ideally, classrooms will provide “break-out” areas where students can work independently or in groups. The integration of movable walls and screens in classroom construction can also help teachers and students create breakout spaces as needed. Furthermore, furnishing classrooms with mobile, reconfigurable desks, chairs, and tables allows occupants to rearrange the space to accommodate various student grouping arrangements and instructional activities.

School Management should emphasize common spaces to facilitate interdisciplinary collaboration among teachers and other school staff. Having multiple teachers share individual classrooms and clustering classrooms around common areas by interdisciplinary team. Common office spaces for interdisciplinary teams can also reduce barriers to communication and enable teachers to collaborate in their planning. Such design components can help teachers explore the

connections between their content areas through informal conversations and formal strategy sessions.

School President have to provide venue/space to practice, collaborate, share, and intentionally reflect on how they make decisions and lead their schools. Look at each moment in their school day as an opportunity to lead in alignment with their values.

Parents should have a healthy relationship with the teachers. Making follow ups will inspire the teachers to focus on the students. Make established consistent structure for homework and routine like reading for their child to develop comprehension skills.

Parent-teacher associations must take an active role in developing programs that support the educational needs of children. They should participate in school activities. Children naturally want to exhibit their talents and skills for everyone to see, especially their parents. It's also an excellent opportunity to get a "feel" of the school environment and how students interact with each other. They promote strong partnerships among families, schools, and communities.

DepEd Officials. Results of the study point the urgent need for DepEd officials to rethink and redesign curricular and institutional reform in the spirit of integral ecology and transformative action.

Government officials must have a constant revisit of the educational curriculum. A curriculum that will produce Filipinos not only competent in cognitive skills but who are proud of their roots, history, culture and traditional values.

Other Stakeholders must understand barriers to learning and can offer solutions which are tailored to the specific needs of the learners such as project resource sourcing for a successful execution and completion of the project.

Future Researchers are encouraged to conduct the same study to verify the usability and significance of the study.

ACKNOWLEDGMENT

I wish to thank with deep gratitude and with the greatest joy to the Lord and the Blessed Virgin Mary who have granted me the grace to finish my graduate studies for my in-depth knowledge and practical skills in teaching.

My special thanks to Dr. Bryant C. Acar, Chairman of the Thesis Committee for his expertise in improving the study.

Grateful acknowledgment to Dr. Elvin H. Wenceslao, my Thesis Adviser for his encouragement, persuasion, proficiency and determined effort. He has been at all times untiringly cheerful and ready to serve in any possible way.

I value and respect the knowledge and know-how of Dr. Annabelle A. Wenceslao and Dr. Jasmine B. Misa for their professional suggestions and recommendations toward the realization of the study.

My profound gratitude to Emmanuel A. Fiel, President of Western Leyte College. I could not have done this if not for his approval of my Faculty Development Program.

Isabelita T. Peroso, Principal of Western Leyte College High School Department for giving permission to conduct the study.

To our librarians who are very accommodating and patient in assisting the students when they do research.

I wish to acknowledge the Grade 7 respondents of Western Leyte College, for their honesty and cooperation in completing the data needed.

To our CICTE and Hotel Management Departments for sharing their laboratories when students do their laboratory works.

To Mardion S. Estrera for his technical skills and the rest of my colleagues who are always ready to give their support and extend a helping hand.

To our medical personnel who shared their expertise to the students on the effects of chemicals to the body.

To the Working Scholars who are very accommodating and ready to answer my requests.

To my family and my Neocatechumenal Community in Isabel for their prayers to make this research paper a reality.

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