Inquiry-Based Reading Comprehension Activities in Science to Improve Academic Performance

Joseph T. Gudelos
Nemesio-Epifania Taneo Memorial Senior High School, Lapu-Lapu City, Philippines.
Corresponding author email id: joseph.gudelos@deped.gov.ph

Abstract – This study utilized a quasi-experimental research design. One group from Grade 11 was given the treatment or intervention and one group served as the control, receiving the traditional method of teaching. Nemesio-Epifania Taneo Memorial Senior High School, Tingo, Lapu-Lapu City was the locale of the study. The research subjects of the study were the two sections of Grade 11 learners, chosen purposively based on its number of enrollees (25 or more) and on the sections handled by the researcher, whom at the same time implementer of the interventions. Twenty (25) subjects of Grade 11 learners served as the experimental group, the other twenty (25) is from another section which served as the control group. The study revealed that majority of the subjects read every other day for less than an hour. All of them have reading resources available at home which include mostly of print and some non-print reading resources. The performance of the learners receiving the traditional teaching is comparable to that of the learners to receive the reading comprehension activities prior to the intervention. The scores of the experimental and control group are in a normal distribution. There is an increase in the mean difference of the pretest performance between two groups compared. There is a statistical significant difference of the pretest and post-test scores within groups (control and experimental group). There is also significant difference between the performance of the learners receiving the Inquiry-based reading comprehension activities (experimental group) to that of the learners receiving the traditional method of teaching or chalk-talk or lecture discussion (control group) implying that the Inquiry-based reading comprehension activities is an effective intervention to increase the performance of the grade 11 learners in Earth and Life Science class. It can be concluded in the study that the Inquiry-based reading comprehension activities are effective intervention to increase the performance of Grade 11 learners in Earth and Life Science class.

Keywords – Academic Performance, Inquiry-Based, Inquiry-Based Learning Approach, Reading Comprehension Activities.

I. INTRODUCTION

The worldwide significance of Science in industry and in the society necessitates student-centered learning approaches, promising teaching methods, and hopeful teaching strategies to advance knowledge and skills in science. The 2008 high literacy rate of the Philippines, 93.4%, had not manifested to a good academic performance in Science for ninety years back (Imam et al, 2014). Imam and associates (2014) added that on the national scale, there is persistent poor mastery of the learning competencies among learners based on 2003 to 2009 National Achievement Test.

As one of the learning institutions which patronize on excellence in teaching, and offer academic track for K-12 program, Nemesio-EpifaniaTaneo Memorial High School commits to improve teaching and learning especially in the Science arena. However, the academic performance of the learners in Science has been dismal as evidenced by a low mean percentage score of 69.6 in the quarter major exams from the first to third grading period of school year 2017 and 2018. The Grade 10 completers who have undergone the four years of Junior High School educational curriculum have faced this concern concurrent with a wide problem of reading comprehension as manifested in the Philippine Informal Reading Inventory (Phil-IRI) by majority, 82 out of

122, 67.21% of the population, categorized as "Instructional", and only 30 out of 122, 24. 59% are categorized as "independent". 67.21% of the Grade 10 learners are fast readers. 44.26% of them are independent readers in terms of correctly pronouncing a word; 47.54% "instructional", but only 30 out of 122, 24.59% can comprehend independently. This means that learners have problems in answering pertinent questions of what they read. Akbasli and associates (n.d.) asserted that Science performance is can be associated with reading comprehension the reading comprehension skills of learners. Understanding the English instruction matters a lot in performing scientific tasks and activities, as well as in solving scientific problems. In short, it is hard to say that scientific literacy is not affected by literacy with comprehension (Imam, 2014). Though there are no concrete studies established in Nemesio-Epifania Taneo Memorial High School which can rule out the link of reading comprehension to poor Science performance, but Science teachers of Grade 10 and 11 raise concerns on poor reading comprehension as one of the hindrances in uplifting Science academic performance. One Science teacher commented in an interview "Di kayo kakuha ang mga estudyante basta nay basahunon nga (You can't take the students as long as they read) situations or problems. Hinay-hinay sila basta ingunana nga comprehension". Translation "They (the learners) cannot really comprehend well when solving situational problems. They are slow in terms of reading comprehension". This implies that learners need assistance and training to develop comprehension and possibly address the problems in science performance and comprehension before they will graduate in the K-12 program.

Committing to improve and maximize the transfer of learning to the incoming Grade 11 in the Science arena, action research on Inquiry-based Reading Comprehension activities in teaching and learning Science will be pursued. Inquiry based learning is a constructivist approach, as mentioned by Lutheran Education (n.d.), where learners seek for the truth and inquire answer to a question through reading, listening, watching, or experiencing to satisfy curiosity and answer a question or a problem. The researcher, as a science teacher, purposefully chose the learning approach for its advantages, as a student-centered, and also as a good fit in embedding the reading program since it values reading to answer the learners' inquiry. The study determined the effectiveness of Inquiry-based Reading Comprehension activities in teaching and learning Science to improve academic performance among Grade 11 learners.

Findings and outcomes of this study served as basis on the action plan geared towards the possible adaption of the intervention to other academic subjects in Junior and Senior High School, particularly English and Science; orientation of the administrators, field educators, learners, and parents as to the effectiveness of the intervention.

II. REVIEW OF RELATED LITERATURE

Reading can be defined in different ways by various researches and authors of different academic orientations. Kerubo (2014) viewed reading as "an interactive process that goes on between the reader and the text, resulting in comprehension." Reading thereby is a communication process of the reader and the one writing the textual message or to the person used as point of view by the author.

It is important to note that comprehending the instructions or understanding what you read is needed for learning that involves oral or written instructions. Comprehension which is the ability of readers to get meaning from text (Roit, n.d.), must be acquired for efficient learning. Reading with comprehension has been a learning skill and a key to further achievements in the academe (Alshumaimeri, 2011). Roughly speaking,

comprehension of the written text in English seems to be a pre-requisite to understanding Science exams, articles, and researches. Since English has been used as a medium of instruction, educators unanimously concur that good reading comprehension in English means a better success in the academic arena such as in the field of Science. It is for the fact that reading articles and researches in Sciences are written English language. For academic subject with English instructions, reading alone is not enough for efficient learning. It must require understanding of it, such as the Science problems, simple experiments, hypothesis testing, and more areas of the discipline that requires reading comprehension as fundamental skills in learning. There is a need for learners to comprehend not just reading the text or words separately (Fakeye & Ogunsiji, 2009).

In the study of Cabardo (2015) most of the learners are categorized at the frustration level of reading proficiency in silent reading; instructional in terms of oral reading. It was further asserted that female students tend to be more proficient than males. The study of Cabasan (2011) also concurred with the results. With The study revealed that majority of the learners was on the frustration level where repetition of words in reading was observed. It can be denoted that learners have problems in terms of reading comprehension.

The Science performance of the Filipino learners has been recorded with the poor achievement for several years. In school, the Science performance level of the learners was measured through formative and summative assessments. However, there were tests widely conducted that reflected the learners' performance in the Science arena such as the National Achievement Test for Grade 10 learners, Trends in International Math and Science Study (TIMSS) for Grade 8.

In the National Achievement Test, a mean percentage score of 39.49 in Science by 2004-2005, lowest among the different subjects being tested; by 2005-2006, a mean of 37.98, by 2011-2012, 40.53, still lowest among other subjects (Philippine Basic Education, 2013, July 20).

The 1999 and 2003 TIMSS results jive with that of the National Achievement Test. In the 1999 TIMMS results, Philippines ranked the 36th place out of 38 participating countries with an average score of 345 compared to the international average of 488 and a highest average score of 569 from Chinese Taipei (National Center for Education Statistics, 2000). In the 2003 TIMSS results, the country still landed at the bottom of the ranks. Philippines ranked forty-second out of forty-three participating countries with an average rating of 377 compared to an average international rating of 474 and a highest international rating of 578 (Martin et al., 2004). Various studies and researches found out that there were interrelated factors which affect Philippine Science performance. It is worth to consider the study of Bernardo (2008) asserting that low Science performance is attributed to factors, such as insufficient Science curriculum and poor Science content and pedagogies (Bernardo, 2008). Moreover, low performance of learners in Science can be attributed to ineffective management of the delivery of Science education and insufficient Science culture in the Philippines. The Philippine Education is now trying to address these concerns. With the K-12 program of the Department of Education, with its new curriculum in Science, educators and stakeholders are hoping to uplift the Science performance in the Philippines. The initiated utilization of a student-centered inquiry-based learning, the selection of teaching methods and strategies are strides to make Science performance in Philippines better. More things have been done aiming to solve the puzzle of poor Science achievements but not much has been done significantly.

Reading comprehension is a necessity for high order thinking skill. Learners can neither analyze nor evaluate

a situation or a problem, scientific or not, without understanding first what the situation is all about based from the given data. In the study of Akbaşlı and associates (n.d.), Program for International Student Assessment (PISA) results, and learners and teachers' perception unanimously pointed out the influence of reading comprehension to Science performance. Learners who don't spend much time in reading obtain a fair to a low academic achievement. It is further asserted that improved reading comprehension skill has something to do with the improvement of learners' academic performance in Science subject. The study of Imam (2014) suggested that reading comprehension skills such as vocabulary skills, perceiving details, making an inference, inducing a generalization should be augmented as early as possible in the secondary years. It further suggested that there should be an application of reading comprehension skills particular to science education and not as a separate entity.

However, an opposite perspective was revealed in the study of Elliott (n.d.) asserting the inefficiency of reading intervention program to augment English literacy and eventually scientific literacy. The study found no considerable difference between the performance of learners enrolled in the reading program to those who were not. Qualitative data emphasized that learners who acquire reading comprehension skills through the reading intervention program did not fairly apply the skills to the specific lessons such as in Science and other subjects.

And so to address the concern is to face the existing problem of education, the poor achievement in Science brought about by a poor to instructional reading comprehension as supported by various researches. In this action research, the embedded reading comprehension activities, designed in teaching and learning Science, is hoping to address the gap of reading comprehension, not as a separate program in English, but as an embedded activity in the Science lesson plans, employing inquiry-based learning to improve academic performance in Science.

There is no such a perfect intervention program as with the reading intervention or an embedded reading activity to be implemented in Science teaching and learning. A program will be assessed whether it is good or not when its implementation is good. Perhaps, the success of the implementation of any program is in the seriousness and commitment of the teacher as the implementer. According to Velten and Mokhtari (2016), the sincerity of the reading program implementation brought success in achieving the goal of improving the reading and comprehension skills. Although in this action research, the reading comprehension activity is embedded in teaching the particular Science lessons, the challenge of commitment or fidelity in the program implementation still applies. Another challenge concern is the teaching quality related to limitation of how a teacher process reading passages through a teaching strategy such as graphic organizers, think-pair share, answering guide questions which focus on vocabulary skills, noting details, making an inference, and inducing a generalization. According to Diamond (2006), the design, the implementation, and the sustainability are the three key components to consider for the success of reading comprehension program or activities. Design in the sense the teacher crafting the research program should plan what reading activity to be presented, how it will be introduced and how it will be processed. There comes the challenge of the teaching approach and strategy comes in with the actual implementation. The question on the effectiveness of the reading intervention design is in the actual realization of the design, whether embedded in teaching or not. Sustainability pertains to the support of the school towards the implemented program. Reading intervention program will have an unclear view of success if it only improves reading comprehension and Science learning for one semester with a one

batch of students. It will never achieve its goal as a program if it started and run for few sessions and discontinue due to lack of resources or reading materials. With the three components to consider comes the challenge of how to acquire them at hand to make the program successful.

III. SCOPE AND LIMITATION

This study utilized a quasi-experimental research design. Grade 11 Humanities and Social Sciences (HUMSS) A was given the treatment or intervention and Grade 11 HUMSS B served as the control group, receiving the traditional method of teaching. The reading activities as the intervention were implemented through slides-presentation or through printed handouts of reading materials. The traditional method of teaching refers to lecture discussion where slide-presentation was allowed as long as it was utilized just to display the content of the lectures. The playing of videos for the experimental and control group was not allowed to control the threat to the internal validity.

Nemesio-EpifaniaTaneo Memorial High School was the locale of the study. The school was formerly called Tingo High School, situated at Tingo, Lapu-lapu City, Olango Island. It has three classrooms for the Grade 11. Two rooms are located in the school campus, in a two-storey building. The other one was outside of the campus, located at the canteen of Tingo Elementary School, which served as a temporary classroom for the Humanities and Social Sciences' Students (HUMSS) while the Senior High School building construction is on-going. In this quasi-experiment, the researcher focused on competencies that include topics on the layers of the Earth, rock cycle, continental drift, and absolute and relative dating.

The study gathered quantitative data on the following: profile of the respondents in terms of reading habits: frequency and duration in reading; availability of reading materials at home; types of reading materials available at home; pretest scores of the experimental and the control group before the integration of Inquiry-based Reading Comprehension Program in teaching and learning Science lessons; post-test scores of the experimental and the control group after the integration of Inquiry-based Reading Comprehension Program in teaching and learning Science lessons; significant difference between the pretest and post-test scores within groups; significant difference between the post-test scores of the experimental and the control group after the integration of Inquiry-based Reading Comprehension Program in teaching and learning Science lessons.

IV. RESEARCH METHODOLOGY

Sampling. The research participants of the study were the two sections of Grade 11 learners, chosen purposively based on the sections handled by the researcher, whom at the same time implementer of the interventions. Twenty (25) participants of Grade 11 Humanities and Social Sciences (HUMSS) A learners served as the experimental group, the other twenty (25) was from HUMSS B which served as the control group. The selection of the participant members of the two groups were based on their general average grades from Grade 10 to establish comparable groups for experiment. They were taken from the population of 120 students. Most of the Grade 11 learners were the former Junior High School completers of Nemesio-Epifania Taneo Memorial High School whose mean percentage scores in Science and reading comprehension profile were taken as one of the basis of crafting the action research.

Research Procedure and Instruments. The researcher prepared the research proposal and was approved and was recommended by the school head for District level screening. The paper was then Endorsed to the Division

office for approval. It was then endorsed to the Regional office upon approval at the Division level. The paper was screened, approved and was granted support funds under the Basic Education Research Fund (BERF) terms. The researcher commenced the data gathering upon the approval. The research instrument utilized, both survey questionnaire on the profile of the participants as well as the pretest and post-test were validated by two (2) Master Teachers. The tests passed the reliability testing and reading ease tests utilizing the free Text Readability Consensus calculator online (Automatic Readability Checker. 2022, December 22).

The intervention which was imposed was an Inquiry-based Reading Comprehension Activities which served as the main activities in the delivery or implementation of the daily lessons in Science. This means that the reading activities are Science by content and by context and not as a separate English language reading comprehension program. The reading activities can also be applied to the introductory activities or in the application part of the Science lessons. The researcher uses the term "Inquiry-based reading comprehension activities" since the approach which was utilized in the implementation of the Science lesson was the Inquiry-based learning. In Inquiry-based learning, the learners were given a practical situation or a problem which posed a question or stimulates curiosity to be solved and answered by the learners through reading the Science reading materials. Questions were given after presenting the practical situation and it was answered when the students have read the materials. The questions were comprised of Science vocabularies, noting lesson details, making inferences, and drawing conclusions (Imam, et al., 2014). Processing of the learners' answers was done through interactive discussions. Abstraction and application of the lesson followed. Assessment of learning was based from the learning objectives which were comprised of Science vocabularies, noting lesson details, making inferences, and drawing conclusions. The interventions run for a month equivalent to 16 contact hours. The researcher designed a short survey to cover data on the profile of the participants. It was validated by two (2) Master Teachers and was administered to the participants after the orientation and prior to the start of the intervention. The researcher made 20-item pretest and 20 item post-test assessed the reading comprehension skill of the participants in Science context. The researcher who developed the test appended Table of Specifications of the covered topics. Two (2) Master Teachers validated the content and coverage of the test. It was further subjected through a free online Text Readability Consensus Calculator (Automatic Readability Checker. 2022, December 22) before it was administered to the participants with a Flesch Reading score of 69.4 (text scale). This means that the instrument has a standard or average text scale which can be understood by average Junior High school learners (Grade 8 and 9) and up. It has a Gunning Fog score of 8.4. (Text scale), which indicates that the instrument is readable or fairly easy to read. The instrument also passed the reliability testing using a test-retest method, which has a correlation of 0.87 interpreted as having a good reliability result. The researcher utilized spreadsheet to calculate the correlation. The questions of the post-test were reshuffled from the questions of the post-test questionnaire to minimize the possible influence of pretest sensitization.

Ethical Issues and Considerations. The research commenced upon the approval of the school head, Schools Division Superintendent and of the Regional office under Basic Education Research Fund (BERF) terms. Participant learners were oriented. Written assent was secured during the orientation. The purpose of the study, the risks and benefits, issues on confidentiality and anonymity, the nature of voluntariness of participation were tackled and explained in details during the orientation. Participants were instructed not to write or state their names but they were given codes during the test. The researcher, who is a Science teacher having a graduate school studies in Science pedagogies, is competent in imposing a reading comprehension activities in Science

lessons since the competency skills in reading comprehension, such as Science vocabularies, noting details, making inferences, and drawing conclusions, which are basically competency skills also in the scientific inquiry (Imam, et al., 2014).

Data Analysis. The profile of the respondents in terms of reading habits: frequency in reading, duration in reading, availability of reading materials at home was dealt with simple percentage. The pretest scores of the students in the experimental and control group before the integration of Inquiry-based Reading Comprehension Program was described through simple mean and was tested for its significant difference through independent samples t-test. The post-test scores of the students in the experimental and control group was described through simple means. The statistical significant difference of the pretest and post-test scores within groups of the control and experimental group was dealt with paired sample t-test. The statistical significant difference between the post-test scores of the students between groups of the experimental and the control group was treated with an independent samples t-test.

V. FINDINGS AND DISCUSSION

I. *Profile of the Participants*

For the profile of the experimental group, in terms of reading habits, majority of the subjects, fifteen (15) out of twenty-five (25), 60% read every other day for less than an hour. In terms of availability of reading materials at home, all of the subjects do have reading resources available. The reading materials available at home include mostly of print, where twenty-two (22) out of twenty-five (25) or 88% of the subjects do have; and non-print, where twelve (12) out of twenty-five of the subjects or 48% owned. For print reading materials, majority of the subjects, nineteen (19) out of twenty-five (25), 76% possessed books and sixteen (16) out of twenty-five (25), 64% possessed newspapers at home. It is also worth to note that more than half of the subjects, fourteen (14) out of twenty-five (25), 56% have dictionaries at home. Only one (1) out of twenty-five (25), 4% owned a journal. None of the respondents owned an Almanacs and Atlas. For non-print reading materials, eight (8) out of twenty-five (25) of the subjects, 32% have e-books, five (5) out of twenty-five (25), 20% of them have computers.

For the profile of the control group, in terms of reading habits, majority of the participants, thirteen (13) out of twenty-five (25), 52% read every other day for less than an hour. In terms of availability of reading materials at home, all of the participants do have reading resources available. The reading materials available at home include print, where twenty (20) out of twenty-five (25) or 80% of the participants do have; and non-print, where thirteen (13) out of twenty-five (25), 52% owned. For print reading materials, majority of the subjects, nineteen (19) out of twenty-five (25), 76% possessed books and fourteen (14) out of twenty-five (25), 56% possessed newspapers. Fifteen (15) out of twenty-five (25), 60% have dictionaries at home. Only one (1) out of twenty-five (25), 4% owned a journal and none of the participants in control group owned an Almanacs and Atlas. For non-print reading materials, ten (10) out of twenty-five (25), 40% have e-books, six (6) out of twenty-five (25), 24% of them have computers.

II. *Pretest Scores of Experimental and Control Group*

The results denote a comparable pretest mean scores of the control group (M = 10.00, SD = 2.68) and experimental group (M = 10.56, SD = 2.12) with a mean difference of 0.56. This means, that prior to the intervention, learners in control group set for traditional teaching exposure are comparable to that of the learners

to receive the reading comprehension activities. This implies that the researcher can appropriately commence the intervention since the control and the experimental group have the same characteristics based on the pretest performance. The threat to internal validity of this research has been controlled since the researcher considered the Grade 10 average grades of the subjects as basis for the selection and as a uniform baseline of the control and the experimental group. Pretest score results also supported on the comparability of the subject's performance in Grade 11 Earth and Life Science class. However, in this quasi-experiment, the specific skills in reading comprehension, such as vocabularies, noting details, making inferences, and drawing conclusions (Imam, et al., 2014) were not itemized since the number of items of the research instrument were not even for each particular skill. It was late after the data gathering period when the researcher realized the need of the test items for improvement so that the study might present findings in a very detailed fashion. Considerably, this research presented the reading comprehension skills of the subjects based on generalized test score results of all the reading comprehension skills as enumerated.

III. *Post-test Scores of Experimental and Control Group*

Learners receiving the traditional teaching method tend to have lower post-test mean score (M = 12.12, SD = 2.76) compared to learners exposed to reading comprehension activities (M = 14.04, SD = 2.72), with a mean difference of 1.92. The test scores of the experimental and control group are in a normal distribution. It can be noted that leaners exposed to the reading comprehension activities have a tendency to perform better compared to those who were exposed to the traditional lecture discussion though further exposure to the intervention may be necessary and may be greater number of participants needed to reveal an extensive edge of the intervention.

IV. *Significant Difference between the Pretest and Post-test scores of the Experimental and the Control Group*

The mean pretest score of the control group (M = 10.00, SD = 2.68) and mean post-test score (M = 12.12, SD = 2.76) with a mean gain score of 2.12, P = .003, interpreted as significantly different statistically. This means that the post-test performance of the control group still significantly improved after the chalk-talk or lecture discussion. This is expected because though lecture is traditional, information could still be imparted to the learners and improvement of the performance is ideal to be observed. The mean pretest score of the experimental group (M = 10.56, SD = 2.12) and mean post-test score (M = 14.04, SD = 2.72) with a mean gain score of 3.48, P<.001, interpreted as significantly different. This means that the performance of the experimental group (learners exposed to inquiry-based reading comprehension activities) significantly improved, slightly better compared to control group (leaners exposed to traditional lecture discussion). This implies that the intervention can be better utilized to improve the performance of Grade 11 learners in Earth and Life Science class.

V. *Significant Difference between the Post-test scores of the Experimental and the Control Group*

The mean post-test score of the control group (M = 12.12, SD = 2.76) and the mean post-test score of the experimental group (M = 14.04, SD = 2.72) with a mean difference of 1.92, P =.02 at .05 level of significance are interpreted as significantly different statistically. This indicates that learners exposed to reading comprehension activities performed significantly better compared to learners exposed to traditional lecture discussion. This prompted the researcher to reject the null hypothesis which implies that the reading

comprehension activities could be a better method and a potential intervention to increase the performance of the Grade 11 learners in Earth and Life Science class. Hence, the teacher should have considered reading comprehension programs or activities integrated into his/her daily lesson plans to enhance the learning of the students as supported by a better performance of the post-test. However, consistent with the pretest data presentation, this quasi-experiment did not provide an itemized presentation of the specific reading comprehension skills enhanced. This research though provides a generalized score of the reading comprehension skills covering vocabularies, noting details, making inferences, and drawing conclusions. Also, the intervention only took for around 16 contact hours which is supposed to be increased for further research to establish a better and clearer effect of the reading comprehension activities. The intervention could further cover wider scope of competencies. Nonetheless, in this quasi-experiment, the researcher focused on competencies that include topics on the layers of the Earth, rock cycle, continental drift, and absolute and relative dating.

VI. Conclusion

The inquiry-based reading comprehension activities can be an effective intervention to increase the performance of Grade 11 learners in Earth and Life Science class. Majority of the learners read every other day for less than an hour. All of them have reading resources available at home which include mostly of print and some non-print reading resources. Print reading materials available are mostly books and considerably newspapers. The performance of the learners receiving the traditional teaching is comparable to that of the learners to receive the reading comprehension activities prior to the intervention. And the performance of the learners exposed to the intervention (experimental group) significantly improved better compared to learners exposed to traditional lecture discussion (control group). Post-test performance of learners in the experimental group is better compared to that of the control group. It is suggested based on research data that reading comprehension activities can be a better method and a doable intervention to improve the academic performance in Earth and Life Science class.

VII. Recommendations

In the research process, if there is a replication of the study, the researcher recommends the following:

1. The research instrument utilized to evaluate the pretest and posttest performance of Grade 11 learners could have even items that measure the learners' performance as to the specific reading comprehension skills, such as vocabularies, noting details, making inferences, and drawing conclusions.

2. The research could have reported findings itemizing the specific reading comprehension skills from the pretest to the posttest results. For this research, the pretest and post scores, covering generally on vocabularies, noting details, making inferences, and drawing conclusions, was considered adequate.

3. There could have been a separate study which would cover the process of learning before, during, and after the intervention of the Inquiry-based reading comprehension activities. For this research, the quasi-experiment is considered enough.

4. The Inquiry-based reading comprehension activities could have been implemented and tested for a group learning activity in comparison to individual learning activity. For this study, it was implemented mostly through a group learning activity and minimally individual learning to the test subjects.

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AUTHOR'S PROFILE

Joseph T. Gudelos, The author is born on December 28, 1989 at Lapu-Lapu City, Cebu, Philippines. He accomplished his Bachelor of Science in Nursing at University of Cebu-Lapu-Lapu and Mandaue, with Diploma in Professional Education in the same school. He graduated his Master's Degree in Teaching Science at Southwestern University. He accomplished his Doctoral Education (Complete Academic Requirements), major in Science Education at Cebu Normal University. He was a college teacher for 3 years at the same time a part-time school nurse in AMA Computer Learning Center (ACLC)-College of Mandaue. Currently, he is working as Master Teacher I at Nemesio-Epifania Taneo Memorial Senior High School, Lapu-Lapu City, Cebu, Philippines under the Department of Education System. His subject area incl--udes quantitative and qualitative Research, Earth and Life Science, and Physical Science.