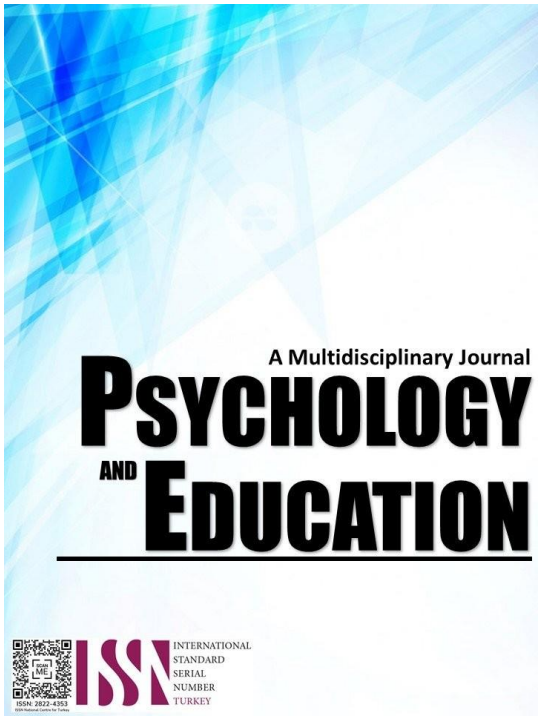
INFLUENCE OF INQUIRY-BASED SCIENCE ACTIVITIES ON STUDENTS' ACHIEVEMENT



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Research Article

Influence of Inquiry-Based Science Activities on Students' Achievement

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Abstract

This study was conducted to determine which domains of inquiry-based science activities that significantly influence the students' achievement of grade 10 learners. The study employed a quantitative, non-experimental method employing causal- effect. Mean, Pearson-r, and Regression Analysis were the statistical tools used to determine the level, relationship, and influence of each variable. The respondents comprised 332 grade 10 students from the four main secondary schools of District 1 in the Division of Compostela Valley, Province of Compostela Valley, for the School Year 2018-2019. The findings of the study revealed a high level of inquiry-based science activities in terms of engagement, exploration, explanation, elaboration, and evaluation. This study also revealed that the level of students' achievement was high in terms of cognitive development, laboratory skills, science process skills and understanding of science knowledge. The correlation between two variables of the study revealed significant relationship between inquiry-based science activities and students' achievement. Lastly, the study revealed that exploration, explanation, elaboration, and evaluation are the domains of inquiry-based science activities that significantly influence students' achievement. However, engagement appeared to be non-significant hence the null hypothesis is not rejected.

Keywords: *MAED-Teaching Science, inquiry-based science activities, students' achievement, Philippines*

Introduction

The problem on how to improve students' achievement in science has always been the concerns of many educators. Students at all grade levels and in every domain of science should improve their achievement by developing their cognitive, laboratory and science process skills in order to enhance their understanding of science concept. This is very important in order for them to execute activities required by the curriculum and learn effectively the competencies behind these activities. Despite significant achievements in improving access to quality education over the decades, there is continuation of poor achievement and performance in mathematics and science subjects at the primary and secondary school level. Clearly, the declining execution of learners in the National Achievement Test (NAT) in the areas like mathematics as well as science is as of now an evidence of the current issue. The consequences of the NAT passing rate reflect students' proficiency and achievement in science continuously fall under frustration level (Prudente, 2011; & Shimbi, 2016).

It is important to increase student performance and achievement and become the main objective of all educators. Students' achievement in terms of the improvement of their cognitive, laboratory, at the same time their scientific aptitudes and skills is significant in the light of the fact that it will empower the students to know and apply logical ideas, take part in logical examination and comprehend the idea of science (Maranan, 2017). One essential aspect of science education is to improve students' achievement in science by developing their cognitive, laboratory and scientific skills. There is a solid conviction that a child who is appropriately acquainted with science through different aptitudes will discover the abilities helpful all through life. It is significant that for science figuring out how to be significant and applicable, it ought to sufficiently reflect the method for science, process situated and product oriented (Akinbobola & Afolabi, 2010).

On the other hand, it has been suggested that inquiry-based methodology is a way in enhancing student accomplishment and performance, particularly in the training of science and because of that the connection between inquiry-based learning with learners' achievement cannot be disregarded. Learners utilizing inquiry-based methodology have been discovered to perform better with respect to institutionalized examinations, develop their methodical abilities in science, as well as have progressively inspirational frames of mind to science (Gibson & Chase, 2002; & Miller, 2014). A Master Teacher I in science in one of the school that is included in the study and who happens to be one of the external validators of this study said that subjects like science are one of the shortcomings of the learners. The low achievement is noticeable in the quarterly examinations as well as in the National Achievement Tests results. This low

performance in science of the young Filipino students might include the insufficient teaching and learning process.

The researcher has not come across a study that deals with the influence of inquiry based-science activities with the learners' achievement in the high school context within the Division of Compostela Valley. Thus, this study can raise concern to the intended beneficiaries and possibly develop a specific intervention to fully implement quality instructional services to students which will help improve their performance and achievement in science. It was recorded in the 2003 Trends in International Mathematics and Science Study (TIMSS) that the Philippines carried 34th place compared to other countries who took examination for both science and math (The Manila Times, 2014). Further, the secondary schools in the District 1 of Compostela Valley consider the issue mentioned above as the same problem experienced by the schools in achieving its success on the students' academic achievement, thus it is with great urgency to conduct the study.

Research Questions

This research was conducted to determine which domains of inquiry-based science activities could significantly influences students' achievement. Specifically, the research was conducted to sought answers to the following questions:

1. What is the level of inquiry-based science activities of students in terms of:
   1.1. engagement;
   1.2.exploration;
   1.3.explanation;
   1.4.elaboration; and
   1.5.evaluation?
2. What is the level of students' achievement in terms of:
   2.1. cognitive development;
   2.2. laboratory skills;
   2.3. science process skills; and
   2.4. understanding of science knowledge?
3. What is the significant relationship between the level of inquiry-based science activities and students' achievement?
4. Which domains of inquiry-based science activities that significantly influences students' achievement?

Methodology

This research used the quantitative non-experimental design method of research utilizing causal-effect technique. The researcher chose to use quantitative non-experimental design because the goal of the study is to know the relationship of the variables. The researcher used the causal effect technique because the research objectives is to identify what domain of inquiry-based science activities influences the students' achievement and the relationship of the independent and dependent variables. As the term correlation research technique, it is the statistical technique that can show whether and how strongly pairs of variables are related (Gay, Mills & Airasian, 2012).The researcher also utilized a modified and adapted questionnaire to gather data on the influence of inquiry-based science activities on students' achievement.

Participants

The respondents of this research were the Grade 10 Junior Secondary School learners from the regular class in the Division of Compostela Valley District 1 who were selected using stratified random sampling. The numbers of respondents were determined by using Slovin's Formula. There were 332 respondents in the study. 125 students were from School A, 77 students from School B, 88 students from School C and 42 students were from School D. Grade 10 students under the regular class of the above-mentioned schools were answering the adapted and modified survey questionnaire. The respondents must be a grade 10 and a bonafide student of the selected schools for the school year 2018-2019. Students who are not grade 10 and not bonafide students of the selected schools are not allowed to participate in the survey. The respondents/participants can withdraw if they feel threatened with the conduct of the study.

Distribution of Respondents

School	*Population*	*Sample*
A	733	125
B	450	77
C	520	88
D	250	42
Total	1953	332

Procedure

After the approval of the panel members, the researcher underwent the following steps and procedures in gathering data for study. Firstly, the researcher asked consent to conduct the research. Primarily, the researcher obtained letter of endorsement from the Program Coordinator of the Graduate School, Dr. Ionne A. Avelino. Then, the researcher forwarded the letter of permission to conduct the study to the Division Superintendent of Division of Compostela Valley. Upon approval, the researcher provided a copy to the School Principals of School A, School B, School C and School D. Upon the approval to conduct the study, the researcher asked the list of the Grade 10 students from the Guidance Counselor of the said schools.

After this, the researcher computed the number of respondents using the Slovin's Formula. The researcher requested assistance and made some appointments to the class advisers of the respondents for the distribution of the questionnaire. Before the distribution of the survey questionnaire, the researcher elaborated first the rationale of such activity for the students to fully understand its purpose. The respondents were given one hour to answer the questionnaires. Also, the researcher spent time with the respondents during the administration of the survey questionnaire. Questionnaires were retrieved after the allotted time given to the respondents was up. Finally, the researcher gathered, checked and tabulated the scores of the respondents upon the approval of the validators, the panel members and the adviser, and data had been submitted to the statistician for analysis.

Ethical Considerations

There are considerable ethical issues and concerns that have specific ramifications for this quantitative inquest. Such issues and concerns may arise primarily from the methodology involved in this study. The ethical contests that are pertinent to this research concern issues of the right to conduct the study, confidentiality and anonymity.

In conducting this study full ethical standards were followed following the study etiquette evaluations as well as the consistency measures, specifically in dealing the participants along with their information enumerated as, but not restricted to:

Voluntary participations. The Grade 10 students from the chosen institution were given their own-willpower to be involved in the study with no type of result or punishment or loss of advantages. Thusly, after the reason and the advantages of the examination was portrayed at the same time introduced to the contributing school. At that point, the privileges of the respondents to contribute to the collection of information were painstakingly considered and followed upon.

Privacy and confidentiality. The researcher secured the privacy as well as with most extreme secrecy the participants' individual data that might be essential to the research.

Informed consent process. The study survey inquiry form was liberated from specialized terms that make it simpler for the participants to comprehend. It provides the participants a vivid understanding of the advantages they might acquire once the conduction of this research is finished. The survey inquiry form was given to the respondents for them to answer upon the approval of the school head.

Recruitment. The distribution of the participants indicated how the participants were dispersed. Besides, the information assortment systems were demonstrated, just as how the survey inquiry form was distributed to the participants, and the way of participants engaged with the investigation.

Risks. The study did not involve in high risks of situations that the respondents may experience in physical, psychological or socio-economic concerns. The study just involves in their field of motivation towards learning.

Benefits. The result of the study benefits DepEd officials of Compostela Valley Division in terms of acquiring information as to the influence of inquiry-based science activities on students' achievement in terms of cognitive development, laboratory skills, science process skills and understanding of science knowledge.

Plagiarism. The research has no indication or proof of somebody's effort as his own. The research had gone through plagiarism detector like Grammarly or Turnitin software.

Falsification. The research has no hint of intentionally confusing the work to suit a method or hypothetical anticipation as well as it was found out to have no proof of over asserting or distortion.

Conflict of Interest (COI). The research has no hint of irreconcilable circumstance like the divulgence of COI which is a lot of conditions where proficient judgment concerning essential concern, for

example, members' benefit or the legitimacy of the exploration will in general be affected by an optional concerns, for example money related or scholarly gains or acknowledgments.

Deceit. The research has no hint of deceiving the participants of the study to any possible mischief.

Authorship. The author of the research graduated with the degree of Bachelor of Science in Biology with education units. The author of the research experienced arrangement of paper amendments in view of the proposals made by her adviser. The study likewise adhered to the measures of University of Mindanao Ethics Review Committee for the rules of moral thought. After their endorsement, the research had to go through preliminary testing at the same time the information gathered will be deciphered for the consistency of the research inquiry.

Results

The analysis, interpretation and findings of the data gathered from the respondents were presented in this section. The data and results of the study were presented both in tabular and textual forms. They were interpreted utilizing appropriate statistical tools needed. All inferential results were analyzed and interpreted at 0.05 level of significance. The topics deliberated in this research were the level of inquiry-based science activities of students, level of students' achievement, significant relationship between levels of inquiry-based science activities and students' achievement and regression analysis on the influence of inquiry-based science activities on students' achievement.

It could be noted that the standard deviation ranged from 0.67-0.81 which is less than 1.0 as the typical standard deviation for 5 – point Likert scale (Wittink & Bayer, 1994). This means that the ratings in the accomplished questionnaires were close to the mean, indicating consistency of responses among the respondents.

Level of Inquiry-based Science Activities

The independent variable used in the study was *inquiry-based science activities* whose indicators include *engagement, exploration, explanation, elaboration* and *evaluation*. Shown in Table 1, is the summary on the level of inquiry-based science activities. It appeared that the responses of the respondents generated an over-all mean of 3.71 with a descriptive equivalent of high which means that the level of inquiry-based science activities is much observed by the learners from their science teachers. This value is obtained based on the mean scores of 3.57 with a high descriptive equivalent for *engagement*, 3.73 for both *exploration* and *explanation*, 3.77 for *elaboration* and 3.76 for *evaluation.*

Table 1. *Level of Inquiry-based Science Activities*

Indicators	*Mean*	*SD*	*Description*
Engagement	3.57	0.81	High
Exploration	3.73	0.72	High
Explanation	3.73	0.80	High
Elaboration	3.77	0.76	High
Evaluation	3.76	0.74	High
Overall	3.71	0.67	High

Level of Students' Achievement

Students' achievement was evaluated on the following parameters *cognitive development, laboratory skills, science process skills* and *understanding of science knowledge*. Shown in Table 2 are the results for the computation on the level of students' achievement among Grade 10 students from the four main secondary schools of District 1 in the Division of Compostela Valley. Its overall mean is 3.66 which is described as High. This indicates that the level of students' achievement is high. Meanwhile among the four indicators, both *Cognitive development* and *Understanding of science knowledge* had the highest mean of 3.72 described as High. Next, is *Science process skills* with a mean of 3.62 described as High. The indicator with the lowest mean of 3.59 is *laboratory skills* which are still described as High.

Table 2. *Level of Students' Achievement*

Indicators	*Mean*	*SD*	*Description*
Cognitive Development	3.72	0.62	High
Laboratory Skills	3.59	0.79	High
Science Process Skills	3.62	0.78	High
Understanding of Science Knowledge	3.72	0.72	High
Overall	3.66	0.66	High

Significant Relationship between Levels of Inquiry-based Science Activities and Students' Achievement

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The test of relationship between the major variables involved in the study requires the use of Pearson Product-Moment Correlation Coefficient. The results of the test of relationship between these two variables are shown in Table 3. It shows the significance on the relationship between the level of inquiry-based science activities and students' achievement. Table 3 shows that all indicators specifically connects inquiry-based science activities and suitable representation to specific situation illustrates that there is a significant relationship between inquiry-based science activities and students' achievement.

Table 3. *Significant Relationship between Levels of Inquiry-based Science Activities and Students' Achievement*

Independent Variable (Indicators)	*Dependent Variable*	*r-value*	*r-squared*	*p-value*	*Decision*
Engagement	Students' Achievement	0.568*	0.3226	0.001	Reject H_o
Exploration		0.622*	0.3869	0.001	Reject H_o
Explanation		0.644*	0.4147	0.001	Reject H_o
Elaboration		0.654*	0.4277	0.001	Reject H_o
Evaluation		0.604*	0.3648	0.001	Reject H_o

*p<0.05

The r-value for *Engagement* and Students' Achievement is 0.558* with a p-value of 0.001 that shows a positive correlation at 0.3226. The r-value for *Exploration* and Students' Achievement is 0.622* with a p-value of 0.001 also showing a positive correlation of 0.3869. The r-value for *Explanation* and Students' Achievement is 0.644* with a p-value of 0.001 shows a positive correlation of 0.4147. The r-value of *Elaboration* and Students' Achievement is 0.654* with a p-value of 0.001 also shows a positive correlation of 0.04277. The value of *Evaluation* and *Students' Achievement* is 0.604* with a p-value of 0.001 as well shows a positive correlation of 0.3648.

The table highlights that the domains *Engagement, Exploration, Explanation, Elaboration* and *Evaluation* had a probability level of 0.001 which is less than 0.05 level of significance, thus, the null hypotheses were rejected. The high positive correlation between the two variables leads to the rejection of the null hypothesis. The r-squared of *Elaboration* has the most significant relationship of 0.4277 to Students' Achievement, *Explanation* has 0.4147, *Exploration* has 0.3869, Evaluation has 0.3648 and *Engagement* has 0.3226. Thus, the interdependence of the variables shows that *Engagement, Exploration, Explanation, Elaboration,* and *Evaluation* have a significant relationship to Students' Achievement.

Regression Analysis on the Influence of Inquiry-based Science Activities on Students' Achievement

Presented in Table 4 is the regression analysis on the influence of inquiry-based science activities on students' achievement. As seen in the table, the computed F-value ratio is 73.02 with an associated overall p-value of 0.001 or significant. This means that there is a significant relationship between inquiry-based science activities and students' achievement. The R value is 0.717 indicating that there is a positive relationship between inquiry-based science activities and students' achievement. The computed R^2 is 0.514 indicating that 51.4% of the students' achievement in science among the Grade 10 students from the four secondary schools of District 1 in the Division of Compostela Valley is explained by *engagement, exploration, explanation, elaboration and evaluation* and the remaining percentage is accountable to other indicators not included in this study.

Data shows that the indicator *exploration* has a corresponding p-value of 0.033, *explanation* with a p-value of 0.001, the indicator elaboration has a corresponding p-value of 0.001 and the indicator *evaluation* with a p-value of 0.004 which means that the null hypothesis is rejected since their probability is lesser than the 0.05 level of significance. This further means that there is a significant relationship between inquiry-based science activities and students' achievement. On the other hand, engagement has a greater p-value of 0.651 which means that it has no significant influence to students' achievement, hence the null hypothesis is not rejected which means that there is no significant relationship between engagement and students' achievement. Moreover the result of this regression analysis shows a beta value of *engagement* of 0.028. *Explanation* has a beta value

Table 4. *Regression Analysis on the Influence of Inquiry-based Science Activities on Students Achievement*

Independent Variable	*Unstandardized Coefficients*		*Standardized Coefficients*	*t-value*	*p-value*	*Decision*
	B	*SE*	*Beta*			
Constant	1.012	0.143				
Engagement	0.023	0.051	0.028	0.452	0.651	Do not reject H_o
Exploration	0.133	0.062	0.145*	2.145	0.033	Reject H_o
Explanation	0.211	0.071	0.253*	4.105	0.001	Reject H_o
Elaboration	0.191	0.058	0.221*	3.277	0.001	Reject H_o
Evaluation	0.150	0.052	0.167*	3.277	0.004	Reject H_o
Dependent Variable: Students' Achievement in Science						

R= 0.717 R^2= 0.514
F-ratio = 73.02 p-value = 0.001

of 0.253* and the highest among the five indicators which make it as the best domain that significantly influence students' achievement in science, followed by *elaboration* with a beta value of 0.221*, next is *evaluation* with a beta value of 0.167* and *exploration* with a beta value of 0.145*. Apparently, data revealed that the four indicators have positive regression weight, thus the regression coefficient beta is significant at Alpha which is equivalent to 0.05 levels. This indicates that the four indicators *exploration, explanation, elaboration* and *evaluation* are good indicators of inquiry-based science activities that significantly influence students' achievement in science.

Discussion

Presented in this section are the discussions, conclusions and recommendations derived from the results of the study.

Level of Inquiry-based Science Activities

The level of inquiry-based science activities in this study is high. This means that inquiry-based science activities are much observed from the science teachers by the respondents. This further indicated that most of the items indicated in every inquiry-based science activities indicators are much observed by the respondents from their science teachers.

Moreover, the indicator that was much observed in this study is elaboration with the highest mean. The findings in this study indicate that the science teacher of the respondents encourages the students to reflect based on their personal understanding.

This confirmed to the findings from the study of Abdi (2014); Beybee et al. (2006); Ozturk (2013); Wilder & Shuttleworth (2005); Sen & Oskay (2016) who revealed that it is essential to include the learners in more encounters so as to broaden, and expound their ideas, procedures or abilities in the wake of getting clarifications about principle thoughts as well as time for their training activities. This level or phase also encourages exchange of ideas to firmly connect to the latest at the same time different circumstances.

The next inquiry-based science activities indicator with the second highest overall mean is evaluation which was also much observed in this study which denotes that the science teacher of the Grade 10 students requires their students to demonstrate the scientific concepts and skills based on their understanding.

This confirmed to the studies of Abdi (2014);Bybee et al.(2006); Ozturk (2013); Wilder & Shuttleworth (2005); Sen & Oskay (2016) that evaluation phase or level guarantees that learners show their training level as well as improvement along with the remarks on the adequacy of their explanations. Furthermore, it likewise guarantees that objectives of the training have been achieved by the educators and have seen the degree at which learners have improved. In the assessment stage, this is the significant chance of the students to utilize the aptitudes they have obtained and assess their comprehension.

The indicator of inquiry based-science activities which is also high or much observed by the respondents from their science teachers is exploration. The findings in this study indicates that the science teacher of the respondents gives advance reading before conducting science activities to find answer to scientific questions. This is parallel to the findings from the studies of Abdi (2014);Bybee et al.(2006); Ozturk (2013); Wilder & Shuttleworth (2005); Sen & Oskay (2016) emphasizing that, in the exploration level, students are dynamic and they discover plausible responses to the inquiries they are interested about by looking into and asking. Moreover, in this level, encounters and experiences furnish apprentices or learners by using a distinctive foundation of exercises as well as accomplishments inside which with recent ideas (especially confusions), procedures and aptitudes are distinguished and theoretical change is encouraged.

Likewise, inquiry-based science activities in terms of explanation are also much observed by the respondents from their science teachers. This denotes that their science teacher explains the process and results if they have some doubts and confusion about the result. This is in consonance to the findings from the studies of Abdi (2014);Bybee et al.(2006); Ozturk(2013); Wilder & Shuttleworth (2005); Sen & Oskay (2016) that at the level of explanation educators have an immense task by asking the learners' problems to inculcate the ideas framed during the preceding two levels. Educators connect the topics to reality by trying to dispose of students' misinterpretations of concepts by recognizing them as well as by making clarifications and justification. The explanation level concentrates to a definite part of the learners' engagement as well as exploration encounters along with experiences as well as gives chances to exhibit their applied comprehension, process abilities or practices. This stage likewise gives chances to instructors to

legitimately present an idea, procedure or aptitude.

Lastly, the inquiry-based science activities in terms of engagement are also much observed by the respondents from their science teachers. This means that their science teacher highly prepares series of questions about the topic they are discussing. This is aligned with the findings in the studies of Anderson (1997); & Sen & Oskay (2016) that instructors, then again, assume the jobs of an planner, a counselor as well as a manager instead of being the wellspring of right answers in the class. This is also in confirmation to the findings of the studies of Abdi (2014); Bybee et al.(2006); Ozturk (2013); Wilder & Shuttleworth (2005); & Sen & Oskay (2016) that during the engagement stage the instructor or an educational plan task gets to the students' earlier information and encourages them to become occupied with another idea using short exercises that advance interest and inspire earlier information.

Level of Students' Achievement

The level of students' achievement in science for this study is also high. This means that the level of students' achievement in this study is high.

The indicator on students' achievement in science with the highest mean and high descriptive equivalent is cognitive development. This shows and implies that students can recall information given during discussions and during an activity. This is in parallel to the findings to the study of Lion (1998) that teachers must know about the intellectual advancement or the manner by which individuals learn. Besides, this additionally in consonance to the findings to the study of Love (2009), who uncovered that in order to recognize various degrees of intellectual improvement in their lessons a good path for instructors to follow is to utilize Bloom's Scientific Classification. This method of classification is considered as a device that is being used by the instructors for estimating the degrees of intellectual improvement they are achieving with their teachings. This device is also known as a grouping framework and a scientific categorization that perceives the procedure that student go through when discovering facts and data.

Likewise, the indicator of students' achievement in science with the same overall mean and high descriptive equivalent is understanding of science knowledge which indicates that the students can relate what they know in science by integrating science concepts in their daily life experiences through giving examples. Thus agreeing to the findings in the study of Guzman & Bartlett (2012), who stressed out that logical concept, is normally theoretical as well as multifaceted or difficult. On the road of improving comprehension of logical information, students should inspect at the same time control things as one of the requirement and causing the undeniably dynamic information to be clearer and progressively concrete for students. This is in confirmation also to the findings in the study of Miller (2014) that numerous students become incapable to actualize logical information when utilizing normal lecture strategies and having effectively overlooked what was already known to them. Through practical application approaches, students can witness the results of investigations including numerous factors as well as observe authentic presentations of the logical information they have educated. It was found out that authentic presentations promote learners argument, because it is simpler for learners to recall diagrams compared to conceptual substance.

Furthermore, the indicator on students' achievement in science with has also a high descriptive equivalent is science process skills which show that students can use scientific knowledge to form a question. This coincided to the findings of Hardianti & Kuswanto (2017) & Shebba (2013) in their study that methodical and learning abilities are substantial and psychological aptitudes that are identified with essential capacities, gained, mastered, and applied in scientific exercises so researchers can figure out how to discover something different. As learners relate to the realm of science, by using their very own exploration through the inquiry, theory, calculation, examination, understanding, along with correspondence stages which are called as logical technical abilities and that are considered as an essential capacity that everyone must familiarize towards science comprehension. Scientific process ability consequently, is a fundamental capacity for learners to utilize in conducting the logical strategy required while directing quest for information.

Lastly, the indicator on students' achievement in science with high descriptive equivalent is laboratory skills which mean that the students can understand the relation of facts to the solution of problems. This is in confirmation to the findings to study of Adb-Hamid, Campbell, Der & Wolf (2012); & Guzman & Bartlett (2012) who reiterated that connection between student accomplishment and practical or applied learning could not be disregarded. To develop as well as increase learners' performance, particularly in the science training, it has been recommended that one of the techniques is the practical laboratory method. Therefore, a few standards, similar to think

fundamentally, dissect data, convey logical thoughts, make sensible contentions, function as a component of a group, and gain other necessary aptitudes, have been built up that light up in what way the practical representation of knowing science give advantage to learners compared to the conventional methodologies. There is little number of learners who have a better comprehension of getting to know and apply logical inquiry since learners do not find a workable pace advantages of a practical, inquiry-based environment.

Significant Relationship between Levels of Inquiry-based Science Activities and Students' Achievement

The present study revealed a high positive significant relationship between inquiry-based science activities and students' achievement in science. This implies that inquiry-based science activities have a positive association or relationship to students' achievement which can be seen on the data. The computed r-value indicates the strength of the relationship between the independent variable and the dependent variable and there is a positive correlation between variables.

The result of the study conformed to the proposition of Gibson & Chase (2002); & Panjwani (2015) stating that inquiry-based science activities and exercises have affirmative influences on learners' achievement and entirely in the learners accomplishments and performances in science in relation to their cognitive development, laboratory skills, science process skills, as well as understanding of science knowledge.

In addition, it also confirmed the findings to the study of Gibson & Chase (2002); & Miller (2014) that it has been discovered that learners utilizing an inquiry-based method got an advanced mark with respect to institutionalized assessment, develop their logical process abilities, and have increasingly uplifting dispositions to science. It is also supported by the research conducted by Nuangchalerm & Themmasena (2009); & Panjwani (2015) that inquiry-based science activities as well as exercises stimulate intellectual at the same time logical understanding, as well as training fulfillment of the learners. This is also in consonance to the study of Mysliwiec (2005); Shields (2006); & Blyth (2010) that inquiry-based learning put together learning works with respect to the necessary scientific educational program at the same time hoists the intellectual improvement of the learners to the most elevated stages of Bloom's Classification.

Consequently, the objective of this learning method is the intellectual improvement of the learners. This is in congruence to the findings to the study of Nuangchalerm & Themmasena (2009); & Panjwani (2015), stating that this inquiry-based technique enhances intellectual development. It is also parallel to the findings to the study conducted by Sola & Ojo (2007); & Khan & Iqbal (2011), that inquiry-based activities is considered to be an encouraging device for learning science as well as improves learners' performance at the same time stimulates improvement of logical procedure abilities.

This is also in consonance to the findings to study conducted by Ergul et. al (2011) with elementary students about how inquiry- based science learning change students learning process abilities along with the approaches to science then had arrived at the resolution that inquiry-based learning fundamentally influenced with respect to their learning abilities as well as towards science approaches.

Additionally, this is also in parallel to the findings to the study of Minner, Levy & Century (2010) stating that inquiry-based learning as a way to deal with knowledge can develop the learners' conceptual understanding as well as impact their disposition affirmatively to science in colleges, universities and secondary schools. This is in confirmation also to the findings to the study conducted by Blyth (2010) who expresses that "comprehending logical concepts is altogether upgraded once thoughts remain secured towards inquest encounters" as stated in a position articulation about logical inquiry by the National Science Teachers Association. It is also additionally prescribed by the association that all educators must formulate method of teaching and learning to be the focal point of their teachings.

The result of this study is also in congruence to the findings from the study of Sen & Oskay (2016) who revealed that inquiry-based learning is a technique for teaching and acquiring knowledge as well as skills which is considered to be helpful in learners' training in acquiring knowledge and skills as well as in creating higher-stage intelligence aptitude which also depends on constructivist concept. Learners experience the following procedures like performing laboratory activities and experiments as well as doing observations, gathering proof, doing predictions, making credible justification and analyzing the results by utilizing the methods researchers use in logical or scientific investigation through this strategy This is also in parallel to the findings to the study of Blyth (2010), who revealed that the main objective of instructors is to improved student accomplishment at the same their performance. To perform to

the best expectations conceivable is the desire of most educators, school administrators, as well as the guardians from their learners. In light of this objective, searching for new training strategies as well as finding better approaches for instruction is significant and important. Educators are answerable for not only teaching their students to present data, yet students should likewise have the option to apply ideas, decide consistent ends as well as comprehend the idea of science.

Regression Analysis on the Influence of Inquiry-based Science Activities on Students' Achievement

The regression coefficient is to test the significant influence of inquiry-based science activities on students' achievement among Grade 10 students from the four main secondary schools of District 1 in the Division of Compostela Valley. The data revealed that the influence of inquiry-based science activities on students' achievement was significant. This means that inquiry-based science activities significantly influenced students' achievement and is also influenced by other factors not included in the study. The overall results of inquiry-based science activities influenced students' achievement in public secondary schools. Therefore, the null hypothesis in this study is rejected. On the other hand, the results of the study points out the essence of inquiry-based science activities to students' achievement which contribute to the present pool of literature since the past researchers focuses only to the general academic achievement of the learner .

As stated in the previous section of this study, the result of computation on the significance of the relationship conformed to the theories espoused in the study. It could be repeatedly mentioned in this section that the significant influence of independent variable on the dependent variable accentuates the veracity of the theories and propositions of Gibson & Chase (2002);& Panjwani (2015) stating that inquiry-based science activities and exercises have affirmative influences on learners' achievement and entirely in the learners accomplishments and performances in science in relation to their intellectual development, laboratory abilities, logical methodical aptitudes, as well as science knowledge comprehension.

Moreover, this is in consonance to the findings to the studies conducted by GunduzBahadir (2012); & Sen & Oskay (2016), who indicated that The 5E Method is one of the methods that are utilized in actualizing inquiry-based teaching and learning in science education. This learning method guarantees that learners have the chance to explore at the same time investigate; to be dynamic in classes, as well as they arrive at information through dialogue setting as well as by persistently inquisitive. This is also parallel to the studies of Bybee et al. (2006);Ozturk (2013);Wilder & Shuttleworth (2005); Sen & Oskay (2016) that the five levels making up this method are: engagement, exploration, explanation, elaboration as well as evaluation. This confirms also to the study of Lister, (2015) that the 5E Instructional method is founded in the constructivism' practices at the same time it is investigative in nature which is most appropriate towards a component of research as opposed to the individualized lecture session and lesson. Data shows that exploration, explanation, elaboration and evaluation with a p-value lower than 0.05 or significant which means that the null hypothesis is rejected or not accepted. However, engagement appeared to be non-significant mainly because of the greater p-value, hence the null hypothesis is not rejected. Moreover, the result of this regression analysis has an association to the responses of the respondents to each item under the indicator engagement, especially in item number 4 which states that their teacher in science gives hands-on laboratory activity before the start of the topic discussion which only got a mean of 2.78 and a standard deviation of 1.33 with the descriptive equivalent of average. The result could be attributed to the fact that most of the secondary public schools lack laboratory apparatuses and materials to be used in the laboratory activities. Additionally, some of the teachers who are teaching science are not science major and have not undergone further trainings and seminars.

Conclusion

Based on the outcomes of the research, inquiry-based science activities influence students' achievement of the students. The findings revealed that the inquiry-based science activities in terms of engagement, exploration, explanation, elaboration and evaluation are high which means that it is much observed by the respondents from their science teachers. In addition, the students' achievement in terms of cognitive development, laboratory skills, science process skills and understanding of science knowledge is also high which means it is much practiced by the students.

Moreover, it was found out that there is a high affirmative significant relationship between inquiry-based science activities and students' achievement. Inquiry-based science activities significantly

influenced students' achievement. Among the domains of inquiry-based science activities, it was found out that exploration, explanation, elaboration and evaluation are domains that significantly influenced students' achievement. However, engagement is one of the indicators of inquiry-based science activities were found out that its influence is non-significant hence the null hypothesis is accepted which states that there is no domain of inquiry-based science activities that could significantly influences students' achievement.

In addition, the researcher is not limited on the variables shown that influences students' achievement because there are possibilities that there are still a lot of factors not in the study that might influence students' achievement in science. For this reason, students who performed high in inquiry-based science activities definitely also reach high achievement in science.

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