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Into the lens of Inquiry-Based Learning (IBL): student's engagement, motivation, and attitudes among Grade 10 students of an integrated high school

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Abstract: Inquiry-based learning (IBL) is an educational approach that emphasizes the student's role in the learning process, encouraging them to explore, ask questions, and engage deeply with the material. Rather than passively receiving information, students in an inquiry-based setting actively investigate topics, problems, or questions that interest them. This approach fosters critical thinking, problem-solving, and the ability to independently seek knowledge.. This study identified the influence of inquiry- based learning (IBL) on student engagement using a descriptive-correlational design among 100 randomly selected Grade 10 students of BIHS. Anchored on the five sub-variables of the utilization of inquiry-based learning, namely engagement, explanation, exploration, elaboration, and evaluation, a five-point Likert scale was used in this study together with the 20-item descriptors for the level of students' engagement. Findings revealed that there were high levels of use of inquiry-based learning in terms of engagement (M= 4.26 ± 0.384) and exploration(M= 4.36 ± 0.362). Further, the levels of utilization of inquiry-based learning in terms of explanation (M= 4.50 = 0.420), elaboration(M= 4.54 ± 0.682) and evaluation (M= 4.58 ± 0.376) are very high. Results also show that inquiry-based learning significantly influence students' engagement ($\beta = 0.647$ with $p < .001$) which means that an increase on the extent of use of inquiry-based learning leads to an increase of 0.647 in students' engagement in science. Results provide tangible data in concluding that IBI activities help students to be more involved in their science classes and more interested in learning.

Keywords: Inquiry-Based Learning (IBL), Students' engagement, Science education, Influence

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INTRODUCTION

As education continues to evolve to meet the needs of a rapidly changing world, inquiry-based learning is gaining recognition for its potential to prepare students for the challenges of the 21st century. By fostering a love of learning and the skills necessary to navigate an increasingly complex world, IBL empowers students to become lifelong learners and active participants in their own education.

Inquiry-based learning can be applied across various disciplines, from science and mathematics to social studies and the arts. It is particularly effective in helping students develop a deeper understanding of complex concepts, as it encourages them to think critically and make connections between different areas of knowledge. The process of inquiry typically involves several stages, including questioning, investigating, creating, discussing, and reflecting. Students may begin with a question or a problem that sparks their curiosity, and through investigation, they gather information, experiment, and explore possible solutions or explanations. This hands-on, student-centered approach not only enhances engagement but also helps develop essential skills such as critical thinking, collaboration, and communication.

Science education is justified by the vast amount of scientific knowledge developed in this area that prepares learners in a scientifically and technologically driven world. The aims of the science education is to produce scientifically literate learners who are well-informed and active participant of the society, responsible decision makers ,and apply scientific

knowledge that is important and high impact upon society and towards the environment. Mcnight (2021) claims that science education equips people with the information and abilities needed to live in the "age of science" and to become citizens who will advance scientific goals in the community. Getting deeper into the discourse of science education, the Philippine science education helps students acquire knowledge and facts related to daily life, as well as critical thinking, process, and life skills that are necessary to deal with day-to-day challenges (Department of Education, K–12 Philippine Education Curriculum, 2012). This science education is in line with Article XIV, Section 2 of the 1987 Philippine Constitution which states that "The State shall establish, maintain, and support a complete, adequate, and integrated system of education relevant to the needs of the people and society.

In order to meet the scientific needs of society, science education must be refined as a body of knowledge. The country's educational institutions are tasked with this duty of refinement in order to make science more accountable for distributing its advantages to the general public. But there are other obstacles facing scientific instruction in the Philippine schools. This resulted in the Philippines ranking among the lowest in the world for science according to the most recent Program for International Student Assessment (PISA) results from 2022; the nation's performance in science did not significantly improve from 2018 test results. Despite the education department's firestorm of reforms and preparations following a dismal showing in PISA 2022 just less than a quarter of Filipino students who took the test in 2022 reached the minimum level of proficiency in all three subjects of math, reading and science, according to PISA (2022). The latest PISA scores show the Philippines performed worse than the global average in all categories, with its placement in the country rankings moving up by just a few spots above countries that dropped ranks.

Despite the challenges faced in the current science education in the country, teachers as deemed by the K to 12 Curriculum need to outcast from the stereotype mode of teaching and take large leaps toward meaningful and applicable knowledge. Science teachers should be equipped and aimed with purposive skills and knowledge in teaching methodologies to further incorporate appreciation of the lesson. As facilitators of learning. they are charged with the great responsibility and challenge at the same time of incorporating and developing skills and values to the learners that they will need to cope with the demands of today's world. But questions and concerns emerged as time passes by. There is no such thing as one size that fits all. However, there are some pedagogical approaches that can be harnessed to make these things come into reality which is supported by inquiry-based teaching. Curricula reforms involving incorporation of inquiry-based teaching and learning strategy in school science education was implemented around the world according to Akuma & Callaghan (2018), In relation to this, K to 12 Science curriculum was designed around the three domains of learning Science understanding and applying scientific knowledge in local setting as well as global context whenever possible, performing scientific processes and skills, and developing and demonstrating scientific attitudes and values (Gomez, 2021). In order to attain these goals, there is a need to facilitate and develop sound educational pedagogy especially the utilization of effective teaching approaches. The idea of inquiry-based approaches is link with the shared responsibility of students and educators in promoting concrete learning experiences.

Many changes have been demonstrated in the implementation of K to 12 curriculum in the country. New science program produced numerous of inventions that able to one of this which is the decongestion of skills and association of spiral enhancement manner. According to Pagulanan (2021), the program of science in terms of instruction from traditional methods of teaching now change as to more innovative exploration for a student enhancement upon the critical thinking skills and scientific skills in response to changing societal skills. The new curriculum utilizes learner-centered approach such as the inquiry based learning (IBL)

pedagogy. Concepts and skills are being taught by providing pedagogy which will enable them to enhance their cognitive, affective, and psychomotor domains. This changes may remain science being the constant feature to education that develop and mold students to a better and ready set of learners in a competitive world of Science knowledge.

Based on the foregoing premises, the utilization of inquiry-based approaches and how it affects the motivations, attitudes, and engagements of learners became the basis to pursue this study. It aimed to assess the utilization of the above-mentioned approach in terms of science teaching improvement and successful learning development that may create interest and enthusiasm to both the teachers and learners in the long run.

IBL is rooted in constructivist theories of learning, which propose that learners build their own understanding and knowledge of the world through experiences and reflecting on those experiences. It contrasts with traditional methods of instruction, where the teacher is the primary source of knowledge, and learning is often more about memorization and repetition. In IBL, the teacher acts as a facilitator or guide, helping students navigate their inquiries and supporting them as they draw connections and make discoveries.

Statement of the problem

The study was conducted to ascertain the influence of inquiry-based approach to students' engagements, motivations, and attitudes in Balibago Integrated High School, Division of Santa Rosa City Laguna. Also, this study aimed to answers to the succeeding objectives:

1) What is the level of utilization of the inquiry-based approach in teaching Science instruction in the classroom in terms of: (a) engagement; (b) explanation; (c) exploration; (d) elaboration; and (e) evaluation.

2) What is the level of students' engagement, motivation, and attitudes towards science?

3) Does the used of inquiry-based approach in teaching Science significantly influence the students' engagement, motivation, and attitudes?

METHODOLOGY

Research design

The researcher used cross-sectional research design as the primary method of this research. A cross-sectional study is a type of research design in which the researcher collect data from Grade 10 students from Balibago Integrated High School at a single point in time. In cross-sectional research, the researcher observed variables without influencing them. Furthermore, cross-sectional research design is of large value in providing facts on which scientific judgements is based. It provides essential knowledge about the nature of objects and persons; plays a large part that the development of instrument for the measurement of many things; instruments that are employed in all types of quantitative research as data-gathering instrument for instance the survey questionnaire

Locale of the study and respondents

The respondents of the study were the Grade 10 students in Balibago Integrated High School, Division of Santa Rosa, Laguna. They were composed of one hundred students (100) from the morning and afternoon class shift. Simple random sampling was appropriate for this study. As defined, simple random sampling is a type of nonprobability sampling in the quantitative research study in which the researcher used her non-judgment scheme in the selection of sample members (De Belen, 2015).

Research instruments

The instrument used in this study was descriptive survey questionnaire which is subdivided into different parts. There was only one survey instrument to be used in this study intended for the student participants. The modified survey questionnaire measured the influence of Inquiry- Based Learning (IBL) to Student's Engagement, Motivation, and Attitudes in among the Grade 10 students after Gejda (2006) conducted her study regarding "Inquiry-Based Learning in the Science Classroom: A Survey on Teachers' Practice".

The instrument used in this study directly answered on the current practice of utilization of the Inquiry-Based Learning in the classroom. The modified test items were systematically prepared by the researcher with a set of questions and deliberately designed to elicit responses from respondents or research informants for the purpose of collecting data or information.

Data analyses procedure

The questionnaire was administered to the respondents. The researcher personally conducted the survey and retrieved the papers after the survey is taken by the respondents, it was tallied, computed, and interpreted. The following statistical methods were used by the researcher in making the analysis and interpretation of data:

The Weighted Mean. The weighted mean was used to determine the level of utilization of the inquiry-based approach in Science instruction in terms of engagement, explanation, exploration, elaboration, and evaluation and the level of influence of inquiry-based learning strategies to students' engagement, motivation, and attitudes towards science.

Pearson r. It shall be used to determine if there is a significant relationship between the level of utilization of the inquiry-based approach in Science instruction in the classroom and the level of influence of inquiry-based learning strategies to students' engagement, motivation, and attitudes towards science.

FINDINGS AND DISCUSSION

Extent of use of inquiry-based learning

The data shows the extent of use of inquiry-based learning in terms of engagement. The result shows that the respondents indicated 'high' extent of utilization of inquiry-based learning ($M= 4.26 \pm 0.384$).

It can be gleaned from the data that a discussion which encourages students to generate a wide range of perspectives or potential next steps or solutions regarding a specific topic through brainstorming gathered a mean score of 4.51 and verbally interpreted as 'Very High'. This followed with providing relevant information to students with 4.49 mean score. Fulfilling students' need for relatedness, showing them how seemingly unrelated content fits together and then into their own scheme of things allow them to be engaged in the class. Furthermore, problem-solving activity helps the students determine the source of a problem and find an effective solution gained 4.46 mean score.

The data implies that inquiry-based learning has various levels to utilize and most have high amounts of engagement in the class. The results also show that IBL is an approach that highly emphasizes the student-centered in the learning process. Being willing to participate in and succeed in their learning process is referred to as student engagement. Students take greater responsibility for their learning and ensures that they stay motivated on track because the direction of the learning is under the students' control (Librada, 2021). To sustain inquiry-based learning, teachers should design highly relevant learning activities for the students to continuously create their own knowledge (Gallerdo, 2020), which improves their recall of scientific ideas and increases their engagement with the material.

Use of inquiry-based learning in terms of exploration

The data shows the extent of use of inquiry-based learning in terms of exploration. The result shows that the respondents indicated 'high' extent of utilization of inquiry-based learning (M= 4.36 ± 0.362).

It can be seen from the data above that giving students the chance to collaborate with one another and the interaction among students in the classroom environment in which students ask each other questions, discuss, or reflect on a topic scored 'Very High' with 4.60 and 4.55 mean scores. The data shows that when questions are asking to capture students' attention allows the students to explore certain scientific concepts with 4.49 mean score. The result implies that IBL highly promotes student exploration to solve problems. It also shows that learners are also able to direct their own inquiry and actively involved in the learning process which helps them explore in scientific inquiry. Through exploration and critical questioning, inquiry-based learning creates links between the classroom and real-world experiences, which keeps students' attention. Students generate hypotheses, forecast outcomes, and create questions about the certain topic in science. With the proper instructions and learning activities from their teachers, students take the initiative to look for solutions, gather data to support or refute theories, and carry out research (Galman, 2019). It enables learners to apply abstract ideas to actual situations and obtain real-world experience. Students' comprehension and memory of the subject matter can be improved by this kind of instruction.

Inquiry-based learning engages students by using exploration and critical thinking to make connections to the actual world (Tudavia, 2020). Students are encouraged to participate in problem-solving and experiential learning through this type of training. Teachers encourage children to learn by doing by providing scenarios, questions, and problems rather than having them memorize facts.

Use of inquiry-based learning in terms of explanation

The data shows the extent of use of inquiry-based learning in terms of explanation. The result shows that the respondents indicated 'Very high' extent of utilization of inquiry-based learning (M= 4.50 ± 0.420).

It can be gleaned from the data that in IBL approach, teachers always ask for an explanation for the students with 4.66 mean score. In this sense, it allows the students to explain scientific concepts with 4.60 mean score. In doing such, student can only justify their concepts when they establish mastery in providing definition to certain concepts with 4.57 mean score. Relatively, this gives the students to justify their thinking ability with 4.56 mean score which all of these descriptive statements verbally interpreted as 'Very High'. This only transpires that the utilization of inquiry-based learning greatly encourages students to think critically about the information they are presented with and able to explain the information and develop their own solutions. Inquiry-based learning is centered on delving into an open-ended subject or issue. They must arrive at a conclusion which they must then defend or deliver, using evidence-based reasoning and original problem-solving techniques among the learners. In addition, inquiry-based learning (IBL) is an effective teaching approach that entails letting students describe the natural or material world in their own words (Marquez, 2019). This process encourages students to pose questions, come to conclusions, and test those conclusions in the pursuit of new scientific knowledge.

Use of inquiry-based learning in terms of elaboration

The data shows the extent of the inquiry-based learning in terms of elaboration. The result shows that the respondents indicated 'Very high' extent of utilization of inquiry-based learning (M= 4.54 ± 0.682).

It can be noticed that four (4) from these descriptions gained 'Very High' verbal interpretation which indicate interrelationship. When students are provided with the opportunity for alternative explanation, they establish interest in IBL class interaction with 4.97 mean score. In this sense, it allows the students to apply their scientific concepts with 4.63 mean score. If this approach is given to the class, it allows the students to apply and extend their skills to other situation with 4.61 mean scores respectively. The data presents that the utilization of IBL greatly allows students to explore and ask questions about the scientific concepts around them and learning helps them develop critical thinking and problem-solving skills. Students put what they've learned in earlier phase of learning practice. This could involve hands-on tasks, information presentations, or other techniques that provide reinforcement. Students can draw connections between new information and prior knowledge with the aid of elaboration (Luna, 2021). Posing "Why?" questions to students enables them to consider the new ideas more thoroughly and consider how they relate to other subjects, which improves the quality of their learning.

Use of inquiry-based learning in terms of evaluation

The data shows the extent of use of inquiry-based learning in terms of evaluation. The result shows that the respondents indicated *'Very high'* extent of utilization of inquiry- based learning (M= 4.58 ± 0.376).

It can be gleaned from the data that in IBL, teachers usually assess students' knowledge with 4.81 mean score. In this sense, it enables teacher to measure the effectiveness of their teaching by linking student performance to specific learning objectives in science. Moreover, teachers also assess the student's ability to efficiently and effectively use a repertoire of knowledge and skills to negotiate a complex task in science with 4.70 mean score and which allows the student to apply their new concept with 4.69 mean score. The data implies that IBL exponentially helps learners make their own connections and evaluate what they learn. Their curiosity helps them engage and gain a deeper understanding of topics and content thus questioning and providing feedback necessitates in the learning process. Answering questions, assessing the given situations, resolving issues through an applied skill, and analyzing scientific problems through evidence are all components of inquiry-based learning (Forough, 2018). In contrast to reading or watching content, answering the questions and frequently the feedback that follows, encourage learning.

Level of engagement

The data shows the level of students to the class. The result shows that the respondents indicated 'high' influence of Inquiry-Based Learning (IBL) to the class (M= 4.32 ± 0.423). The data shows that among the twenty (20) indicators, students come to school every day with 4.76 mean score as the highest influence of IBL with the learners. Furthermore, students enjoy the lessons in the class with 4.70 mean score. Essentially, teachers establish students' creativity to instill an engaging discussion in science class which impacts students' desire in the science class with 4.64 mean score.

The data implies that engagement in science class highly involves interaction among the learners with the goal of generating mutual benefit, mindful of scientific concepts and skills and imperatives of fostering more responsive and inclusive modes of knowledge production and discussion, increasing emphasis on students participatory and engagement.

Results showed that students move from participatory roles towards constructive ones. Students build the lessons they learn based on their own curiosity, rather than just following along with a lesson, which helps them develop into independent thinkers and problem solvers. Student engagement helps others to stimulate learning and improve their critical thinking and problem-solving abilities (Cilindro, 2021). Furthermore, students can cooperate, work with classmates, and develop their collaborative skills. Students who can create their own knowledge using these strategies are focus in the learning process and retain science concepts better.

Relationship between the use of inquiry-based learning and engagement in science

The data shows the relationship between the extent of utilization of inquiry-based learning and its influence on students' engagement. The results present that inquiry-based learning influences students' engagement.

The data illustrates the correlation between the degree of inquiry-based learning implementation with p *value of* < .001and the impact it has on student engagement with p *value of 0.029*. The data demonstrates how inquiry-based learning affects students' involvement. Moreover, the outcome shows that inquiry-based learning in the classroom has a major impact on student participation. Additionally, students are motivated to collaborate with one another and significantly increase their involvement and engagement in the classroom when they are allowed to create their own knowledge through the investigation and interaction of things. Participation and performance in the classroom are significantly impacted by classroom engagement. When given the opportunity to generate their own knowledge by investigating and interacting with objects, students flourish. Giving students more opportunities to participate in inquiry-based learning can boost their interest in the subject matter and help them develop their analytical and critical thinking abilities (Castañas, 2021).

CONCLUSIONS AND RECOMMENDATION

IBL was first intended to promote social interaction among students, but it has now evolved into a paradigm for addressing problems that draws on and refines their inquiry-based skills. This strategy may work especially well in a scientific context, since investigation and questioning are essential components of a scientific methodology. Students of all backgrounds gain from the use of inquiry-based learning as it helps them advance their present learning, build long-term abilities, and influence their engagement in the class.

According to the results, the application of inquiry-based learning is positively and directly correlated with student engagement as its influence. Resources may be scarce, and creating lessons for inquiry-based learning might take a lot of effort. However, hands-on and experiential learning allows students to experience deeper learning and develop direct connections, which is beneficial for their general engagement as well as their recall and retention of knowledge.

IBL must be highly valued at all academic levels, beginning in the early stages and spanning all disciplines, to fully utilize this cutting-edge student-centered approach. For an interactive learning experience that demands critical thinking from students, in-depth knowledge, and motivated, engaged students, it is imperative that IBL be ingrained in regular school curricula.

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