A REFLECTION PAPER ON LONGITUDINAL IMPACT OF AN INQUIRY-BASED SCIENCE PROGRAM ON MIDDLE SCHOOL STUDENTS’ ATTITUDES TOWARD SCIENCE

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Inquiry-based science adopts an investigative approach to teaching and learning where students are provided with opportunities to investigate a problem, search for possible solutions, make observations, ask questions, test out ideas, and think creatively and use their intuition. It encourages students to develop an understanding of the world around them, and how to think critically about problems and solutions. This approach helps students understand what it is that scientists do, and how questions can be answered in a scientific, logical manner. Students gain an understanding of the importance of the creative and logical processes of science. Students discover answers to questions rather than listen to answers. This process develops the students’ critical thinking abilities and encourages them to become lifelong learners. Inquiry builds on previous knowledge and presents new knowledge in a context that allows the student to make meaningful connections between these two sets of knowledge.

In this manner, inquiry-based science approach involves students doing science where they have opportunities to explore possible solutions, develop explanations for the phenomena under investigation, elaborate on concepts and processes, and evaluate or assess their understandings in the light of available evidence. This approach to teaching relies on teachers recognizing the importance of presenting problems to students that will challenge their current conceptual understandings so they are forced to reconcile anomalous thinking and construct new understandings. Inquiry-based science approach challenges students' thinking by engaging them in investigating scientifically orientated
questions where they learn to give priority to evidence, evaluate explanations in the light of alternative explanations and learn to communicate and justify their decisions.

One of the approaches to promote meaningful science learning is via greater student involvement via inquiry-based learning. New knowledge is acquired as students collect data, analyze data, and solve problems. Memorizing facts does not promote or develop problem-solving skills, but when students are allowed to investigate, reason, and organize knowledge; they are able to incorporate new knowledge into their understanding. It helps to develop students’ understanding of the world around them through gathering knowledge. Students’ scientific understanding is supported through the expansion of habits of the mind and using problem-solving skills. Using prior knowledge, students make connections with their new knowledge. Inquiry-based approach is seen as a system of learning that supports the development of students' problem-solving and critical thinking skills, which is important for them in everyday activities. Through this approach, students learn not only how to ask questions and figure out the answers, but they also learn what questions are important to ask. A learning environment that supports these kinds of cognitive skills enables students to assimilate these skills in other areas of learning.

Teaching science is not about preparing students for a world that is static and fixed, but it concerns getting students ready to cope with changes and challenges in their lives. Traditionally, direct instruction in science generally focuses on mastery of content with less emphasis on the development of scientific skills and attitudes; students are the receivers while the teacher the dispenser. Some teachers often think they are doing inquiry because they are out at the front of the classroom directing the inquiry or investigation or demonstrating how to do it a particular concept. This is not inquiry science approach. Inquiry science approach requires teachers to be able to excite the students' interest in a topic or lesson being discussed in the class and then provide them with opportunities to undertake the investigation either by themselves or preferably in
collaboration with others. The teacher, though, needs to remain active in the lesson, guiding the students and asking questions to help them consolidate their understandings. Providing feedback is critically important to helping students understand how they are progressing.

Using inquiry based approach in science teaching, the teachers’ role is to engage students' interest through novelty, something unusual that spurs their curiosity and then they use language that is very dialogic or language that lets the student know that they are interested in what they think or want to say about the topic or lesson. Teachers then carefully guide students as they begin to explore or investigate the topic, being careful not to dominate the conversation but allow student time to develop responses or think about the topic more carefully. In this manner, teachers give students the time to reflect and think more carefully about the question being asked by the teacher. However, teachers are always careful to ensure that the inquiry-based science lesson moves forward and they do this by asking questions that probe and challenge students' thinking as well as giving them feedback that is meaningful and timely. Inquiry-based approach in teaching science complements the natural curiosity of students by encouraging them to ask questions, try things out and evaluate the outcomes. Students should know how to pursue their own questions about the world around them. This pursuit, however, does not happen naturally in the classroom, and student will need to be supported in their attempts to understand phenomena. When science is taught through the process of inquiry, students have the opportunity to pose questions and seek answers based on observation and exploration. Students can then use the evidence gathered throughout this process to answer their own questions that may arise. Inquiry allows students the opportunity to explore, yet simultaneously requires them to learn something about how scientist answer their own question. Teachers who do inquiry well tend have a very good understanding of both the content they are teaching and the processes involved. They tend to use language that is very collaborative and friendly and take a genuine interest in what students are doing. They ask questions that challenge students' thinking and they
acknowledge students' efforts. Teachers are critically important in employing inquiry based approach because they can inspire students to learn, love and engage with a subject.

As what transpired in the study, using inquiry-based approach in teaching science is more effective at increasing students’ achievement test in science. It also help to create a scientifically literate society we need to focus, not only on increasing scientific reasoning abilities, but also on students’ attitudes toward science because science should be visualized as a vehicle to train a student in thinking, reasoning, analyzing and articulating logically. One of the universally recognized aims of teaching science is helping the students in developing scientific attitude to meet the demands of daily life, new scientific knowledge and work in related field of knowledge has special significance. It is reality that science is felt to be difficult to absorb. Many students find science very difficult and un-interesting and perform poorly in it but if teachers are creative enough, using different approaches such inquiry based approach that helps students to engage in different activities that make science learning is fun to learn, because it help students to develop their own intellectual powers like power of imagination, memorization, observation, invention, concentration, creativity, logical thinking and systematized reasoning. However, even if inquiry-based approach is utilized in teaching science is implemented in the classroom; it does not automatically result in positive effects on students’ learning. To engage students in inquiry and to teach science as exploration is not enough. Students need explicit instruction on science as inquiry including how to create knowledge through arguments based on explorations and evidence based on the activity given by teachers, as well as teacher competencies are essential to increase students’ science literacy, consisting of meaningful understanding of subject matter knowledge of scientific facts and concepts, improvement of their science skills and interest in science.

Employing inquiry based approach in science program it really helps to achieve its purpose and provide meaningful learning among students, because based on the study
inquiry based science teaching is found to enhance or improve student’s performance in science and students will have positive attitude toward science when they are encourage and motivated by their teachers therefore, teachers should be encouraged to teach science using inquiry based science teaching approached. Teachers must provide better learning opportunity and create an enabling environment for effective teaching in science to ensure all students may acquire knowledge because they conducive learning environment and the approached used by the teachers arose their interest to learn better.

Reference: