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Inquiry- Based Teaching and Learning in Science: It's Extent of Implementation, Challenges Encountered and Learning Outcomes among the Secondary Schools in the Division of Aklan, Philippines

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ABSTRACT

It has been observed that implementing Inquiry-based learning in the classroom shows a positive effect on the learning outcomes of the high school students. This mixed-method of research was conducted to assess the use of inquiry- based teaching and learning in Science: Its extent of implementation, challenges encountered by the teachers and learning outcomes of the students among the secondary schools in the Division of Aklan. For quantitative data collection, the survey-correlational was used. On the other hand, a Focus Group Discussion (FGD) was utilized to gather qualitative data. A total of 502 respondents: 102 were the secondary science teachers and 400 were the secondary students. The frequency, percentage, mean, and Standard deviation were used for descriptive statistics. ANOVA, Pearson r and Linear Regression were used for inferential statistics. All inferential tests were set at 0.05 level of significance. The secondary science teachers in the Division of Aklan are "highly implementing" the Inquiry Based Teaching in their science classroom discussion. Most of the science teachers are good in posting Higher Order Thinking Skills questions. To the teachers, as they used IBTL in their science classroom, there were "moderately evident challenges" that they encountered using IBTL in science classroom. Likewise to the students, they also encountered "least evident challenges" when their science teachers use IBTL. Because of these challenges they encountered, learning of the students are affected. The study revealed that there is a positive results on the learning outcomes of the use of IBTL in the science classroom.

KEYWORDS: *Inquiry Based Teaching and Learning, Implementation, Challenges, Learning Outcomes*

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INTRODUCTION

Background of the Study

Nowadays, many science teachers are wondering why learning is less effective even if teaching strategies are diverse and hands-on. Still most of the science teachers encountered different challenges on how to meet the different competencies and they tend to look for an effective learning approachneeds of the science teachers.

Inquiry-based learning is rooted in learning by discovery. Jerome S. Bruner, an American psychologist, made significant contributions in defining discovery learning. Bruner's works focused on three distinct components while dealing with cognitive learning theory. Three key tenets are: the role of culture and structure in learning, the spiral curriculum, and discovery learning Bruner described culture as the toolkit for sense making and communication. Notably, students are encouraged to become active learners inside the classroom by contributing their own learning experiences. Students with less span of attention or having difficulty in staying focused needs to have this kind of teaching approach.

Correspondingly, Inquiry-based learning is a set of teaching methods characterized as providing the student with a learning strategy based on research-focused processes where the teacher's role is that of a facilitator. In addition, through exploration and investigation, students assume a degree of responsibility for their own learning, and are forced to make decisions and reach judgments that might otherwise have been made by their teachers (Levy 2009; Aditomo et al. 2013, Jonassen 2000 as cited by Gomez, 2014).

The researchers' observed that some of science educators in the country failed to use this kind of approach since they have different challenges and difficulties in using this approach. Lack of instructional materials that promotes the use of Inquiry based Learning, lack of teachers training and time consuming since they have a lot of school activities and forms to be accomplished.

Some studies found that teachers were vocal in their appeals to promote scientific inquiry instruction. But most teachers do not know how to conduct a practical inquiry instruction. Relevant issues such as inquiry process, inquiry structure, and organization of required curriculum content are not included in the new physics curriculum standards.

Researchers cannot help but doubt whether or not the new physics curriculum standards can be implemented effectively in practice (Luo et al., 2005) as cited by Fan (2015).

Thereupon, in the Division of Aklan, inquiry-based teaching method was introduced together with the different types of teaching strategies. It was highlighted that inquiry-based teaching approach is a powerful teaching strategy that can enhance their critical thinking, problem solving skills thru the inquiry and it is widely used in every science classroom.

It is in this light; the researcher wants to investigate whether the secondary science teachers in the Division of Aklan have been implementing Inquiry Based Teaching and if they encountered different challenges while using this kind of approach. Furthermore, the researcher wants also to know what are the possible learning outcomes among the secondary students using Inquiry based Teaching approach.

Statement of the Problem and the Hypotheses

This study was conducted to assess the extent of implementation, challenges encountered and learning outcomes of Inquiry-Based Teaching and Learning among Secondary Schools in the Division of Aklan.

Specifically, the study sought to answer the following questions:

1. What are the extents of implementation of Inquiry-Based teaching and learning in Science as perceived by teachers in terms of asking question, investigating solutions, create an experiment, results and discussion, and reflection among secondary schools in the Division of Aklan?
2. What are the levels of challenges encountered by teachers and students in using Inquiry-Based teaching and learning in Science in terms of knowledge, skills, attitude, and curriculum, resources and other support among secondary schools in the Division of Aklan?
3. What are the learning outcomes in using Inquiry-Based teaching and learning in Science as perceived by students in terms of knowledge, skills and attitude among secondary schools in the Division of Aklan?
4. Is there a significant relationship between extent of implementation and challenges encountered in using Inquiry-Based teaching and learning in Science as perceived by teachers among secondary schools in the Division of Aklan?
5. Is there a significant relationship between challenges encountered and learning outcomes in using Inquiry-Based teaching and learning in Science as perceived by students among secondary schools in the Division of Aklan?

Based on the above stated statements of the problem, the following hypotheses were advanced:

1. There is no significant relationship between extent of implementation and challenges encountered in using Inquiry-Based teaching and learning in Science as perceived by teachers among secondary schools in the Division of Aklan.
2. There is no significant relationship between challenges encountered and learning outcomes in using Inquiry-Based teaching and learning in Science as perceived by students among secondary schools in the Division of Aklan.

METHODS

Research Design

The mixed-method of research was utilized in this investigation. For the quantitative method, survey-correlation was used and for the qualitative technique, the second set of data was collected through focus group discussion (FGD).

Participants

The respondents of this study were the 102 science teachers and 400 students for both Junior and Senior High Schools coming from the selected secondary schools in the Division of Aklan.

Data Gathering Instruments

The data for the study was gathered using a researcher-made questionnaires. The questionnaires were made up in four (4) parts. Part I, determined the personal profile of the respondents. Part II, was the researchers made Inquiry-based Teaching Implementation with Cronbach Alpha value of 0.959. Part III, was the researchers made Inquiry based Teaching Challenges Encountered with Cronbach Alpha value of 0.843 and Part IV, was adopted and modified research questionnaire Inquiry-based Learning outcomes of the students with Cronbach Alpha value of 0.879.

Data Analysis

The descriptive statistics used were frequency, percentage and mean. The inferential statistics employed were Pearson r. The inferential test were set by 5% alpha level of significance.

RESULTS ANDDISCUSSIONS

Table 1 Mean and Standard Deviation of Implementation of Inquiry-Based Teaching and Learning as Perceived by Teachers

Implementation of Inquiry-Based Teaching and Learning	Mean	Description	SD
Overall	4.18	Highly implemented	0.45
Asking Questions	4.29	Very highly implemented	0.45
Investigating Solutions	4.16	Highly implemented	0.48
Creating an Experiment	4.15	Highly implemented	0.60
Making Results and Discussions	4.17	Highly implemented	0.60
Making Reflections	4.13	Highly implemented	0.48

Mean	Description
4.21- 5.00	Very highly implemented
3.41- 4.20	Highly implemented
2.61- 3.40	Implemented
1.81- 2.60	Less Implemented
1.00- 1.80	Not Implemented

The result in table 1 indicate that the teacher- respondents in the Division of Aklan are "highly implemented" in the use of Inquiry-Based Learning. Science teachers tend to implement the IBL through giving experiments, group activities such as research works and even by giving journals. They want also to develop the independency of the students since science teachers serve as the facilitator or just guiding the students.

Table 2 Mean and Standard Deviation of Challenges Encountered by Teachers and Students in Using Inquiry-Based Teaching and Learning

Challenges Encountered in Using Inquiry-Based Teaching and Learning	Teachers			Students		
	Mean	Description	SD	Mean	Description	SD
Overall	2.79	Moderately evident	0.57	2.21	Less evident	0.56
Knowledge	2.85	Moderately evident	0.81	2.42	Less evident	0.70
Skills	2.67	Moderately evident	0.80	2.20	Less evident	0.64
Attitude	2.35	Less evident	0.77	2.01	Less evident	0.66
Curriculum, Resources and Other Support	3.28	Moderately evident	0.63			

Scale	Description
4.21-5.00	Very Evident
3.41-4.20	Evident
2.61-3.40	Moderately Evident
1.81-2.60	Less Evident
1.00-1.80	Least Evident

In table 2, in terms of teacher challenges it was "moderately evident" this means that as they implement the use of IBTL in science classrooms, they encountered several challenges in terms of developing the knowledge, skills, attitude of the students. Teachers conform that they are trying their best on how to cope with those challenges just to implement the IBTL. They know how to lower down their expectations to their students since not all of them are not just teaching higher achiever students but also they are also teaching lower achiever or those students that belong to lower section. When it comes to the students, the challenges encountered is "less evident". This signifies that students experienced or encountered minimal challenges when their teachers who are using the Inquiry Based Teaching and Learning approach in teaching Science due to the fact that some of the topics are just new to them. Students reveal that their teachers are always thinking beyond or find solutions so that the students will be more motivated to learn Science.

Table 3 Mean and Standard Deviation of Learning Outcomes in Using Inquiry-Based Teaching and Learning as Perceived by Students

Learning Outcomes in Using Inquiry-Based Teaching and Learning	Mean	Description	SD
Overall	3.57	Evident	0.50
Knowledge	3.27	Moderately evident	0.94
Skills	3.68	Evident	0.60
Attitude	3.72	Evident	0.55

Scale	Description
4.21-5.00	Very Evident
3.41-4.20	Evident
2.61-3.40	Moderately Evident
1.81-2.60	Less Evident
1.00-1.80	Least Evident

The learning outcomes in using the Inquiry-Based Teaching and Learning as perceived by students are "evident". This good result shows that the students acquire the necessary knowledge, skills and attitude in learning Science as well as the teachers describe, apply and integrate the essential learning required in using the Inquiry- Based Teaching and Learning in teaching Science.

Table 4 Pearson r Between Implementation and Challenges Encountered in Using Inquiry-Based Teaching and Learning as Perceived by Teachers

Variables	r	Sig
Implementation and Challenges Encountered in Using Inquiry-Based Teaching and Learning	(-)0.22*	.029
* p<0.05 significant @ 5% alpha level		
ns p>0.05 not significant @ 5% alpha level		

The data in table 4 show that there is a significant relationship between the implementation and challenges encountered in using Inquiry-Based Teaching and Learning as perceived by teachers. The finding shows that there is a relationship between the two variables is negative and weak relationship. It means that when the teachers implement IBTL, they will encounter more challenges along the way especially when the teachers are not fully trained or equipped in the use of IBTL.

Table 5 Pearson r Between Challenges Encountered and Learning Outcomes in Using Inquiry-Based Teaching and Learning as Perceived by Students

Variables	r	Sig
Challenges Encountered and Learning Outcomes in Using Inquiry-Based Teaching and Learning	(-)0.13*	.009
* p<0.05 significant @ 5% alpha level		
ns p>0.05 not significant @ 5% alpha level		

The data in table 5 shows that there is a significant relationship between the challenges encountered and learning outcomes in using inquiry-based teaching and learning. It also shows that the correlational value is negative and weak relationship. It implies that when the students encounter less challenges most probably that their learning outcomes when using IBTL is higher.

CONCLUSION

The secondary science teachers in the Division of Aklan are implementing the Inquiry Based Teaching in their science classroom discussion. Most of the science teachers are good in posting Higher Order Thinking Skills questions.

To the teachers, as they used Inquiry Based Teaching in their science class, there were several challenges that they encountered using IBTL in science classroom because of these challenges this may lead to teachers tend not to use and/or might use other teaching approach that may not be effective and discriminative to the learner. This may result to poor performance in teaching.

Likewise to the students, they also encountered several challenges when their science teachers use IBTL. Because of these challenges they encountered, learning of the students are affected, some of the students feel nervous while taking the exam, they will have the difficulty in giving concrete answers and they will find the science subject a hard one.

If the teacher is fully equipped and trained on how to use IBTL therefore, challenges or difficulties is lessened. Thus, teaching and learning process will be more effective. This may give a positive effect in the development both in mental, physical and emotional intelligence of the students.

The quality of learning of the students is associated with their different challenges they encountered. Through the support, motivation and guidance to the students feel lesser challenges and that is why the students show positive result of their learning outcomes. Also, students may develop a confidence to perform well if they are much provided on their needs.

RECOMMENDATIONS

1. For the teachers, it is recommended that they may sustain this positive result in implementing the Inquiry-Based Teaching approach in Science by the use of time management, a balance between the paper works and attending classes. They can explore more using other resources to find different tasks, invite experts so that students will be more exposed to the new insights, experience the real word situations and to create a link on what they have in the book.

2. To the students, they also motivate themselves in learning science, not only in science but also in other subjects. They may improve their own study habits. Cooperation in the classroom activities by always attending classes and responsible students.

3. To the school administrators, they can minimize and balance the giving and distribution of extra work loads to the teachers so that the teachers can prepare instructional materials. Furthermore, they can also conduct a regular classroom observation so that teachers will be aware on the things that they need to develop on the use of IBTL in teaching science.

4. To the Department of Education, they may implement more trainings and seminars about IBTL for the science teachers and for all the teachers to become more familiar of the advantages of IBL and the factors to be considered in implementing the IBL.