

Questioning strategies to promote Participation in important scientific ideas
of junior high school students in the schools for expanding educational
opportunities in the upper northern region

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Abstract

The purpose of this research is to study the questioning strategies of teachers teaching science in the School for the Expansion of Educational Opportunities by studying teachers' questioning methods, teacher efforts in making students in the whole class participate in lessons and in methods to motivate students. Sample group used in the research contains science teachers in the School for the Expansion of Educational Opportunities in the upper north region teaching in the 1st semester, the academic year of 2018.

This research uses an integrated research methodology consisting of quantitative and qualitative research. The tools used in the study include (1) video recording for teaching, UTeach Observation Protocol (UTOP) and (2) teacher interview. The researchers collect data by recording the video for the atmosphere of learning management and in-depth interview with science teachers. After that, the instructional video will be analyzed using classroom observation record using the rating scale. Qualitative data is analyzed by content analysis, percentage analysis and presented by dedicated tables.

The research results indicate that questioning strategies that science teachers use to promote the most important scientific participation of junior high school students are the open-ended questioning method for students to come up with an analytical process with science teachers questioning to encourage students on a regular basis throughout the learning session. It is found that there is a clear attempt to make students in the whole class participate in the lesson and teachers use questioning to stimulate the interest of the whole class to help each other to think periodically.

The results of this research can be used to promote and develop science teachers to apply questioning strategies that stimulate a thought process and the extension of knowledge. That is, if used in teaching and learning, students will be able to develop the skills necessary in various fields while they can help and improve the quality of basic education in the country better which will make the learner become a quality person that will be an important force for the future development of the country.

Keywords: questioning strategies, participation and important scientific ideas

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Introduction

The science teaching process has a variety of teaching techniques. Regardless of any technique, what makes teaching the most effective is questioning of teachers. Questions are an important tool for teachers to help inspire and encourage students to achieve effective self-learning objectives. Questions that teachers use and how teachers use the questions will help students know what and how to think about. It is the exploration to gain knowledge and to find answers by themselves.

Learning management by using questioning strategies is like an opportunity for students to think, consider, review, analyze, and synthesize by themselves with having instructors helping as organizers of learning experiences, encouraging students to think at either basic and advanced levels so as to promote problem-solving skills and motivating students. This is consistent with the concept of Benjamin Bloom, which contains namely knowledge, memory, understanding, application, analysis, synthesis and valuation and important learning principles to promote learning skills in the 21st century with the standards focused on providing students a deep understanding of the content, having skills and methods of thinking and working systematically. If teachers are promoted and developed the use of questioning strategies in their teaching and learning, it will be able to help stimulate thinking, analyze a thought process and promote the extension of knowledge to give students the skills necessary in various fields, which will help and improve the quality of basic education in the country to be better which will make the learner become a quality person that will be an important force for the future development of the country.

Teachers use questioning with different purposes. In general, teachers use questions during the introduction to the lesson as an examination of understanding, to review the original knowledge and ex-

perience of students or what students have already learned. Students' answers will lead to new lessons and new experiences. The questions that teachers use are mostly questions to encourage learners, both to stimulate the students' ideas, to encourage students to discuss, to generate interest, to practice in solving various problems enhancing cognitive abilities for learners. It also helps students learn to find the answers seeking for reasons and for learning by themselves.

Questioning plays an important role in learners' learning because it stimulates the students' thought process, stimulates discussion. The good questions will help to continue the discussion, expanding the ideas and ways of learning, and summarizing new guidelines so as to train students to solve various problems. Questions are important as an effective tool to motivate and encourage students to learn and express themselves to have an opportunity to think. Questioning of teachers will help students learn how they should think. And regardless of any teaching methods used, questions will play a very important role in aiming for students to search for knowledge.

Teachers need to use questions to encourage students to think, causing them to be interested, eager in finding the answers. Methods in the questioning of teachers will include questions that encourage students' participation in thinking, encouraging students to participate in the lesson, providing an explanation regarding steps for practice, describing the experiment method or how to acquire scientific answers for students.

Objective

To study the questioning strategies of teachers in teaching science in the Expansion School for Educational Opportunities

The extent of the study

1. Scope of content

Questioning strategies of teachers in this research is a method of questioning of teachers; teachers' efforts to make students in the whole class participate in lessons including methods to motivate students

The questioning method of teachers in teaching science covers questioning in 5 levels:

Level1: Teachers use very little or do not use questioning strategies that require student participation regarding learning content or important scientific concept at any level during the class. Or teachers use a question that students can answer without having to use any ideas or a question that students take the response from what they recognized

Level 2: Teachers use questioning technique that is mostly of closed-ended type and the answer is from a short-term memory with one word or short phrase or use more challenging questions with some students to draw attention or to encourage participation or to check for skills development or teacher asks students the whole class to answer to create interest or to ensure that students are interested in what they are learning. But there are no questions that challenge students to think critically about the content or scientific concepts. Teachers use only questions to ask the whole class to answer.

Level 3: Teachers use constant questioning strategies to promote and maintain the level of student involvement, to examine the development of skills and learning processes with the activity of the lesson in certain periods during the class, especially during the lessons and during the closing / summarizing of lessons. Teachers use appropriate questions about the process and facts properly with scientific content or concepts. But there are a few times that teachers challenge students' ideas with questions that will examine their deep understanding or verify-

ing students' misunderstandings.

Level 4: Teachers regularly use questioning strategies throughout the teaching and learning sessions to promote and maintain student involvement levels, to examine the development of skills and learning processes with activities of lessons provided throughout the lesson. Teachers use some questions with individual students to examine ideas or to identify students' misunderstanding about content or important scientific ideas, which is a suitable method that teachers use to reflect and amplify students' ideas about the content or important scientific concepts that are being studied.

Level 5: Teachers regularly and consistently apply multiple-level questioning strategies to get answers that are passed through deep thought processes from students and to promote and maintain student participation levels, to examine the development of skills and learning processes with the activities of the lesson provided at all times during the class of that day.

Teachers' efforts to make the whole class to participate in the lesson cover 5 levels of effort:

Level 1: Teachers don't try to make every student participate in the lesson, ignoring students who have no involvement. Teachers never check the progress of the work of one group at all.

Level 2: Teachers try to make students participate in the lesson occasionally. Sometimes teachers ask students to volunteer in answering or teachers simply examine the progress of the work of some students who ask for help.

Level 3: Teachers try to do something for most students over 90 percent participate in the lesson by asking some willing students to participate and teachers check the progress of work for almost every student group.

Level 4: Teachers obviously try to make most of the students (almost everyone) to pay attention

to work to ensure that everyone participates in the lesson. Teachers ask both students who volunteer and do not volunteer and check the progress of work among all students including having understanding in managing students who are not interested in participating in the class.

Level 5: Teachers are eager at all times in that class so as to make all students participate in the lesson regularly while challenging and maintaining the level of thought participation and participation in lesson activities of all students. This includes shy students, students who are not brave, students who are bored, who do not catch up with the class or students who are disturbing or students who need particular help

As for methods to motivate students, the issues in stimulating students as a result of teacher interviews are as follows.

1. Use questions to stimulate students' interest in the classroom to encourage them helping each other to think periodically
2. Encourage students individually, especially those who lack of interest or still do not understand the lesson.
3. Adjust personality to create a friendly relationship with students.
4. Use both positive and negative reinforcement alternately, such as scolding, deducting grade points, alternating with compliments and giving points or prizes.
5. Strengthen motivation by giving credit point
6. Use music or games to stimulate the interest.

2. Target groups

The target groups used in this study includes 22 science teachers in schools for School of Expansion for Educational Opportunities in the upper north region in Chiang Mai, Lamphun, Lamphun, Chiang Rai and Phrae provinces who participate in the "Chevron

Enjoy Science project: enjoy science, power of thinking for the future" in the 1st semester, academic year of 2018.

3. Study Variables

Variables used in this study are questioning strategies to promote students' participation in important scientific ideas.

4. Term

Duration of the study is 1 semester, in the 1st semester, the academic year of 2018

Review of literature or related information

Questioning strategies

Suwit Mulkham and Orathai Mulkham (2002: 78-87) state that the application of questioning is a learning process aimed at developing the students' cognitive processes. The instructor will give questions in various ways with good questions that help to develop students' ideas asking students to use rational thinking to analyze, criticize, synthesize or evaluate so that to answer those questions. Phop Laohapai-boon (1994: 157 - 175) discusses questioning technique as an effective teaching technique in science teaching at the secondary level aimed at allowing students to study, learn, solve problems and summarize concepts by themselves. Regardless of the methods of teaching teachers are, use of questioning always plays an important role in the teaching process. As for inquiry-based teaching, questions must be used as a medium for knowledge. It may be a verbal question-answer between teachers and students. There are three types of self-knowledge seeking namely; Passive inquiry where the teacher is asking questions; "Active Inquiry", where the student is asking the question and "Combined inquiry" where teacher and student join questioning together.

While Pimphan Dechakupt and Phayao Yindeesuk (2005: 111 - 112) provide the meaning of the right usage of questioning, knowing how to

use good question, knowing how to select the right question both easy questions and difficult questions or either narrow question and wide question as well as a low-level question and high-level question and they also discuss about questioning in the classroom which may be in accordance with Phop Laohapiboon (1994: 157 - 175) as follows; (1) Teacher asks the students the questions to answer (2) Teacher and students join asking the questions and discuss together and (3) Student is the questioner. As for questioning, the good question is the art of asking questions that can stimulate the students' thoughts, encouraging students to have confidence to respond and ask the question in return.

In addition, Aporn Jaithiang (2003: 182 - 187) said that using questions plays an important role in teaching and learning, stimulating the students' thoughts. If the instructor has ability to ask questions effectively, it will help learners to develop critical thinking skills very well while they can find appropriate guidelines.

Pimphan Dechupt and Phayao Yindeesuk (2005: 120 - 122) categorize questions according to levels of cognitive domain based on Benjamin Bloom's concept into the following 6 types;

1. Ask for knowledge, memory; it is the questioning with definite answers. It is to ask the content of the facts, definitions, terms, terminology, rules, and theories. It is to ask about Who, What, When, When, Where, including Yes or No

2. Ask for understanding; It is the questioning that requires the combination of knowledge and memory to explain using an expression with their own speech. It is the questioning that is at a higher level than simply asking for knowledge.

3. Ask for further application; It is the questioning in bringing knowledge and understanding to solve problems in new scenarios.

4. Ask for analysis; It is the questioning that

classifies different stories for if they contains any sub-parts using the principles, rules, theories, background of that story or event.

5. Ask for synthesis; It is the questioning that utilizes thinking process to summarize the relationship between sub-data to be processed to a new principle or concept.

6. Ask for evaluation; It is the questioning that allows learners to evaluate by using their knowledge, feelings, opinions to determine criteria to evaluate those things.

The Institute for the Promotion of Teaching Science and Technology (IPST) proposed that the questioning has 4 levels, which is called O-E-P-C, in which it is similar as the level of inquiry-based teaching, as follows;

1. Observation question; it is a question that allows the respondent to use all five senses to recognize and to answer the problem or to collect information to analyze problems and solve problems in the next step.

2. Explanation question; it is a question that requires the respondent to use reason along with various information collected from observations in the current situation and from previous knowledge.

3. Hypothesis question or predictions question; it is a question that requires the respondent to predict what will happen once there is something is changing something, or to anticipate to extend the conclusion in the expansive explanation.

4. Control and Creativity Question; it is a question that requires learners to apply existing rules and knowledge to the events or other things. It is about thinking of new, unusual things.

Somchit Sawatanapiboon (Unknown year of publishing: 122 - 126) categorizes 4 types of questions as follows:

1. Question to continue the class; it refers to questions that teachers use for teaching and learning

activities to direct the class into the desired direction. It also stimulates the interest of students. This type of question is not directly related to the content of the subject.

2. Question to emphasize the content; it refers to questions that are not intended to be answered by students seriously. But it is a way of telling or reviewing facts and to motivate students' attention to that matter too. Thus teachers should avoid these types of questions.

3. Narrow question; it refers to a question that has a limited and exact answer. Caution is that when asked, all students often respond simultaneously. Thus teacher must find ways to prevent students from answering the whole class. When asking, always ask one of any student to answer.

4. Broad question; it has various answers more than one or two possible answers. It requires knowledge to be processed to answer the question, including questions that ask students to comment, make assumptions, design experiments, predictions, as well as asking about knowledge assessment

While Jiraphon Akarasomphong (2013) describes the types of questions as follows: (Supervisory unit, Department of Teacher Training 1977: 2 - 5)

1. Question that requires basic thoughts. It is a simple question which can be divided into 2 types: memory and observation

2. Question for the invention which requires more complex thinking than basic ideas, including (1) Understanding, in such ways like translation, interpretation, and expansion (2) Application, based on basic thinking and understanding (3) Comparison, which must analyze the story into small parts and consider for what is important, what is not, what is the cause or purpose? (4) Cause and reason; where searching for the relationship of the story, event, person, and idea is required to see if they are consistent or conflicted to each other.(5) Summarization of principles,

thinking, analyzing the cause and the importance of the matter, the relationship which can, therefore, be summarized for principle.

3. Question that expands thinking and encourages creativity for students to have a broad concept, apart from thinking for facts. The tendency of question has various manner such as (1) Estimation; which is a hypothetical question or assumption of events which may or may not be possible. The best way to process the answers requires discussion or additional information (2) Planning; it is a question that the respondent proposes a concept, planning of a project or proposing a new plan which depends on the purpose of the question. Respondents may process facts from their experiences, combined with their own ideas and then propose as a question. (3) Criticism; it is a question that requires the respondent to consider the matter or event in the sense of appropriateness, advantages, and disadvantages, which the respondent would provide comment based on his attitude The nature of the question may result in extensive discussion (4) Valuation; it is a question to make a definitive summary of the diagnosis.

In addition, Weerapong Longloi (<https://www.gotoknow.org>) divides the question into 2 types:

1. Basic question; it is a question that needs answers at the level of knowledge, understanding, and implementation such as asking about facts, asking to explain, asking how to apply knowledge to solve problems that are similar to the situation they have learned, a question to solve the problem

2. Advanced question; it is a question at a higher level than applying ; such as asking to analyze, synthesize, evaluate, and think creatively by aiming for students to think abstractly using facts or explanations and then bring into summarization for the relationship, meaning, comparison, reference and reason so that to find the right answer. Normally this type of question will always contain the word "Why". In-

structors often use to ask to look for students' cognitive abilities. The nature of this type of question is the questions for evaluation, questions for reference questions to compare, questions to find the cause and effect, questions for the initiative, questions for discovery

Chaiyong Promwong (1984: 67) states that the strategy or technique of using good questions will help students think systematically, having many different thinking skills which help to stimulate interest. In the application of effective questioning, it is necessary for teachers to prepare learning plans in advance when using questioning strategy as well as study the subject content and expected learning outcomes. This is implemented by using questions asking directly to the point, focusing on developing cognitive processes by providing questions that focus on answers which help students to learn by themselves. And teacher should also train students to ask the questions to teacher in order to verify for students' competency. This is in line with Jiraporn Akarasompong (2013) which states that the use of questioning will promote thinking skills for learners, stimulating interest in learning, alerting learners to be interested in learning better, expanding the ideas and ways of learning to learners, helping learners participate in teaching and learning activities, being a medium to link the previous knowledge with newly gained knowledge, cultivating research habits in finding answers from received questions. And it is used to measure and evaluate the learning results of learners effectively. While Kittichai Suthasinobol (1998) proposes about the use of question as follows:

Step 1: Planning the use of questions. Teachers should plan in advance for how to use questions for what purpose, what format will be consistent with the content and objectives of the lesson?

Step 2: Preparing questions by creating questions using criteria systematically and consistently

Step 3: Using questions; Teachers can use questions in every step of learning activities and may create new questions other than the prepared question which must be appropriate to content of the class and the situation

Step 4 Summary and Evaluation: Instructors may use questions to summarize lessons or evaluate collaboratively with students by using various evaluation questions.

It is, therefore, very important that teachers have the skills to ask effective questions which will help learners to have thinking skills and important scientific ideas as intended by objectives of the curriculum

Research Methodology

1. Tools used in the research consist of (1) Video recording system; UTeach Observation Protocol (UTOP) is used in conjunction with the classroom observation form for video recording of the instruction and (2) teacher interview forms.

1.1 Classroom observation record form is adapted from The UTeach Observation Protocol (UTOP) to suit the educational context of the Chevron Enjoy Science project: enjoy science, energetic thinking for the future. Classroom observation forms consisting of; Part 1 Basic data recording; Part 2 Overview of the lesson and ; Part 3 Assessment Scale with 5 levels of scoring to examine content validity of the questions in the assessment by 3 experts to analyze the consistency index between expert opinions (Item Objective Congruence Index: IOC). It is found that the evaluation form has an IOC value of 0.67 to 1.00 and experts consider that the evaluation criteria for teaching and learning management have appropriate evaluation criteria.

1.2 Teacher interview form is a question form that is used as a checklist of questions for teacher interviewing, including the questions like; in the

teaching and learning activities in this period, what strategies do you use to motivate students? Why do you use this strategy? This checklist is used to check the content validity of the interview questions by 3 experts. In analyzing for consistency index between opinions of each expert (Item Objective Congruence Index: IOC), it is found that the interview form has the IOC value of 0.67 to 1.00 1.2.

2. Research procedures are as follows;

2.1 Clarify to executives, academic department teachers, science teachers to make understanding in the project of Fun with Science & Power of thinking for the future.

2.2 Plan and scheduling and prepare for data collection tools

2.3 Coordinate teachers to make appointments for classroom observation.

2.4 Collect data by recording videos using UTeach Observation Protocol (UTOP) for teaching and perform interviewing teachers.

2.5 Evaluate teachers' teaching from the UTeach Observation Protocol (UTOP) video recording

by using classroom observation form and analyzing teacher interview results as collected in interviewing form.

2.6 Summarize and report the results based on the following framework; Teachers 'questioning strategies in this research include questioning methods, teacher efforts that allow students to participate in the class lessons and how to motivate students.

Research Results

The results in studying the questioning strategies of teachers in this research include 3 issues: (1) Questioning methods of teachers (2) Teachers' efforts to make students in the whole class to participate in the lesson

1. Teacher questioning methods from the result of observation of classroom teaching from video recording of UTeach Observation Protocol (UTOP), regarding questioning strategies to promote participation in important scientific ideas of students in the Expansion School of educational Opportunities in Upper North region are presented as in table 1

Table 1. shows the number and percentage of questioning methods of science teachers (n = 22 persons)

Level	Questioning methods of teachers	Frequency	Percentage
1	Teachers use very little or do not use questioning strategies that create student participation regarding the content or important concepts of science at any level during the lesson or the teachers use questions that students answer in a way that doesn't require any ideas or a question that takes from what they remember in memory to answer.	1	5.00
2	Teachers use questioning strategies that are mostly closed-ended types and the answer received is a short response from memory with one word or a short phrase expression or with more challenging questions to some students to draw attention or to get them involved or to check for skills development or teacher asks students the whole class to answer to create interest or to ensure that students are interested in learning subject but there are no questions that challenge students to think critically about the content or scientific concepts. Teachers use only questions that require the whole class to answer.	3	14.00

Table 1. (Continue)

Level	Questioning methods of teachers	Frequency	Percentage
3	Teachers use questioning strategies regularly to promote and maintain student participation levels, to examine the development of skills and learning processes with the activity of the lesson in certain periods during the class, especially during the introduction and closing/summary of the class. Teachers use appropriate questions about the process and facts that match with scientific content or concepts properly. But there are a few times that teachers challenge students' ideas with questions that will examine their deep understanding or for checking students' misunderstandings.	6	27.00
4	Teachers use regular questioning strategies throughout the teaching and learning sessions in order to promote and maintain student participation levels, to examine the development of skills and learning processes with activities of lessons throughout the lesson. Teachers use some questions with individual students personally to examine ideas or to determine incorrect understanding of students about the content or key scientific concepts which is a suitable method that teachers use to reflect students' thoughts and ideas about the content or important scientific concepts that are being studied.	9	41.00
5	Teachers regularly and continuously apply multiple levels of questioning strategies in order to acquire the answers through deep thought processes from students and also to promote and maintain student participation levels, to examine the development of skills and learning processes with the activities of the lesson at all times during the class of that day. In addition, most questions over 50 percent are applied to individual students to check their thoughts about the content or their deep scientific concepts that challenge existing concepts and assumptions and to strive students to develop new knowledge or new ways in applying their knowledge.	3	14.00
	Total	22	100.00

From Table 1, it can be seen that the most questioning method of science teachers use are at level 4 that is teachers use regular questioning strategies throughout the sessions of teaching and learning to promote and maintain student participation levels, to examine the development of skills and learning processes with activities of lessons throughout the lesson. Of 9 teachers, accounting for 41.00 % use some questions with individual students to examine ideas or to determine incorrect understanding of students about the content or key scientific concepts which is a suitable method that teachers use to reflect students' ideas and thoughts about the content or important scientific concepts that they are studying. Followed by Level 3, in which teachers use questioning strategies on a regular basis at all times to

promote and maintain student participation levels, to examine the development of skills and learning processes with activities of lessons throughout the lesson. Of 6 teachers, accounting for 27.00 percent use some questions with individual students to verify ideas or to determine incorrect understanding of students About content or important scientific concepts which is a suitable method that teachers use to reflect students' ideas and thoughts about the content or key scientific concepts that they are studying.

2. Teachers' efforts to make students in the whole class participate in the lesson, in which the results from the observation of classroom teaching from the video recording using UTeach Observation Protocol (UTOP) are presented in Table 2.

Table 2. shows the number and percentage of the level and effort of teachers that make students in the whole class participate in the lesson (n = 22 people)

Level	Teacher's effort to make students in the whole class participate the lesson	Numbers of Teachers	Percent
1	Teachers do not try to make every student participate in the lesson, neglect students who pay no attention. Teachers do not check the progress of the work of any group at all.	2	9.00
2	Teachers try to make students participate in the lesson occasionally. Sometimes teachers ask students to volunteer for answering or just check the progress of the work of only for a few students who ask for help.	1	5.00
3	Teachers try to do something for most students over 90 percent to participate in the lesson by asking students to volunteers for, and by checking the progress of work for almost every student group.	2	9.00
4	Teachers obviously make an effort to make most of the students (almost everyone) work hard to ensure that everyone participates in the lesson. Teachers call both students who volunteer and do not volunteer and check the progress of work among all students including checking for understanding, managing students who are not interested in participating in the lesson.	13	59.00
5	Teachers are eager at all times in that lesson in making all students participate in the lesson regularly. Teachers challenge and maintain the	4	18.00

Table 2. (Continue)

Level	Teacher's effort to make students in the whole class participate the lesson	Numbers of Teachers	Percent
5	level of participation in thinking and participation in lesson activities of all students including shy children who do not brave, children who are bored, children who can't follow up the class or those that are annoying or students who need special help.		
Total		22	100.00

Table 2 indicates teachers' efforts to make students in the whole class participate in the lesson from level 4 and above accounting for 77.00 percent, mostly in level 4. That is, teachers obviously show their efforts to make most (almost everyone) students work hard to ensure that everyone is involved in the lesson. Of 30 teachers accounting for 59 percent call both students who volunteer and do not volunteer and check the progress of work among all students as well as manage to deal with those who pay no attention to the class to participate in the class. Followed by level 5, which includes 4 teachers accounting for 18.0 % who are enthusiastic at all times in that lesson in making all students participate in the lesson regularly, challenging and maintaining the level of

thought participation and level of participation in lesson activities of all students which include children who are shyful, scared, and bored, children who can't follow up the class, or those who are annoying or students who need special assistance.

3. 1. As for how to motivate students, from interviewing teachers for how they motivate students in learning management to promote the participation of key scientific ideas of students in the School of Expansion for Educational opportunities in the upper north region and then bring the results of the interview to be used as guidelines to motivate students. The results indicate the methods to stimulate students in science teaching as shown in table 3

Table 3 shows the percentage of how to motivate students in learning management (n = 22 persons)

	Motivation methods	Quantity	Percentage
1.	Use questions to stimulate students' attention throughout the class to improve the thought process periodically.	14	63.64
2.	Encourage students individually, especially those who lack interest or still do not understand	4	18.18
3.	Adjust personality to create a friendly relationship with students	1	4.55
4.	Use both positive and negative reinforcement alternately, such as scolding, deducting of points, alternately with compliments and giving points or rewarding.	1	4.55
5.	Enhance motivation using scoring	1	4.55
6.	Use music or games to stimulate interest.	1	4.55
Total		22	100.00

From Table 3, it indicates that the most motivation method is the use of questions to stimulate attention in which 14 teachers, accounting for 63.64 % use for students in the whole classroom to help each other in a thought process.

Discussion

As for questioning strategies to promote students' participation in important scientific thought in the class in the School of Extension for Educational Opportunities in the Upper North region, The most used strategy is to ask questions regularly throughout the sessions of teaching and learning to promote and maintain student participation levels, to examine the development of skills and learning processes with activities of lessons provided throughout the lesson. Teachers use some questions with individual students to examine ideas or to identify students misunderstanding about content or important a scientific idea which is a suitable method that teachers use to reflect students and expand their ideas about the content or important scientific concepts that are being studied. It can be seen that science teachers use questions throughout the teaching and learning sessions in allowing students to participate in the class thoroughly. Questioning is implemented both at the individual level and at the class level in order to alert students to learning and to verify students' ideas. This is consistent with the results of teacher interviews like in the below examples.

"Questions that force individual student to stay alerted ; after forcing, for example, in case they still can't answer, teacher will suggest to find answer in the textbook or ask a friend which at least it does not make him/her feel alone, nor feeling afraid in the question that the teacher is asking. If he can answer, he then will be given with compliment or reward. Sometimes we give.....a compliment and ask them to pay attention to the study"

"Teachers are using questions to encourage students to be interested in the worksheets, interested in experimental results, asking them to present in front of the class asking all of them to listen if their answers are like of the others, to compare their results. Questions that teachers use today are of a Thinking plan. Teachers will be asking them with an open-ended question like why? how? For example; "if there is no root, how will it affect the tree?" "What are the components of the complete tree?". The teacher asks overall in the class and if anyone wants to answer, they would raise their hands. The teacher will once again choose who will answer. If there is anyone who doesn't answer, teacher will then motivate him/her, asking and talking with them for how these activities are and what students will do? How to plan?. Teacher will treat like this for all groups, asking students throughout the entire hour of the class"

From interviewing teachers, it reflects that teachers use many questions in both closed and open ends and these include both basic questions that need answers at the level of knowledge, understanding, and application in asking about facts to allow learners to remember information or things that have been previously learned, such as "What are the components of a complete tree?" In addition, teachers also ask students to provide an explanation which requires reasoning ability or ability to see the relationship of things, such as "If there is no root, how will it affect the tree? ", "How do students plan for this activity?" As for questioning of teachers, it is consistent with the question levels as defined regarding the Explanation Question of the Institute for the Promotion of Teaching Science and Technology (IPST) in which researcher considers that the characteristics and methods of teacher questioning are appropriate that is teachers ask questions to all students, leave duration before next question, wait for answer, re-

view questions and give students the opportunity to answer and provide compliments students immediately after they answer. This is a positive reinforcement that will affect the attitude and achievement of better study outcomes. However, teachers should plan in defining high-level questions in advance for what type of questions to use to examine some important scientific ideas of learners. If teachers practice questioning skills at a higher level, this will provide the question that helps stimulate systematic thinking system of students which will help promote the class to be meaningful and students will interact with teachers or students themselves while having more interaction with the lesson if they are stimulated by challenging provocative questions. This also will help examine students' ideas that if students have incorrect understanding so that teachers will know and find ways to manage the teaching and learning which is consistent to Suwit Munham and Orathai Munkham (2002: 76) which discuss the benefits of using the question to stimulate interest and motivate students to participate in activities so as students raise new problem or lead to new issues. And this is to encourage or stimulate students to find more information on their own, to promote the decision-making process and develop students' concepts as well as diagnosing problems, disadvantages, and advantages of students, assess and examine students' understanding if they can achieve objectives of activities and learning experiences or not and how.

Teachers have a clear effort to make students in the whole participate in the lesson, work hard to assure that everyone is involved in the lesson. Teachers call both students who volunteer and who don't and check the progress of work among all groups of student including understanding in managing students who are not interested in participating in the lesson. Reasons that teachers try to express clearly their efforts to make students participate in the les-

son may be due to various reasons as follows: Science teaching is intended for students to study and search for knowledge in a manner of acquiring knowledge. The nature of the course is to train students to have scientific skills, teamwork working process, and to reflect the exchange of learning, using of ideas, rational thinking, creative thinking, analytical and criticism thinking, educational continuity including the ability to solve problems, important skills in searching for knowledge and extending of knowledge systematically. From the observation of the researcher, it indicates that teachers' efforts to engage students in the lesson to make science teaching more effective, which is consistent with Phop Laohapaiboon (1994: 157 - 175) which discusses about effective teaching techniques in teaching science in a secondary level aiming at allowing students to study, research, solve problems, and summarize key concepts of the study by their own. The use of questioning always plays an important role in the teaching process. As for inquiry-based teaching, the question must be used as a medium for gaining new knowledge.

As for motivating students, use questions to stimulate students' interest in the classroom to make them help each other in the thought process periodically. In addition, method in motivating student individually, especially those who are not interested or still do not understand the less, teachers adjust their personality to create a friendly relationship with students, using both positive and negative reinforcement alternately, such as scolding, deducting points, alternately with compliments and giving points or prizes, encouraging them by scoring, using music or games to stimulate interest. Using method stimulating the interest of students by using questions to make them periodically help each other in thinking throughout that lesson may be due to the reason that using questions help learners gain knowledge and create a good atmosphere in the learning envi-

ronment which will enable students to develop their thinking, use reasoning to make conclusion, know ways in finding reason to support the answer making learners participate in learning activities, leading to more fun and more interest in studying. This is in accordance with Arporn Jaithieng (2003: 182 - 187) which state that the use of questions plays an important role in teaching and learning which stimulate the students' thoughts which allowing the instructor to have the ability to ask questions effectively which will help learners to develop critical thinking skills helping in finding appropriate guidelines effectively. However, in organizing learning activities, teachers should prepare more high-level questions in advance and teachers should also give students the opportunity to ask more increasingly.

According to the results of this research, if teachers are promoted and developed to apply the questioning strategies to use in teaching and learning, it will help stimulate thinking, analyze thinking processes, and extending of knowledge so that to provide students the skills necessary in various fields that can help and improve the quality of basic education in the country better which will make the learner a quality person who will be an critical force needed for future development of the country

Conclusion

The most used questioning strategy of science teachers to promote the important scientific thinking of students is to ask questions regularly throughout the course of teaching as well as clear efforts of teachers in making student in the whole class participate in the lesson and use questions to stimulate students' interest in the entire classroom to help each other in thinking process periodically.

Suggestions

1. Questioning strategies of teachers should be studied in order to promote the important scientific thinking of students in different contexts
2. Studying and gathering of information or knowledge sources related to the use of questioning in stimulating thought processes should be implemented.

Acknowledgment

In this research, the researcher would like to thank Chevron Thailand (Exploration and Production) Co., Ltd. that supports the research budget, the Management System International organization who is a consultant in this research, The Kenan Foundation of Asia that supports technical data and data collection of the research. Thanks to the network of researchers from 16 universities nationwide (National Research Team) who encourage us to do this research until completion.

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