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Developing Higher Order Thinking Skills Shadowing NSBC Framework*

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Abstracts

National Standard-Based Curriculum 2008 (NSBC) has its framework for regional and local education entities to use as a road map in preparing education to their students. The ultimate goal is to improve quality and equity of education to all compulsory age level students regardless of their origin, gender, religion and socio-economy status. Regional and local school districts assume the duty in providing quality education and equal opportunity to all children in their territory. The school plays a substantial role in conjunction with their local community members to develop curriculum that best serve their local needs. Teacher plays the most significant role in teaching the students to reach the NSBC goal. One way to reach the learning goal is to develop learners with higher thinking skills. To achieve such goal, the learning environment need to allow students to think out of the box and express ideas creatively without fear. In this article, the authors discuss their personal teaching experiences

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following the project-based learning (PBL) process to promote higher thinking skills. PBL is a student-directed, which permit them to research, experiment, and display outcomes themselves. Teachers are coaches to mentor and facilitate their learning by providing necessary guidelines. Experienced teachers in PBL setting lend opportunities for students to practice the skills until they feel comfortable to use them and be able to apply them in other contents as well as their daily life. PBL is a means that can be used to develop thought processes in order to enhance critical thinking skills, knowledge and teamwork among students as presented in this article.

Key words : National Standard-Based Curriculum, Project-based learning, higher order thinking skills

บทคัดย่อ

หลักสูตรอิงมาตรฐาน (Standard-based Curriculum) มีเป้าหมายในการพัฒนาคุณภาพผู้เรียนตามมาตรฐานการเรียนรู้ กระบวนการนำหลักสูตรไปสู่การจัดการเรียนการสอนที่หลากหลายจึงเป็นหน้าที่ของครูผู้สอนในการพัฒนาผู้เรียนให้บรรลุเป้าหมายของหลักสูตร โดยเฉพาะการจัดการเรียนการสอนให้นักเรียนเกิดทักษะการคิด มีความสำคัญอย่างยิ่งในการจัดการศึกษาเพื่อให้ได้คุณภาพสูง การพัฒนาคนให้เป็นบุคคลที่มีความคิดจึงเป็นเป้าหมายที่สำคัญยิ่งของสังคมและประเทศชาติ การบูรณาการทักษะการคิดลงในเนื้อหาของหลักสูตร ต้องพิจารณาว่าเนื้อหาวิชาอย่างไรควรจะใช้ทักษะใดจึงเหมาะสม เพื่อผู้เรียนจะได้ฝึกทักษะนั้นจนเกิดความชำนาญ สามารถถ่ายโยงไปใช้ในวิชาอื่นๆ และชีวิตประจำวันได้ การจัดการเรียนรู้ด้วยบทปฏิบัติการวิทยาศาสตร์ที่สอดแทรกภูมิปัญญาท้องถิ่นและให้ปราชญ์ชาวบ้านเข้ามามีส่วนร่วมในการถ่ายทอดองค์ความรู้ทำให้การเรียนรู้ก็ไม่จำเป็นต้องอยู่ในห้องเรียน นักเรียนได้ออกแบบการทดลองและลงมือปฏิบัติจริงจากแหล่งเรียนรู้ ในท้องถิ่น เป็นกระบวนการที่ช่วยให้ผู้เรียนได้พัฒนาทักษะการคิดจะส่งผลต่อการพัฒนาทั้งด้านความรู้ด้านทักษะการปฏิบัติการ ด้านทักษะกระบวนการทางวิทยาศาสตร์ให้กับนักเรียนนำไปการจัดการเรียนรู้แบบโครงงานซึ่งเป็นวิธีหนึ่งที่สามารถพัฒนาทักษะกระบวนการคิดการสร้างองค์ความรู้และส่งเสริมการทำงานเป็นทีมให้กับนักเรียน รวมทั้งเป็นรูปแบบการจัดการเรียนการสอน ที่เน้นนักเรียนเป็นศูนย์กลางของการเรียนรู้อย่างแท้จริง กิจกรรมการเรียนรู้แบบโครงงาน (Project -Based Learning) จึงเป็นกิจกรรมการเรียนการสอนที่มุ่งเน้นให้ผู้เรียนมีโอกาสได้ลงมือปฏิบัติและเป็นกิจกรรมที่ส่งเสริมให้นักเรียนเกิดทักษะการคิดขั้นสูง

คำสำคัญ : หลักสูตรอิงมาตรฐาน, การเรียนรู้แบบโครงงาน, ทักษะการคิดขั้นสูง

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Introduction

The current Thai National Basic Core Curriculum for compulsory age students, grades K-12, is a standard-based curriculum, which has been mandated in 2008.The curriculum focuses on developing students who will encompass knowledge, desirable characteristics, essential skills and other life skills necessary for students to better survive in today's fast growing technological and economic world. (Wongyai and Pattapon, 2015). Children in this era must be able to deal with changes quickly and effectively. This new economy places increasing demands on flexible intellectual skills, and the ability to analyze information and integrate diverse sources of knowledge in solving problems.

The core curriculum ends opportunities to compulsory educational institutes to modify, deepen or intensify content matters and skills deemed important and necessary to their students and community according to the context, environment and accessible resources.The basic core curriculum was established in order to provide a curriculum framework or a roadmap for regional educational entities to arrange and provide proper equal basic core education to all children in compulsory age in the community regardless of race, religion, social economic status and gender (Ministry of Education, 2008)

The role of local educational organizations is to establish the curriculum that is harmonized with the nation's basic core curriculum framework of 2008. Therefore, the curriculum at this level must stem from the core curriculum, yet be appropriate to its community and can be utilized to develop students' full potential in term of intelligence and social skills. Another important duty is to determine the needs of the student, school and community consistent with the location and availability of local resources. It is crucial that all parties involved clearly understand the steps and process to bring the curriculum into action. They must further understand that there may various options the curriculum can be implemented depending upon the school readiness and standards and benchmarks specified for each subject and grade level. It is clear that the basic core curriculum serves as an essential roadmap for the school to develop learning experiences for their students who will become the nation's invaluable human resources. Teachers who play inevitable roles and who also assume the highest accountability in their students' achievement must fully involve in curriculum development process. They must clearly understand this standard-based curriculum and be able to execute it efficiently for students to become a critical thinker and to reach their maximum potential. Project-based learning (PBL) is one of the learning processes that has been claimed to promote critical thinking in students.

The main purpose of this article to share the author's own experiences in developing students' critical thinking or higher thinking skills using PBL. It is a must that teachers in PBL setting are able to design projects-based learning that is student directed, yet requires collaboration and teacher guidance. Such kind of learning emphasizes on the learning process that help students understand how learning occurs. The PBL activities must be congruent with the authentic needs of the community. It must be based on real-world experiences or problems. Learning in this setting occurs through direct personal experience as Dewey stated in his Theories of Education that children learn best through direct personal experience. Children progress fastest in learning, not through being mechanically drilled in non-real life related materials or worksheet, but by doing real work, experimenting with real things, changing them in purposeful ways. This direct personal learning may take place outside a classroom where learning resources are available and affordable. Experts of the fields in the community may be invited to be a facilitator the learning process. Students in PBL also learn collaborative habits by working together with others.

Sample PBL Lesson:

In a science classroom of a school where soy beans and other crops are grown vastly in the community, the teacher asks students if it is possible that they can produce bean sprouts from gelatin look as they have been seeing to different colors such as orange, green or red color, etc. This allows the students to think creatively of what they may possibly use to alter the color of bean sprout that will still keep its original taste or produce better taste, yet more nutritious and non-toxic due to the color they derive. Another teacher may ask the students if they were asked to produce bean sprouts that look different from the original ones. How would they go about to do it? What materials they may need? What make them think they would produce the bean sprout the way they would like to? In traditional classrooms, learning is directed by teachers where the product or outcome is predetermined. Students are to follow the same goals to produce the products that will be submitted or presented to their teachers who may be their only audience. Such learning lacks real-world relevance. In contrast, students in PBL setting will make their choices that determine the outcomes, which will be presented to authentic audience or community audience. There has been much research evidence indicates that PBL students better develop their thinking skills and self-esteem.

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How to Integrate PBL into Science Curriculum

The present Thai basic core curriculum serves as a roadmap that open the door for local educational institutes who are accountable specifically for compulsory education level, to design the learning activities that are best relevant to authentic needs of their students and community. PBL could be one of the learning approaches that will make the goal realized. The below diagram displays the hierarchical roles of Thai educational organizations from the nation down to classroom level.

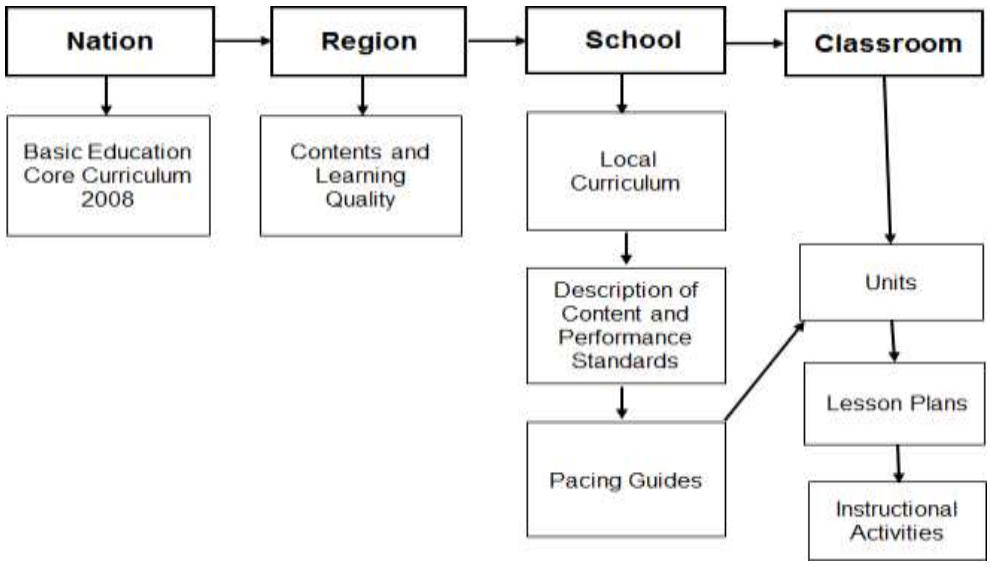

Diagram exhibits connection among the Basic Education Core Curriculum 2008, Local School Curriculum and Classroom Learning Management: Kanyarat Kojorn, 2012)

It is understandable that the school curriculum is a guide to help students develop their potential as well as experience that leads to accumulation of learning acquisitions. PBL allows students to learn by their own, discover themselves for what they want to be, and how to live in the society and the world joyfully. The educational institutions take essential roles in providing help and support to schools to develop, design and apply the school curriculum to best meet the needs of students and community. To apply the school's curriculum into learning activities which help develop competent learners as well as sustainably strengthen the communities, both curriculum and learning activities must serve the needs of the families and communities. Both must also be appropriate to the school context and environment that the students are able to gain knowledge and thinking skills, and apply them to daily life. Thus,

it is crucial that the school curriculum that complies with national basic education standards must serve the real needs of students and communities. The school curriculum is a framework of school educational plan that leads to educational reform in accordance with the needs of students and communities. It is believed that such kinds of learning activities will be joyful and also activate intrinsic motivation in students, which in turn will lead the learning more effective.

Teaching Strategies that Promote Critical Thinking Skills

Thinking analytically is crucial for learning.There has been much research substantiate that critical thinking can be developed, learned and promoted through the process of learning. This new and fast growing technology and economy place increasing demands on flexible intellectual skills, and the ability to analyze information and integrate diverse sources of knowledge in solving problems. Students have to be able to cope with changes quickly and effectively. Being able to think critically requires prior foundational knowledge and skills including memorization, recollection, comprehension and application. Teaching children how to “think” and “think critically” turns to be the heart of today’s educational process. It is a “lip word” among educators. Critical thinking skill is considered an integral part of raising educational achievement.

Many countries determine quality of education in three principal domains including cognition or intellectual, morality or ethics and citizenship. Khammanee and et.al (2009) addressed that cognitive development tends to receive utmost attention in comparison with the other two as its products are more prominent and easier to be observed. The current Thai basic core curriculum standards specifically place the weight on a thinking curriculum that requires teachers to elevate learning beyond memorization. Critical thinking is a skill that children will unquestionably need and exercise well beyond their school years. With today’s technology and new economy, it is undeniable that students need to obtain, understand and analyze information on a much more efficient scale. Educators, especially teachers, must equip their students with the strategies and skills that enable them to think analytically, so they can better handle with today’s technical and complicated issues. Classroom activities that permit students to think reasonably or take risk to think freely to make decision enhances thinking skills. Learning process that requires only emulating or rehearsing modes may restrict students to think critically. In reverse, learning activities that activates critical thinking requires the students to interpret, infer, analyze, synthesize and evaluate in order to construct or

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reconstruct new experience. Such skills are essential for them to search for new knowledge, which can occur through various channels i.e., researching for new knowledge to be used for analyzing and synthesizing in order to invent or construct. Therefore, process of thinking skills is one of the most important elements to acquire new knowledge.

Designing Learning Activities to Promote Thinking Skills

One of the most important goals in reforming Thai educational system during the second decade, 2009-2018 is to develop its population to become competent thinkers who possess lifelong learning skills for the aim of improving knowledge, skills and competencies within a personal, civic, social and/or employment-related perspective. To fulfill its desired goal, the Ministry of Education has placed the emphasis on developing the students' abilities in accordance with the Basic Education Core Curriculum of 2008. It is mandated that knowledgeable capacities, communication and thinking skills as well as quality traits must be fostered in all educational levels from early childhood to college (The Ministry of Education, 2000). Zoller (2011) expressed that it requires adaptation of learning activities to lead to creation of sustainable thinking skills. The context of relationships among science, technology, environment, social studies and learning activities should be flexible, adaptable and harmonized with daily life. This will lead the students to a more advanced thinking level where they can think systematically and make smart choices to solve problems and evaluate the outcome properly. Sintapanon and et.al (2012) concurred with Zoller that the teacher plays a significant role in designing learning activities that advocate thinking skills. They further stated that classroom environment that is conducive to learning activities should be comfortable and worry free where the students are permitted to make choices and decision. The teacher is a facilitator who motivates the students to take part in learning activities and allows them to take risk to do things independently. Strategies to promote students to become thinkers may include, questioning, analyzing, comparing/contrasting, categorizing/classifying, sequencing/ordering, predicting, making connection/linking, clarifying, reasoning, inferring, drawing conclusion, etc. Rouysoonner (2009) proposed two approaches for teaching thinking skills.

1. Teaching thinking skills directly in isolation without connecting it to subject matter or content. Students taught by this method may not be able to make connection or apply the thinking skills to the contents.

2. Teaching thinking skills by integrating them into contents or subject matters periodically throughout the learning process. Thinking skills are consistently enriched in every content of all education levels. This method of teaching helps students to transfer and apply thinking skills to learn contents.

In today's world, the most crucial matter to consider when providing education to children probably is to design learning activities that will help them develop lifelong learning habits and thinking skills, so they can cope with day-to-day changes and live in this fast growing and modern world contentedly. Today's teachers must be true facilitators, coaches and balancers to repeatedly improve their thinking methods and skills. These should take part in classroom discussion by supporting, provoking, promoting, praising, advising and maintaining relaxing classroom environments. Students should be given sufficient amount of time to digest, reflect and present their own ideas.

Thinking skills should be integrated into the learning process that the students can apply and utilize in other content areas as well as their everyday life. Conducting project-based learning activities in science deepens students' understanding and enhances students' knowledge as they have opportunities to set their own goals, perform their own task, make their own choices for the product that is not predetermined by the teacher. The entire process allows them to reflect their learning and thinking. Most importantly, the product is presented to real audience.

Salih (2010) investigated the development of thinking skills of science students in the classrooms, where various learning activities were employed to promote the students' higher order thinking skills. Likewise, Longo (2011) advocated that designing learning activities for science contents is a way to help create inquiry learning which enables higher order thinking skills. The students are able to analyze the data and conclude the findings of the project. Techakup and et.al (2010) addressed that having the students conduct projects is a means to empower the students' thinking skills. The proposal by Ministry of Education (2010) concurred with the above-mentioned that scientific way of learning such as PBL advancing higher order thinking skills in students. Such type of learning requires the students to analyze, evaluate and construct, which should normally be required in science classrooms.

In contrast, science teachers who strictly emphasize on principles, logics and use techniques that requires students to think and perform experiments in a systematic manner and do not allow them to think out of the box will hinder the students' interest, curiosity and enthusiasm. It will also discourage their creativity. Science teachers must recognize that

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science concepts and reasoning thinking are crucial, but the two alone may not help their students to survive contentedly in such a fast pace growing world as intend by the Ministry of Education 2008. Students must be encouraged and permitted to think independently. One way to do that is to integrate creative thinking in instructional learning activities that lend opportunities for the students to perform their hand-on tasks.

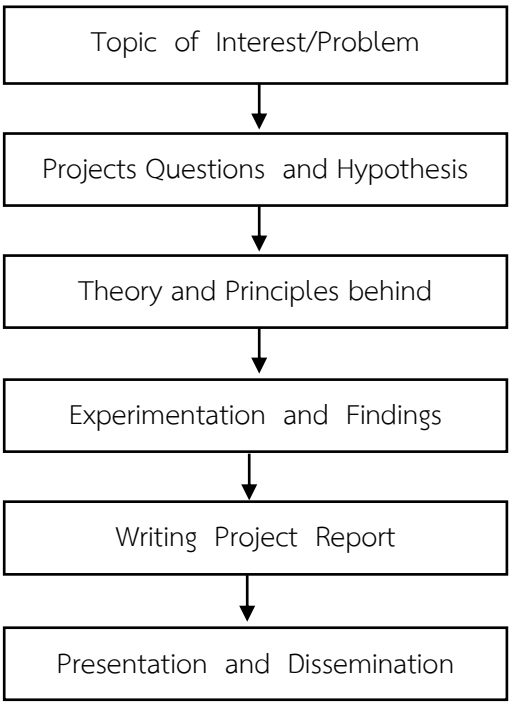
Designing Project-Based Learning Activities

Project-based learning (PBL) is a student-directed instruction that comprises a dynamic classroom method in which students acquire deeper knowledge through active exploration of real-world challenges and problems. Such learning enables students to discover new knowledge and new ways of learning by themselves through guidance of teachers and experts of the discipline. According to Techakup and et.al, (2010) PBL is learning new inventions and new ways of acquiring knowledge that many traditional teachers and students may never realize before. A unique quality of PBL is its process that students employ to search for knowledge or to discover solutions for what they want to acquire using various means. The learning can be individual or with a group of peers who have similar interests (Sirimahasakorn, 2010). However, there is a myth that PBL is the duty of science teachers as it emphasizes on logics, rationales, and hypothesis, and requires various investigations to find solutions that can be substantiated through scientific methods. In fact, other content areas such as math, social study, language arts and so forth can also be learned through PBL. Additionally, PBL is a way of learning that stimulates thinking and collaborative skills in students which serves the major purpose of Thai Basic Core Education Curriculum (Rouysoonneun, 2009).

Laoriandee (2011) stated that the intent of PBL is to serve students' interest and ambition in searching for new knowledge and select their choices to make decision with their peers to fulfill the project. It is an authentic way of working together to solve their own problem, which in turn will not only enhance their thinking skills, but learn how to work collaboratively with others. These skills are necessary for living in today's world as Kanter (2009) discovered that learning science through PBL helps improve deeper understanding of science concept for the students. Working collaboratively with counterparts also helps improve the students' communication as well as social skills. Such skills in turn enable them to better adjust themselves to their schools and communities surrounding their daily life. Kojorn (2012) advocated that a scientific way of learning as PBL helps advance higher order

thinking skills such as analysis, synthesis, evaluation and creativity in students. We can presume that the PBL learning approach links the gap between classroom experience and outer world, which meet the educational act 22 of 1999.

As previously mentioned that in PBL class, the project or assignment derives from the students' interest, curiosity and potential. Students are the working bees setting their own goals, selecting their own ways of acquiring the knowledge, performing their own task, evaluating and presenting their own product to the audience with necessary guidance and support from the teacher. PBL learning is based on Learning by Doing Theory initiated by Dewey as shown in the below diagram.



(Source : Techakup and et.al, 2010)

Achieving Science Learning : a Case Study of McLeans College, New Zealand

New Zealand is another English-speaking country where its quality of education is highly and globally acknowledged. A large number of international students from countries across the world attend schools in New Zealand each year. Almost all educational institutes in the country has an International Student Office to provide support and oversee international students' well-being. The school safety environment is also a key factor to attract international students. Most of New Zealand schools are owned and funded by government. The schools may establish their own curriculum and objectives that mirrors the national curriculum. The

secondary school system and curriculum are almost identical in term of qualifications for admission and quality of education. It is certain that all graduates meet learning objectives per the National Certificate of Education Achievement (NCEA). NCEA is one of the criteria that universities use to determine admission qualification of the students. Students graduate from New Zealand are able to use the NCEA to study in other countries.

Developing intelligence quotient (IQ) and emotional-intelligence quotient (EQ) are the two outstanding features of New Zealand's educational system. The two are embedded in the contents that students are learning. Students are free to choose what they want to learn based on their interest and potential. It is believed that students not only do their best of what they want to learn, but also activate their self-esteem. This also makes them confident in themselves as Chuchay and et.al (2015) pointed that the outcomes of letting students choose what they want to learn per their potential and interest enable them discover themselves, which also will lead them to a successful life.

The success of science learning in McLeans College derives from the inquiry approach. Classroom learning activities there requires students to search for knowledge and to conduct experimentation help students get better concept of learning and build more positive scientific attitude. The inquiry method that teachers employ consisting of five Es including **Engagement, Exploration, Explanation, Elaboration** and **Evaluation**. Learning activities in each step must be well-prepared and organized to draw students' interest and curiosity, which in turn will attract them to engage and explore. New Zealand teachers use questions to provoke the students' thinking skills. Students actively search for the answers using multimedia and resources for their enquiries.

New Zealand students are from diverse cultures, religions, races and origins. Thus, teachers must be well-rounded, receptive, dynamic and understanding the differences in each of their students. The learning activities for students must also be variety and appropriate. The below diagram displays four steps of teaching that teachers may modify and utilize in their classroom (Chuchay and et.al, 2014).

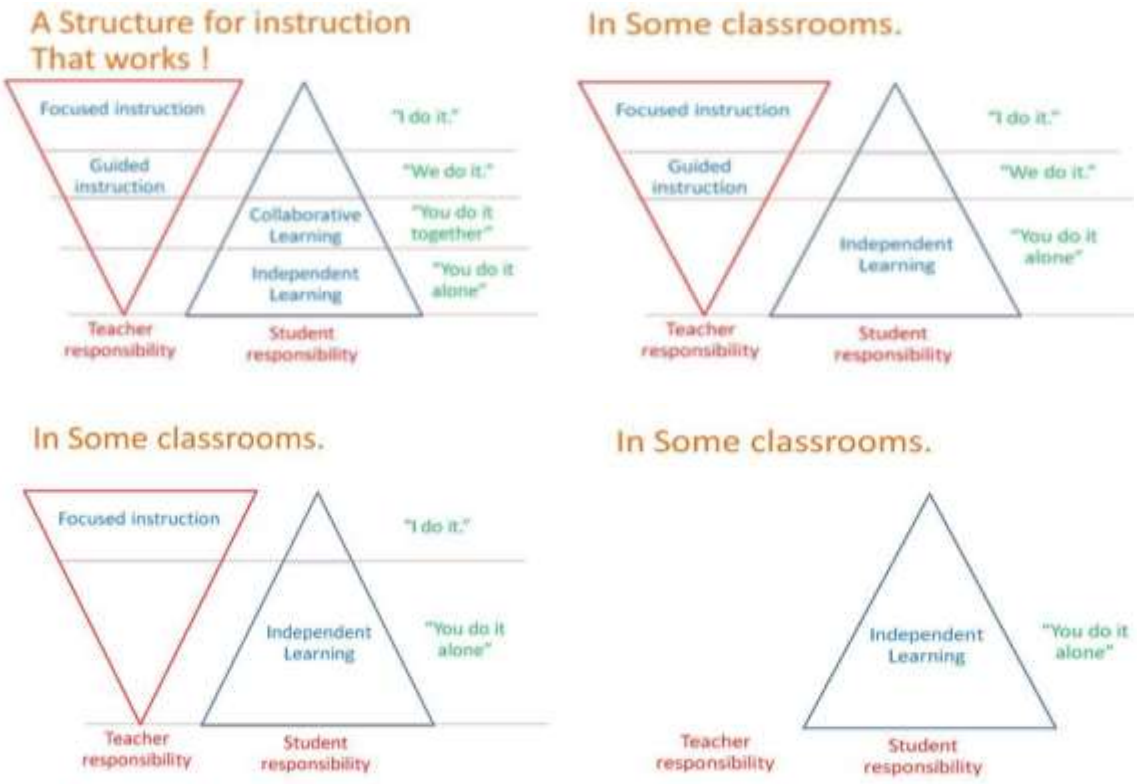


Diagram Displays the Four Steps of Managing Learning Activities based on McLeans College, New Zealand

(Source: Warren Yardley (Eds.), 2013)

Step I: I Do It. This is a focused instruction step when the teacher introduces new content or theory to the students. In this step, the teacher acts as a demonstrator and students are observers who closely watch their teacher's presentation. The teacher may pose questions for them to actively involve with the presentation.

Step II: We Do It. After the above step, the teacher provides guidelines with a variety of cloze activities such as cloze paragraph, learning games, skits, etc., for the students to complete. In this guided instruction step, the teacher will serve as a facilitator while the students are performing their task.

Step III: You Do It Together. It is the step when the students are broken into small groups to complete their experiment together in a collaborative learning manner. The teacher explains and provides steps in details for the students to conduct the experiment themselves. Collaboration is the key for the students to learn how to work together with their peers, yet also obtain knowledge and experience by performing the task. Collaboration is another necessary life-skill to survive in this modern world.

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Step IV: You Do It Alone. It is called the step of finding the treasure. It is an independent learning step that requires each student to perform a given assignment alone and bring it back to next class. Students have opportunities to research the information at home or from other sources such as computers, community library or community experts of the field.

Learning activities for the students to develop higher thinking skills based on McLeans College depends on two main factors, teacher readiness and domain of content. The process of learning activities, especially for science subject can be summarized as below:

1. Teaching science to achievement the goals, teachers must employ scientific-based or research-based practices to deliver their instruction. Teachers who have research mind will constantly search for new knowledge of the content they are teaching. They employ appropriate instructional approaches to the content and utilize appropriate tools to measure learning outcomes of their students.

2. Classroom management is not less important than teaching and learning process. As we know, a classroom where the students are well-behaved, punctual, engaged and accountable for their learning yields high achievement.

3. Questioning skills is just as much important as the aforementioned. The teacher who can employ proper questions and use a variety of techniques when posing questions will draw high attention and participation of their students. A good question must also rouse the students to think analytically.

4. The amount of homework given to the students may not have as much impact as having the students practice or respond to the questions in class. To do this, the teacher must pay close attention to the responses of students and provide them with immediate meaningful and positive feedback. Too much homework is not necessary to yield high achievement. It is quality of the homework that counts.

5. Allocating a proper amount of time is one of the keys elements when preparing learning activities. Different activities may consume different amount of time to accomplish. Thus, it is crucial that teachers prepare a long range plan ahead covering an entire school year curriculum with a pacing guide that serves as a road map for daily instruction. The plan should also be flexible permitting teachers to revise, modify or adjust according to day-to-day instruction and other circumstances.

It can be interpreted that scientific learning activities that mirrors the Basic Education Core Curriculum 2008 and the school curriculum must be various and focus on student-directed learning mode. There should be a collaboration effort between the school and the community representatives to help establish and manage the school curriculum and educational system. By doing this, the students will have opportunities to not only acquire content knowledge from the textbook or from the teacher, but also have direct hand-on learning experience from authentic community resources. This will enable them to utilize local resources to adapt themselves and to solve problems. Learning Science is not stagnant. It is a lifelong learning process that involves with constant changes of the nature and the world. It also deals with fast growing economy and increasingly use of technology. Everyone has to learn to live contentedly in this fast changing world. It would be difficult to live in today's world in isolation. People in today's world must be able to considerately work well with others. The school must provide the learning activities that activate higher level of thinking and require the students to actually perform hand-on tasks with their counterparts and by themselves as presented in the previous section that "You Do It Together" and "You Do It Alone". They must also be able to search for information for the solution of their problems. An important role of the teacher is to observe the students performing their task and to provide guidelines and support as necessary. Student-directed learning as PBL that takes place within or outside classroom setting is an ideal instructional design that may serve the purpose. It is the skills that the students acquire and the learning process that are important. Without the above two, solving problems themselves would be difficult or impossible. Students come from diverse backgrounds in terms of knowledge, maturity, aptitude, needs, interests and potentials and socio economic status .Designing and providing learning activities must take the above-mentioned factors into consideration. Thus, learning activities that demand students to perform their own task should also permit them to take risk to make their own choice based on those elements. Additionally, they should be included in the evaluation process which may include teachers, parents and community members to evaluate their tasks. The comments from evaluation will help them to modify or improve their future tasks. Finally, they should run the show to present their own products to the community. Outside professional experts have become an important resource of the educational experience for today's students. Students are normally excited to meet with visitors or experts of their interests. These individuals could be doctors, dentists, policemen, fire fighters, nurses, authors, artists and well-respected successful community members, which

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could be a parent or relative of a student. One of the benefits of having a professional resource person is that the students get to see the insight and perspective of the expert's particular field. The students have an opportunity to expose into authentic-world experiences from the position of someone who has been there. It is an enhancement of the students' educational experience and may also introduces them to other professions and career opportunities. Additionally, it helps students make connection between what they learn from the textbooks and the real world. These individuals could be good role models for the students as they may look up to them and want to become one of them when they grow up. It is wise to include these people as resources when planning learning activities. Classroom activities that involves professional experts may not be necessary to take place in the school setting.

It is important that individuals involving in science education development process have clear vision that learning science can take place anywhere and anytime, where there is high collaboration among schools, parents and community for the same ultimate goals, which are student learning and success. It can take place in the medical clinic, fire station, court house, police station, supermarket, lawyers' office, etc., in accordance with the topics of their study. Research evidences that outside classroom learning with outside professions of the field increases students' interests, enthusiasm, motivation and achievement.

Conclusion

In summary, designing and providing quality science learning activities with student-directed focus in today's rapid growing and changing world in economy, society and technology has much to do with teachers. Classroom practices that teachers employ for students to develop knowledge and skills is one of the key elements. As mentioned previously that only knowledge and skills may not be sufficient to survive through today's world contentedly, teachers must also be able to integrate life-skills and embed positive value into learning process, so students can transfer and apply them into their daily life.

As we all know that teachers play a significant role in student achievement, to lead the students to this modern world, they themselves also have to keep up with the fast changing economy and technology more than, or no less than their students do. Moreover, they must be a model of a lifelong learner for their students. In order for the students to acquire a lifelong learning habit, the teacher may have to change their role from someone who traditionally must know all and can do no wrong, to someone who is able to design proper learning activities, deliver them effectively and let students conduct their tasks based

on their students' potential. Teachers become facilitators or coaches who provide support and necessary guidelines to their students similar to what we see coaches do in the sport fields. It also takes substantial effort, dedication, commitment and practices for those players to become skillful outstanding athletes, likewise, to become an outstanding dancer or singer, you must be a lifelong learner as Albert Einstein maintained that "Wisdom is not a product of schooling but of the lifelong learning attempt to acquire it." It is obvious that lifelong habits do not occur overnight. Thus, planting life-long behaviors in students also takes time, consistency and persistency of coaches which in this case is teachers. It also requires the change in teaching behaviors from teaching to coaching. Changing the role of the teachers to suit today's role is doable, but may have to be done gradually. To conclude, reaching the goal of Thai Basic Education Core Curriculum 2008 to the level where the students become lifelong learners who are able to adapt to such a frantic pace of changes in economy, technology and environment is not an easy task, but can be done with high cooperation and understanding of all levels from higher education to classroom and community. It is expected that a future action research be conducted to investigate PBL in other subject areas to develop critical thinking skills.

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