



PROJECT-BASED LEARNING HANDBOOK

“Educating the Millennial Learner”



Educational Technology Division
Ministry of Education



FIRST EDITION: SEPTEMBER 2006

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ISBN: 983-3244-31-9



Published by:
Communications and Training Sector
Smart Educational Development
Educational Technology Division
Ministry of Education
Pesiaran Bukit Kiara
50604 Kuala Lumpur
Malaysia
Tel: 603-2098 7788/7870
Fax: 603-2092 3763

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Foreword



Foreword



There is a need to use multi-faceted approaches to deliver content as outlined in the national curriculum, and to develop soft skills among students. To fulfill this need, the Educational Technology Division of the Ministry of Education, Malaysia has prepared this Project-based Learning Handbook. The Ministry of Education has implemented “*Program Pembestarian Sekolah*” or “Making Schools Smart” Programme for all Malaysian schools under the Ninth Malaysian Plan (RMK-9). This programme calls for innovation in areas of teaching and learning by integrating technology. This handbook is timely as it gives a brief overview of Project-based Learning (PBL), how it can be used to achieve 21st century skills, and activity-based learning to encourage self-directed, self-paced and self-accessed learning among students.

Besides providing useful information on PBL, ideas to address issues and overcome obstacles are included to ensure teachers practise PBL.

The Educational Technology Division wishes to thank the group of dedicated educational officers and representatives from the private sector who have shared their expertise and experience, and who have worked so diligently to make this handbook possible.



DATO' HAJI YUSOFF BIN HARUN

Director
Educational Technology Division
Ministry of Education, Malaysia

Introduction

I n t r o d u c t i o n
Introduction

Introduction

“Be the change you want to see in the world.”
- Mahatma Gandhi

Motivating and engaging students in active learning is challenging even for the most experienced teachers. Due to students’ different learning styles, cultural and ethnic backgrounds, prescriptions of either a “one-size-fits-all” approach or the “cookie-cutter” approach do not necessarily gear them towards achieving high standards.

The suggested Project-based Learning is important in the learning process. It is touted to be the approach and means to achieve the 21st century skills. Moving away from rote learning and memorisation, Project-based Learning builds on individual strengths, and allows individuals to explore their interests in the framework of a defined curriculum.

Project-based Learning is holistic in nature and incorporates the principles of providing challenging and complex work, interdisciplinary and encourages cooperative learning. Project-based Learning also lends authenticity to learning. While in practice, practitioners plan, implement and evaluate projects in real-world situations beyond the classrooms.

Hence, this Project-based Learning Handbook serves as a reference for educators thinking of, or perhaps intending to start off Project-based Learning activities in their fields of practice.

In this handbook, the essence of Project-based Learning is simplified and presented in various sections where users are given a brief “walk-through” of project-based instruction. It outlines the approach, and how it can be utilised to increase students’ engagement and knowledge retention. Alternative assessment tools and rubrics are introduced to evaluate project-based activities. To enlighten users, a set of Frequently Asked Questions (FAQ) and how to avoid pitfalls in the “Dos and Don’ts of PBL” are enclosed. Finally, a list of resources for further reading is provided for users to gather more information on Project-based Learning and its implementation.

“The journey of a thousand leagues begins from beneath your feet.”

- Lao-Tzu

Project-Based Learning (PBL)

Project-Based Learning (PBL)
ject-Based Learning (PBL)


Project-Based Learning (PBL)

“The classroom is a place where people can live a fulfilling life together as a community of learners if needs and concerns are appropriately expressed. Problems can be discussed. Support, encouragement, and models can be provided by both teachers and peers. Where expectations for children’s learning are high, it is important that the social interaction itself is designed to facilitate learning.”

(Sylvia Chard, Associate Professor of Education, University of Alberta, Alberta, Canada)

What is Project-Based Learning?

Project-based Learning (PBL) is a model for classroom activity that shifts away from the usual classroom practices of short, isolated, teacher-centred lessons. PBL learning activities are long-term, interdisciplinary, student-centred, and integrated with real-world issues and practices. It is a method that fosters abstract, intellectual tasks to explore complex issues. It promotes understanding, which is true knowledge. In PBL, students explore, make judgments, interpret, and synthesise information in meaningful ways. It is more representative of how adults are asked to learn and demonstrate knowledge.



According to Sylvia Chard, the Project-based Learning approach is an “in-depth investigation of a real-world topic worthy of children’s attention and effort.” Hence, field trips, experiments, model building, posters, and the creation of multimedia presentations are sample activities within PBL where students with differing learning styles demonstrate their knowledge by means of inquiry.

In sum, PBL should:

- Be anchored in core curriculum and multidisciplinary
- Involve students in sustained effort over time
- Involve students in decision-making
- Be collaborative
- Have a clear real-world connections
- Use systematic assessment: both along the way and end product

(Source: <http://www.edutopia.org/modules/PBL/whatispbl.php>)

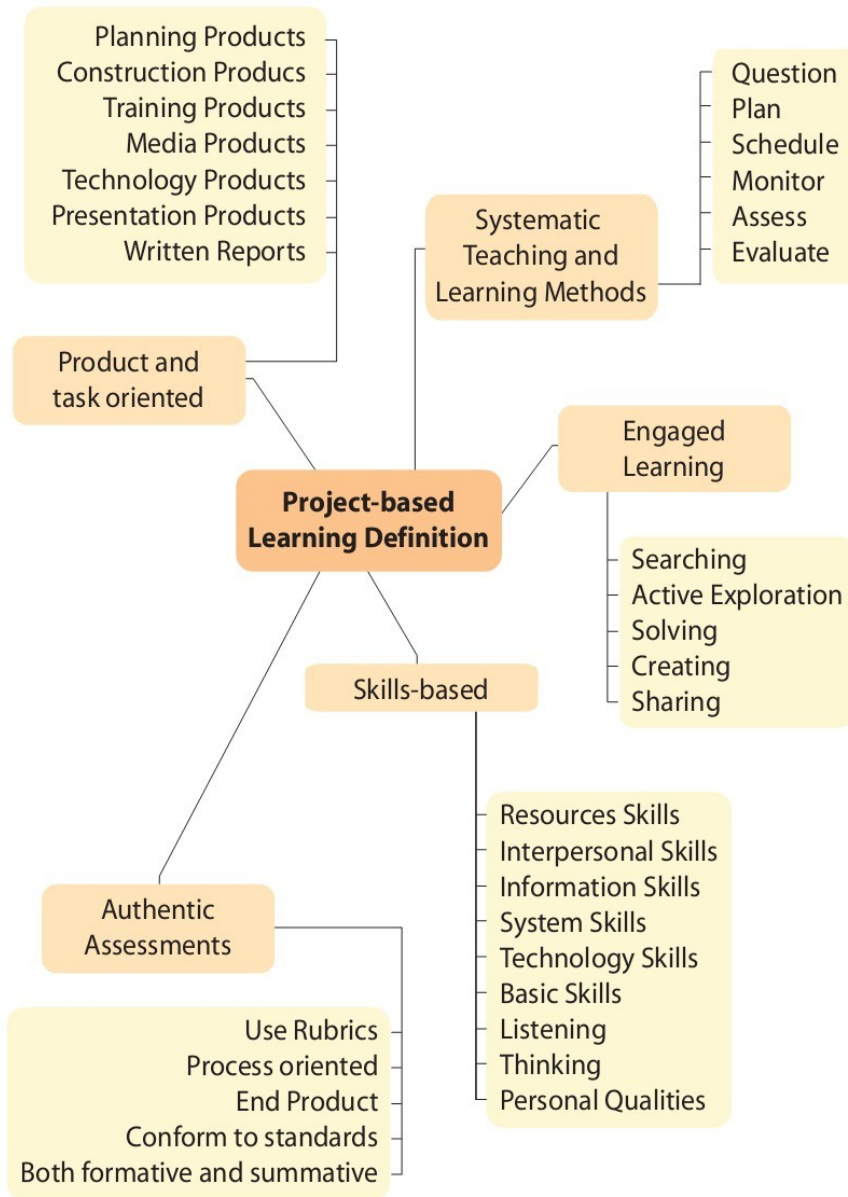


Figure 1: Project Based Learning At A Glance

Why Is Project-Based Learning Important?

“We are living in a new economy – powered by technology, fueled by information, and driven by knowledge”

(Futureworks: Trends and Challenges for Work in the 21st Century, US Department of Labor, 1999)

Project-based Learning helps students develop skills for living in a knowledge-based and highly technological society. The old-school model of passively learning facts and reciting them out of context is no longer sufficient to prepare students to survive in today’s world. Solving highly complex problems requires students to have both fundamental skills and Digital Age skills. With this combination of skills, students become directors and managers of their learning, guided and mentored by a skilled teacher.

The Secretary’s Commission on Achieving Necessary Skills (SCANS) has been appointed by The US Department of Labour to determine skills required for young people to succeed in the work environment. The objective of SCANS is to help teachers understand the curriculum and change classroom instruction to enable students to develop high-performance skills needed to succeed in the high-performance workplace.

As outlined in their report, *What Work Requires of Schools* (1991), a high-performance workplace requires workers to have solid foundation in basic literacy and computational skills, in thinking skills necessary to put knowledge to work, and personal qualities that make workers dedicated and trustworthy. High-performance workplaces also require other competencies such as the ability to manage resources, work amicably and productively with others, acquire and use information, master complex systems, and work with a variety of technologies.

In general the 21st Century Skills published by the Secretary's Commission on Achieving Necessary Skills (SCANS) includes:

- personal and social responsibility
- planning, critical thinking, reasoning, and creativity
- strong communication skills, both for interpersonal and presentation needs
- cross-cultural understanding
- visualising and decision-making
- knowing how and when to use technology and choosing the most appropriate tool for the task

Project-based Learning and the use of technology bring a new relevance to the learning at hand.

By bringing real-life context and technology to the curriculum through a Project-based Learning approach, students are encouraged to become independent workers, critical thinkers, and lifelong learners. If students learn to take responsibility for their own learning, they will develop in the way to work with others in their adult life. Project-based Learning is not just a way of learning, but a way of working together. Besides students, teachers can communicate with administrators, exchange ideas with other teachers and subject-area experts, and communicate with parents, all the while breaking down invisible barriers such as isolation of the classroom, fear of embarking on an unfamiliar process, and lack of assurances of success.

Project-based Learning lends itself to authentic assessment.

Authentic assessment and evaluation allows systematic documentation of a child's progress and development. Project-based Learning lets the teacher have multiple assessment opportunities. It allows a child to demonstrate his/her capabilities while working independently. Project-based Learning also develops the child's ability to work with his/her peers as well as building teamwork and group skills. A teacher learns more about the child as a person. It helps the teacher communicate in progressive and meaningful ways with the child or a group of children on a range of issues.

Project-based Learning promotes lifelong learning.

Lee Shulman, president of the Carnegie Foundation for the Advancement of Teaching stated, “Teaching has been an activity undertaken behind closed doors between moderately consenting participants.” Project-based Learning and the use of technology enable students, teachers, and administrators to reach out beyond the school building. Students become engaged builders of a new knowledge base and become active, lifelong learners thus taking control of their learning. In that pursuit of new knowledge, technology allows students’ access to research and experts, from such sources as first person accounts to movies of the Civil War found on the Library of Congress’ “American Memory” collection to online chats with NASA astronauts.

Project-based Learning accommodates students with varying learning styles and differences.

Children having different learning styles, build their knowledge on varying backgrounds and experiences. It is also recognised that children have a broader range of capabilities than they have been permitted to show in regular classrooms with the traditional text-based focus. Project-based Learning addresses these differences because students must use all modalities in the process of researching and solving a problem, then communicating the solutions. When children are interested in what they are doing and able to use their areas of strength, they achieve at a higher level.

Project-Based Learning in Malaysian Schools

“One of the major advantages of project work is that it makes school more like real-life. It’s an in-depth investigation of a real-world topic worthy of children’s attention and effort”

(Sylvia Chard, Associate Professor of Education, University of Alberta, Alberta, Canada)

The Ministry of Education, Malaysia is taking various steps to ensure that this innovative instructional approach, widely used in developed countries for many years takes place in our schools.

The Minister of Education in his 2006 Ministerial Message stated:

“The way we assess our children’s achievements in learning must be in response to developments and changes in the world.”

(Y.B. Datuk Seri Hishamuddin Hussein, in 2006 Ministerial Message, NST, January 18, 2006)

Reflecting on what the Minister of Education had said and what was documented in the “Malaysian Smart School Conceptual Blueprint”, implementing Project-based Learning in our schools shall definitely meet our curriculum requirements and promote new approaches for student’s assessment.

Documented in the “Malaysian Smart School: A Conceptual Blueprint” (Ministry of Education, 1996), the ideal curriculum is:

- **MEANINGFUL.** The curriculum emphasises the active construction of meaning, so that students find purpose in their studies.
- **SOCIALLY RESPONSIBLE.** The curriculum develops in students a sense of social responsibility, so that they become aware of their obligations and duties as citizens in a democracy, and are especially sensitive to the needs of the poor and the aged.
- **MULTICULTURAL.** The curriculum reflects and is responsive to the cultural diversity of this nation and our community, so that students develop a sense of pride in their own heritage and a respect for that of others.
- **REFLECTIVE.** The curriculum fosters in students the skills and attitudes of reflection, so that they are able to think critically, creatively, and affirmatively.
- **HOLISTIC.** The curriculum gives appropriate emphasis to all the significant aspects of growth and all the types of human intelligence, helping students see the connections between the separate subjects.

- **GLOBAL.** The curriculum develops in students an awareness of global interdependence in all aspects of life including the environment and the economy.
- **OPEN-ENDED.** The curriculum is open-ended in two ways: it is open to revision and continued refinement; and it provides open access to all students, allowing them to go beyond explicitly stated learning outcomes in curriculum documents.
- **GOAL-BASED.** The curriculum focuses on significant goals, so that all students, including those with special needs, develop the critical skills and acquire the knowledge they need for effective lifelong learning and full functioning as citizens in a changing society.
- **TECHNOLOGICAL.** The curriculum uses technology as one delivery system, examines the influence of technology on students' lives, and gives students the skills they need to use technology.



Furthermore, these skills are to be infused into the curriculum:

- Personal skills
- Social Skills
- Knowledge Acquisition Skills
- Mathematical Skills
- Thinking Skills
- Scientific Skills
- Generic Skills
- Environmental Skills
- Creative Skills
- Information Technology Skills

These skills could only be acquired through practice with content as the context for learning. With Project-based Learning, students use collaborative and co-operative approaches to generate knowledge and this is the key to facilitate meaningful and real-life learning.

To initiate this change in making PBL viable in Malaysian schools, four design principles needs to be adhered strictly.

- Define learning-appropriate goals that lead to deep understanding;
- Provide scaffolds such as “embedded teaching,” “teaching tools,” sets of “contrasting cases,” and beginning with problem-based learning activities before initiating projects;
- Ensure multiple opportunities for formative self-assessment and revision; and
- Develop social structures that promote participation and a sense of agency.

**SMK Batu Empat Gerik, Perak
2006 Malaysia – Japan Teddy Bear Project**



Students in action...



Upon receiving teddy bears from Japan.



“Yeah... we can start to communicate with our friends in Japan...”



Virtual Field Trip to New Zealand: “Blue Duck”



Students of SK Putrajaya 2, Putrajaya presenting their work on “Blue Duck”

Students at work...



In partnership with New Zealand



Students engaging in audio conferencing



(Source: "Blue Duck"- SK Putrajaya 2, Putrajaya, Selangor)

How to Implement Project-Based Learning?

Real PBL, by contrast, is deep, complex, rigorous, and integrated where each stakeholder in the school plays an important role. In implementing PBL, its fundamentals are fourfold:

- Create teams of three or more students to work on an in-depth project for three to eight weeks.
- Introduce a complex entry question that establishes a student's need to know, and scaffold the project with activities and new information that deepens the work.
- Calendar the project through plans, drafts, timely benchmarks, and finally the team's presentation to an outside panel of experts drawn from parents and the community.
- Provide timely assessments and/or feedback on the projects for content, oral and written communication, teamwork, critical thinking, and other important skills.

Eight (8) learning outcomes embedded in all projects, assessments, and grade reports should be considered in the PBL teacher's instruction. They include (1) content standards, (2) collaboration, (3) critical thinking, (4) oral communication, (5) written communication, (6) career preparation, (7) citizenship and ethics, and (8) technology literacy.

The school's strategy:

- To learn collaboration, work in teams.
- To learn critical thinking, take on complex problems.
- To learn oral communication, present.
- To learn written communication, write.
- To learn technology, use technology.
- To develop citizenship, take on civic and global issues.
- To learn about careers, do internships.
- To learn content, research and do all of the above.

Project-based Learning, as with all lessons, requires much preparation and planning. When designing the project, it is essential that the content standards are addressed. With these standards in mind, devise a plan to integrate as many subjects as possible into the project. Teachers must have ideas on what materials and resources to be made accessible to assist students. Next, students will also need to be given assistance in managing their time. Finally, multiple means are used to assess students' projects upon completion.

Teddy Bear Project



2004 Malaysia-Taiwan Teddy Bear Project (English Language)

Final grammar check on students' scrap book

A taste of local crisps - "kuih kapit" for our Taiwan friends



同学们知道我们会晕机，于是想方设法让我们以最舒服的坐态上路。谢谢你们的用心，朋友。

2005 Malaysia-Taiwan Teddy Bear Project (Chinese Language)

Sending off teddy "Batik" and "Sarong"

"Welcome teddy Tai-tai and Wan-wan!"



1945 - My Hometown Project



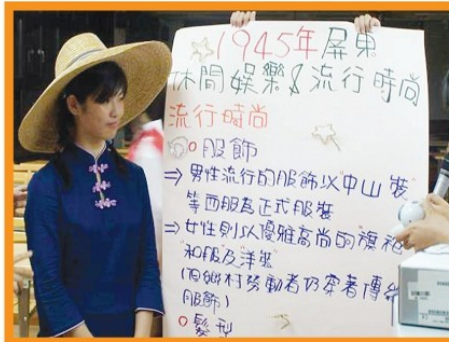
Group discussion:
Refining texts to be published in project websites



Project members taking a break at the school canteen



Taiwan's project partners engaging in discussion and presenting their project outcomes through video conferencing.



(Source: "Teddy Bear Project" and "1945-My Hometown" - SMK Batu Empat, Gerik, Perak)

Steps in Project-based Learning

There are six (6) steps to Project-based Learning

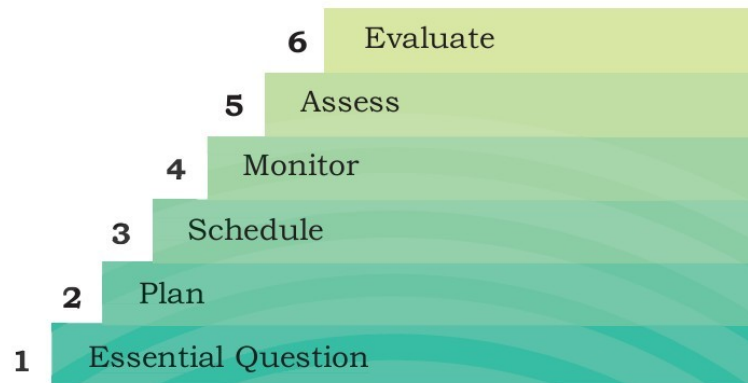


Figure 2: Steps in PBL

Step 1

Start with the Essential Question

The question that will launch a Project-based Learning lesson must be one that will engage students. It is greater than the task at hand. It is open-ended. It will pose a problem or a situation that the students can tackle knowing that there is no ONE answer or solution.

To start off,

- Take a real-world topic and begin an in-depth investigation.
- Question is based on situations or topics that are authentic.
- Make students feel that they are making an impact by answering the question or solving the problem.
- Make the question relevant for students. The question should have meaning in their lives at that moment of time.

Step 2

Design a Plan for the Project

When designing the project, it is essential to select content standards to be addressed. Involve students in the planning process. Students feel ownership of the project when they have an active role in deciding activities. Base on the curriculum, select activities that support the question. Know what materials and resources to be made accessible to students. Be prepared to delve deeper into new topics and issues as students become more involved in pursuit of answers.

Step 3

Create a Schedule

Design a timeline for project components. Realise that changes to the schedule will happen. Be flexible, but help students realise that a time will come when they need to finalise their thoughts, findings, and evaluations. Allow students to go in new directions. Guide them when they appear to be going in a direction that has no connection to the project. Help students to stay on course but don't accidentally set limitations.

Step 4**Monitor Students and Project Progress**

Facilitate the process and inculcate love for learning. Teach students how to work collaboratively. Designate fluid roles for group members. Let students choose their primary roles but assume responsibility and interactivity for other group roles. Remind students that every part of the process belongs to them and needs their total involvement. Provide resources, guidance and assess the process through creating team rubrics and project rubrics. Team rubrics state the expectations of each team member while project rubrics refer to evaluation requirements of the projects. As such, these requirements must be made clear to students to ensure success in their projects.

Step 5**Assess the Outcome**

Assessment provides diagnostic feedback and helps educators set standards. It allows one to evaluate progress and to relate that progress to others. It gives students feedback on how well they understand the information and what they need to improve on. Assessment also helps teachers design instruction to teach more effectively. Whenever possible, allow self-assessment among students. If student's and teacher's assessment contradicts, a student-teacher conference to justify learning outcomes should be held.

Step 6**Evaluate the Experience**

In the busy schedule of a school day, there is often little time for reflection. Yet, reflection is a very important part of the learning process. Set a time for reflection of daily activities. Allow individual reflection, such as journaling, as well as group reflection and discussion. Share feelings and experiences, and discuss what worked well and what needs change. Share ideas that will lead to new questions, thus new projects.

The Essential Question (EQ)

The Essential Question (EQ)
Question (EQ)

The Essential Question (EQ)

Crafting the Essential Question

Good PBL projects are built upon inquiry-based learning guided by the teacher. The Essential Question (EQ) is central to the inquiry process and comes before deciding on project activities. Naturally the project outcome is driven by the essential question or problem statement.

In Project-based Learning, a good essential question should:

- Drive the project
- Capture the project theme or the “big idea”
- Point students toward mastering content and skills which enable them to answer the question
- Not be easily solved or answered

Creating essential questions therefore takes time and careful thought. Often, brainstorming among peers would produce the best essential questions.

Other aspects to be taken into consideration in crafting the essential question are the: (1) level of complexity, (2) level of coherence, and (3) level of authenticity.

Level of complexity in an essential question

A good essential question makes a project intriguing, complex, and problematic. Although standard classroom assignments and homework pose questions that students must answer, an essential question requires multiple activities and the synthesis of different types of information before it can be answered.

Level of coherence in an essential question

An essential question brings coherence to disparate project activities and serves as a “lighthouse” that promotes students’ interest. It directs students toward the project’s goals and objectives, and delivers the targeted learning outcomes.

Level of authenticity in an essential question

The essential question should address authentic concerns. For example, a teacher when creating the essential question should first ask themselves,

“Is the content I am trying to teach used in the real world?”

Although it is usually easier to focus student’s attention on a single question, some topics will require multiple essential questions. Once you have the project theme or a “big idea” for a project, capture the theme in the form of a problem or a question that cannot be easily solved or answered.

The elements of “Trinity of PBL” comprising: (1) content, (2) skills, and (3) personal strengths have to be identified by educators when they frame the essential question.

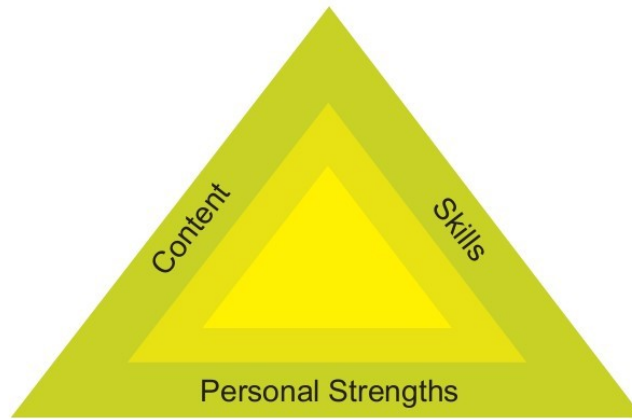


Figure 3: Trinity of PBL

(Source: Alan Engle, Instructional Technology Specialist, Rockwall, ISD, TCEA)

Checklist for framing an effective question

A checklist should be used to ensure a good essential question is developed. Questions to be asked in the process should include the following.

- Is it provocative?
- Is it open ended?
- Does it go to the heart of a discipline or topic?
- Is it challenging?
- Does it arise from real world dilemmas that students find interesting?
- Is it consistent with learning outcomes and other curricular standards and frameworks as defined in the *Huraian Sukatan Pelajaran (HSP)*, etc?

(Source: www.pbl-online.org)

Why do we need essential question?

Essential question creates the framework and the environment within which students' 'real' learning occurs. It drives the student's inquiry process and requires students to:

EVALUATE

Make a thoughtful choice between options, with the choice based upon clearly stated criteria

SYNTHESISE

Invent a new or different version

ANALYSE

Develop a thorough and complex understanding through skillful questioning

Essential questions spark curiosity and sense of wonder derived from our inner wish to understand issues and the unexplainable. Answers to essential questions cannot be found. They must be invented. It is like cooking a great meal. The researcher goes out on a shopping expedition for raw ingredients, but "the proof is in eating the prepared *nasi lemak*."

Students must construct their own answers and make their own meaning from the information gathered. Only in this way, they create insights. Answering such questions may take a whole lifetime, and even then, the answers may only be tentative.

In answering the essential question, research is required and it proceeds over the course of several weeks, with much of the information gathering activities taking place outside of the formally scheduled classroom hours. Hence, the essential question would engage students in research which are similar to real-life applied problem-solving.

Essential questions usually lend themselves well to multidisciplinary investigations, requiring students to apply skills and perspectives of math and language arts while wrestling with content from social studies or science. With effective essential question driving PBL projects, teachers would be able to implement thematic and cross-curricular teaching and learning practices.

(Source: www.FNO.org)

Examples of Essential Question (EQ)

Table 1: Sample Essential Question

English	<ul style="list-style-type: none"> • What is independence or “merdeka” to you? • Why is Shakespeare still so popular? • What is “good writing”? • What does it mean by “to come of age”? • How does literature reflect the times in which it is written? • How do we persuade others?
Mathematics	<ul style="list-style-type: none"> • What is the best design for a “high school of the future” for a given site? • Is it better to buy or lease a car? • How should a tax form be done? • How can hikers determine the shortest distance between two points?
Science	<ul style="list-style-type: none"> • What is the earth made of? • Can we predict the weather? • How good is our water? • How should a bridge be designed for this site? • How can we stop the spread of infectious disease?

Ten Functions of Essential Questions

- Build or invent: construction or adaptation to meet special requirements
- Persuade or convince: identifies arguments on behalf of proposal
- Challenge or destroy: find weakness in an idea, argument, research, or plan
- Wonder: explores doubts or boundaries while not forgetting entertaining unusual possibilities
- Understand: ability to grasp key traits, elements, and structures
- Decide: illuminates the key differences between choices and judges particular courses of action
- Acquaint: deals with familiarity and appreciation
- Dismiss: rids of that which is unworthy of consideration
- Predict: create hypothesis about likely outcomes
- Figure out: this involves solving a mystery or completing a puzzle, anchored to facts and reality

(Source: Jamie McKenzie's "The Great Question Press: Squeezing Import from Content")

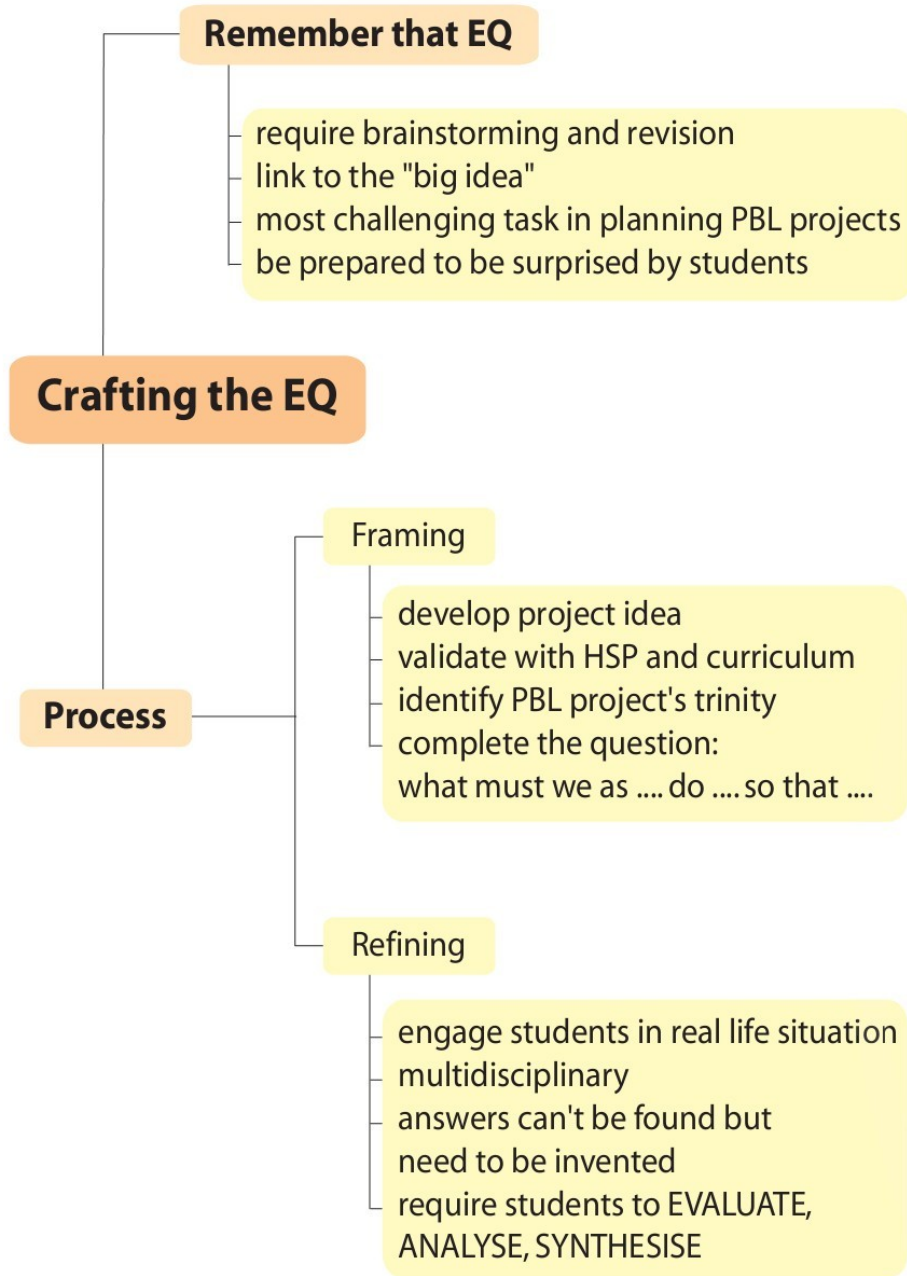


Figure 4: Crafting the Essential Question

The Refining Process

Creating a powerful essential question usually involves drafting and refining the first version of the question. Questions must often be enriched to require students grapple with complex issues, engage big ideas, learn content standards, and “do” as well as “know” as shown in this example.

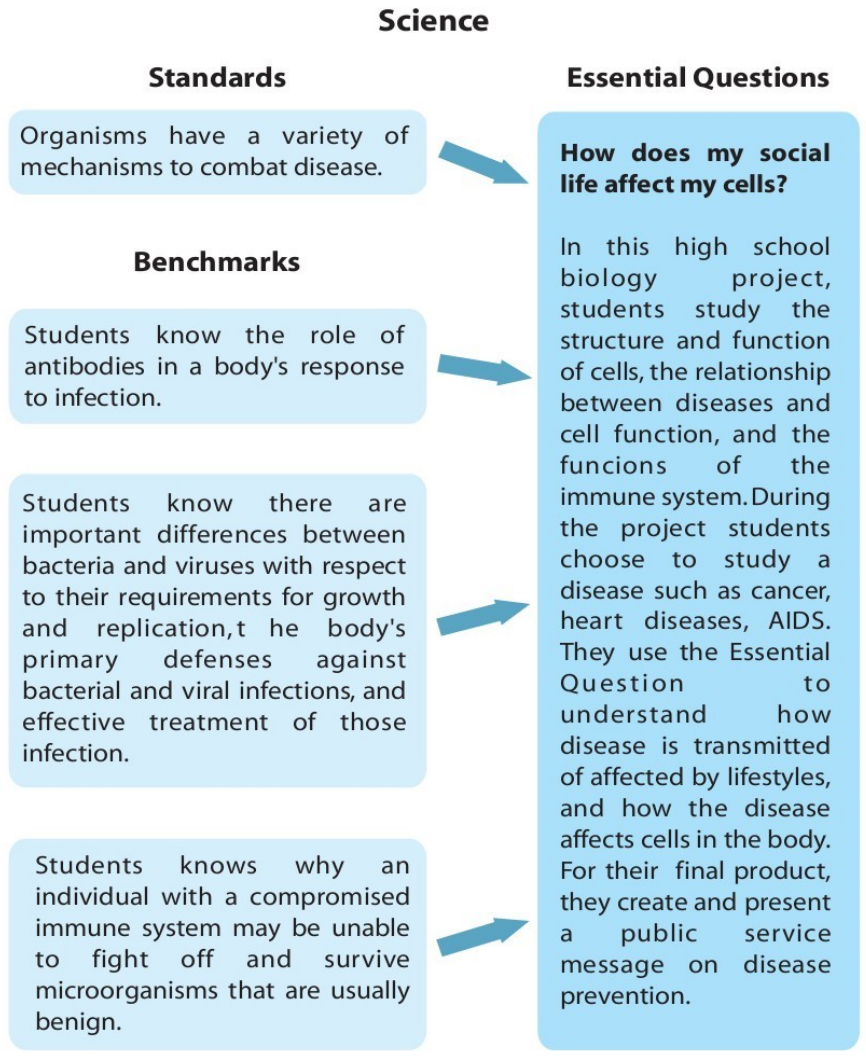


Figure 5: A Science sample on the essential question

Alternative Assessment

Alternative Assessment
Alternative

Alternative Assessment

Assessment for learning starts with outcomes, proceeds with projects, products, and performances that map to the outcomes, and completes the loop with assessment and feedback to students. Alternative assessment provides avenues to assess projects effectively.

Alternative assessment **assesses acquisition of knowledge and skills in ways other than the conventional methods** such as traditional paper-and pencil tests. It actively involves students in **a process that combines what is taught, how it is taught, and how it is evaluated.**

Characteristics of alternative assessment

- Authentic, often in real-life environments, with real-world challenges
- Interdisciplinary in nature emphasising on specific knowledge as well as general skills such as transfer of information across settings
- Involves negotiation and interpersonal skills as well as decision making skills
- Involves mastery of a task before progressing to next task
- Involves mastery assessment of periodic performance
- Gives responsibility to learner for directing and managing own learning

Assessment Tools

Table 2: Tools for Assessment

Tools for Assessment			
Checklist	Anecdotal records	Calendar records	Exhibition
Oral Presentation	Performing a Skill	Conducting Experiments	Demonstration

(Source: *The Malaysian Smart School: A Conceptual Blueprint*, Ministry of Education, Malaysia and <http://www.teachervision.fen.com/educational-testing/teaching-methods>)

Types of Assessment

Performance-based Assessment assess application of skills and competencies mastered in completing activities or task through observation.

Example:

In a science class, students conduct a lab experiment and write about their process and choices in a lab report instead of taking multiple-choice tests about scientific experiments.

Authentic Assessment assess “real-life” and planning skills, creativity, knowledge integration, and collaboration abilities outside the school environment. This can be achieved by using a pre-determined set of criteria for instance rubrics, a scoring scale incorporating a set of essential criteria for the task and appropriate levels of performance for each criterion used.

Example:

The Biology teachers assess students’ understanding of the scientific process and collaboration by having students take part in the “Save the Mammals” campaign and analysis of local dugong population.

Portfolio Assessment evaluates the compilation of work and processes attested in efforts and success of a particular project or area. Examinees are required to review and select items that best demonstrate their learning. Example of portfolios can be paper-based, computer-based or a combination of both.

Journal Assessment assess the continual documentation of examinee’s expressions, feelings, and experiences through checklists and keeping of logs.

(Source: <http://www.teachervision.fen.com/educational-innovation/educational-testing>)

Alternative Assessment in Malaysia

Moving away from the construct of achievement-based examination in the current system, the Smart School Assessment System as documented in the “Malaysian Smart School: A Conceptual Blueprint” outlines the following characteristics which are in tandem with alternative assessment.

Table 3: Smart School Assessment

Smart School Assessment	
Characteristics	Benefits
<ul style="list-style-type: none"> • Holistic • Element-based • Criterion referenced • Learner-centred • On-line • Conducted in various forms • Using multiple approaches and instruments • On-going 	<ul style="list-style-type: none"> • Help realise the National Philosophy of Education • Assure quality • Flexible and learner-friendly • Provide more accurate picture of a student’s achievement, readiness, progress, aptitude, learning styles, and abilities

(Source: The Malaysian Smart School: A Conceptual Blueprint, Ministry of Education, Malaysia)

Rubrics

Rubrics

RUBRICS

What Are Rubrics?

Authentic assessment corresponds closely to real-world experience. Originally developed in the arts and apprenticeship systems, assessment has always been performance-based. The instructor observes the student in the process of working on something real, provides feedback, monitors the student's use of the feedback, and adjusts instruction and evaluation accordingly. Authentic assessment takes this principle of evaluating real work into all areas of the curriculum.

Rubrics are authentic assessment tools designed to simulate real-life activity where students are engaged in solving real-life problems. It is particularly useful in assessing complex and subjective criteria. Formative assessment best describes rubrics and it becomes an ongoing part of the whole teaching and learning process. Its assessment tools comprise the rating scale, a set of evaluation criteria and descriptors.

Sample Rubrics 1

Project Description: Moon Observation - Lab Report

Students individually observe the moon (phases) for about one month. They write down dates, times, how much of the moon was visible, and any other comments they have about their observations. From there, they have to write up what patterns they observed and research why these patterns occur. They also must have a visual to go along with their observations. The idea is to get them to discover that there are phases of the moon, why there are phases, and how long a revolution takes.

Rubrics

CATEGORY	4	3	2	1
Data	Professional looking and accurate representation of the data in tables and or graphs. Graphs and tables are labeled and titled.	Accurate representation of the data in tables and/or graphs. Graphs and tables are labeled and titled.	Accurate representation of the data in written form, but no graphs or tables are presented.	Data are not shown OR are inaccurate.
Visual	The visual is colourful and also clearly represents the data shown. It is meaningful to the project.	The visual clearly represents the data and is meaningful to the project.	The visual is somewhat meaningful.	The visual is not representative of the data.
Journal/ Notebook	Clear, accurate, dated notes are taken regularly.	Dated, clear, accurate notes are taken occasionally.	Dated, notes are taken occasionally but accuracy of notes might be questionable.	Notes rarely taken or of little use.
Summary/ Patterns	Summary includes all of the patterns and explains them well.	Summary includes the patterns and somewhat explains them.	Summary includes the patterns.	No summary is written.

(Source: <http://rubistar.4teachers.org/index.php?screen=ShowRubric&rubricid=90622>)

Sample Rubrics 2

Project Description: “Who’s on the pole?” : Math - Problem Solving

This project is used as a review of rational coefficients as an introduction for Algebra 2 students to a unit on solving rational equations and applications of rational equations.

Rubrics

CATEGORY	4	3	2	1
Mathematical Concepts	Explanation shows complete understanding of the mathematical concepts used to solve the problem(s).	Explanation shows substantial understanding of the mathematical concepts used to solve the problem(s).	Explanation shows some understanding of the mathematical concepts needed to solve the problem(s).	Explanation shows very limited understanding of the underlying concepts needed to solve the problem(s) OR is not written.
Mathematical Errors	90-100% of the steps and solutions have no mathematical errors.	Almost all (85-89%) of the steps and solutions have no mathematical errors.	Most (75-84%) of the steps and solutions have no mathematical errors.	More than 75% of the steps and solutions have mathematical errors.
Checking	The work has been checked by internet site and all appropriate corrections made.	The work has been checked by internet site and most corrections made.	Work has been checked by internet site but corrections were not made.	Work was not checked by internet and no corrections were made.
Working with Others	Student was an engaged partner, listening to suggestions of others and working cooperatively throughout lesson.	Student was an engaged partner but had trouble listening to others and/or working cooperatively.	Student cooperated with others, but needed prompting to stay on-task.	Student did not work effectively with others.
Neatness and Organization	The work is presented in a neat, clear, organized fashion that is easy to read.	The work is presented in a neat and organized fashion that is usually easy to read.	The work is presented in an organized fashion but may be hard to read at times.	The work appears sloppy and unorganized. It is hard to know what information goes together.
Diagrams and Sketches	Diagrams and/or sketches are clear and greatly add to the reader’s understanding of the procedure(s).	Diagrams and/or sketches are clear and easy to understand.	The work is presented in an organized fashion but may be hard to read at times.	Diagrams and/or sketches are difficult to understand or are not used.

(Source: http://rubistar.4teachers.org/index.php?screen=ShowRubric&rubric_id=407816)

Sample Rubrics 3

Project Description: “Turn Over A New Leaf”- Story

“Turn Over a New Leaf” is a project designed to help students take things that they have done in the past (e.g. not doing homework, being a problem at school etc.) and really think about them.

Rubrics

CATEGORY	4	3	2	1
Introduction	The introduction is inviting, states the main topic and previews the key points of the paper.	The introduction clearly states the main topic and previews the key points of the paper, but is not particularly inviting to the reader.	The introduction states the main topic, but does not really preview the key points of the paper nor is it particularly inviting to the reader.	There is no clear introduction of the main topic or key points of the paper.
Body	There are 3 clearly defined body paragraphs that tie into the main idea.	There are 3 somewhat clear paragraphs that tie into the main idea.	There are only 2 somewhat clear paragraphs that tie into the main idea.	There really aren't any paragraphs and they don't seem to tie into the main idea.
Grammar & Spelling	Writer makes no errors in grammar or spelling that distracts the reader from the content.	Writer makes 1-2 errors in grammar or spelling that distracts the reader from the content.	Writer makes 3-4 errors in grammar or spelling that distracts the reader from the content.	Writer makes more than 4 errors in grammar or spelling that distracts the reader from the content.
Neatness	Paper is neatly written with no distracting corrections.	Paper is neatly written with 1 or 2 distracting corrections (e.g. dark cross-outs; bumpy white-out, words written over).	The writing is generally readable, but the reader has a hard time reading some of the words.	Many words are unreadable OR there are several distracting corrections.
Conclusion	The conclusion is strong and leaves the reader with a feeling that they understand what the writer is “getting at.”	The conclusion is somewhat strong and wraps-up most of the story.	The conclusion is included, but does not wrap-up the story	There is no clear conclusion, the paper just ends.

(Source: http://rubistar.4teachers.org/index.php?screen=ShowRubric&rubric_id=405583)

Why Use Rubrics?

Rubrics involve all stakeholders in learning and assessing.

Students involved in both peer and self-assessment take more responsibility for their own learning, empowered by being involved in the teaching and learning process, and have a clearer idea of what is expected in terms of specific performance. As students become familiar with rubrics, they can assist in the rubrics design process. This involvement empowers students and as a result, their learning become more focused and self-directed. Authentic assessment, therefore, blurs the lines between teaching, learning, and assessment.

Other stakeholders are given clear information about student assessment and instructional objectives. **Teachers** clarify their goals, expectations, and focus, and finding their paperwork reduced because students are part of the process of assessment development.

To ensure effective use of rubrics, involve students in the following:

- Arrange students in groups of four or more and give them rubrics used for a particular task. Tell students to discuss the task given and create quick samples of papers which would receive marks in each of the categories. The groups will then present their results to the whole class.
- It is a good idea to involve students in creating their own rubrics for classroom assignments. A student who can write rubrics for a math problem knows the whole process inside and out, and he/she can apply the knowledge and skills learned from the process to future assignments.

(Source: <http://kancrn.kckps.k12.ks.us/Harmon/breighm/rubrics.html>)



In sum, rubrics:

- Allow assessment to be more objective and consistent
- Allow teachers clarify his/her criteria in specific terms
- Show students how their work is evaluated and what is expected
- Promote students' awareness on criteria to used in assessing peer performance
- Provide useful feedback on effectiveness of instruction.
- Set benchmarks against what to measure and document progress
- Set specific performance characteristics in levels to indicate the **degree** to which a standard has been met.

Creating Rubrics

Step 1

List the criteria used in assessing performance and determine learning outcomes.

The criteria used should relate to the learning outcome(s) assessed. For example, a musical performance might be rated for intonation, rhythmic accuracy, and tone quality, and an oral presentation might be rated for content, organisation, delivery and language. Be sure that your criteria are explicit. “Neatness” would not be a good criterion because the term “neat” is not explicit enough. What is neatness? You may want to look at some actual examples of student work to see if you have omitted any important criteria.

Step 2

Determine performance levels.

Examples of performance levels may be:

- Needs Improvement...Satisfactory...Good...Exemplary
- Beginning...Developing...Accomplished...Exemplary
- Needs work...Good...Excellent
- Novice...Apprentice...Proficient...Distinguished
- Numeric scale 1...2...3...4...5
- Depth...Breadth...Quality...Scope...Extent...Complexity...Degrees...Accuracy
- Presence to absence
- Complete to incomplete
- Many to some to none
- Major to minor
- Consistent to inconsistent
- Frequency: always to generally to sometimes to rarely

Step 3

Write a description for each performance level

Describe different levels of performance that match each criterion. You may want to start with the best and worst levels of quality, and then fill in the middle levels based on your knowledge of common problems. It may be helpful to sort examples of actual student work into three piles: the very best, the poorest and those in between. Try to articulate what makes the good assignments good, and the poor assignments poor.

Step 4

Use, evaluate and revise rubric

Reevaluate the rubric if needed. Ask these questions, “Did it work?” or “Was it sufficiently detailed?”

Tips for developing good rubrics

- Keep it short and simple. Include 4 - 15 items; use brief statements or phrases
- Each rubric item should focus on a different skill
- Focus on how students develop and express their learning
- Evaluate only measurable criteria
- Ideally, the entire rubric should fit on one sheet of paper
- Focus on measuring a stated **objective**, e.g. performance, behaviour, or quality

For Project-Based Learning Users

For Project-Based Learning Users
Project-Based Learning

For Project-Based Learning Users

“Dos and Don’ts in PBL”

To ensure that Project-based Learning serves the purpose of facilitating students’ learning, attend to the following “Dos and Don’ts”.

Dos (✓)	Don’ts (X)
Provide clearly defined learning objectives and guidance throughout the learning process.	Assign project work without giving any guidance.
Craft driving questions that will engage students in the project.	Present a question that is too general.
Pick different skills and content.	Try to cover skills and content.
Assign projects with clear expectations that require higher order thinking skills.	Provide activities that score low on Bloom’s Taxonomy.
Real-world problem solving.	Give students make-believed situation or illogical facts.
Identify key objectives or essential knowledge you want all students to learn.	Expect students will learn something at the end.
Decide on products or performance to demonstrate how students learn.	Let students decide what to produce.

Dos (✓)	Don'ts (X)
Coordinate well among teachers of different subjects so that projects are properly assigned.	Don't assign too many projects of different subjects in the same period.
Encourage cross curriculum project to connect different areas of learning.	Overlap themes in a number of projects for different subjects or at different levels.
Use lesson time flexibly to enable students conduct project work.	Demand too much time outside lessons to complete the project.
Put emphasis on both the learning process and product.	Place undue emphasis on the product of students' work.
Share with an appropriately planned audience to provide additional motivation for knowledge construction.	Limit presentation to classroom audience only.
Encourage creative publication and presentation.	Specify how students' product should look like.
Engage students in purposeful learning experiences that encourage them to go deeper, not wider in a particular discipline.	Teach skills in isolation and give frivolous experimentation.
Challenge the highs to go higher and provide options for the lows to experience success.	Accumulate students in the middle of the bell curve.

Dos (✓)	Don'ts (X)
Allow students time to reflect and discover.	Don't rush students.
Entrust students with some empowerment to complete projects.	Don't push students.
Allow students to make mistakes.	Start by giving too much information.
Encourage research and use of primary resources.	Limit the use of resources.
Help students discover ways to correct mistakes.	Penalise students for making mistakes.
Use open-ended questions to facilitate students.	Use close-ended question or yes-no questions.
Keep own notes for observation on groups' work.	Ignore gender and minority divide.
Encourage creativity and divergent thinking.	Furnish students with templates to follow.
Join in as a part of the learning community with students.	Leave students to work on their own.
Show excitement and joy in discovery along with students.	Worry that students are not learning.

Frequently Asked Questions (FAQ)

What is Project-based Learning?

Project-based Learning (PBL) is an inquiry-based process for teaching and learning. In PBL, students focus on a complex question or problem, then answer the question or solve the problem through a collaborative process of investigation over an extended period of time, and seek to incite a self-driven desire to learn. Projects are used to investigate authentic issues and topics found outside of school. During the inquiry process, students learn content, information, and facts necessary to draw conclusions about the question. Students also learn valuable skills and habits of mind during the process.

What is the philosophy behind Project-based Learning?

The goal of PBL is to produce students who achieve understanding in each area of discipline. PBL is based on the constructivist theory of Piaget and the whole-language movement. PBL allows learners to create meaning and reach understanding by exposure to challenges of new information, experiences or individuals anchored in the real-world, now, and built on thorough understanding of the past.

Why should I use Project-based Learning?

PBL is extremely effective as a method for engaging students in their learning. With engagement comes focus, discipline, and mastery of academic content. Further, students have the opportunity to work on problems and issues relevant to their lives, as well as learn vital work and life skills necessary to succeed in schools or in working environments.

Does Project-based Learning incorporate content and standards?

PBL encourages learning of specified subject-matter, concepts and standards. Projects begin with curriculum standards and alternative assessment tools are used to determine what students have learnt. Projects are designed around a Driving Question/ Essential Question which knits together intended outcomes and project activities.

How does Project-based Learning differ from problem-based learning?

PBL and problem-based learning are similar, and the terms are sometimes used interchangeably. Both are based on inquiry into an authentic problem or question. Problem-based learning is a term commonly used for research in colleges and universities, while Project-based Learning is a term used in schools.

How long should projects last?

A period of 2 - 6 weeks is recommended for projects as it ensures maximum effectiveness and solid assessment.

I have heard that Project-based Learning requires too much time.

PBL changes the nature of teachers' planning process where more time is required for planning because materials, performance assessments, and activities must be mapped out before the project begins. However, teachers often find time spent working closely with students, rather than preparing new lessons once the project has begun.

Can other teaching methods be used along with Project-based Learning?

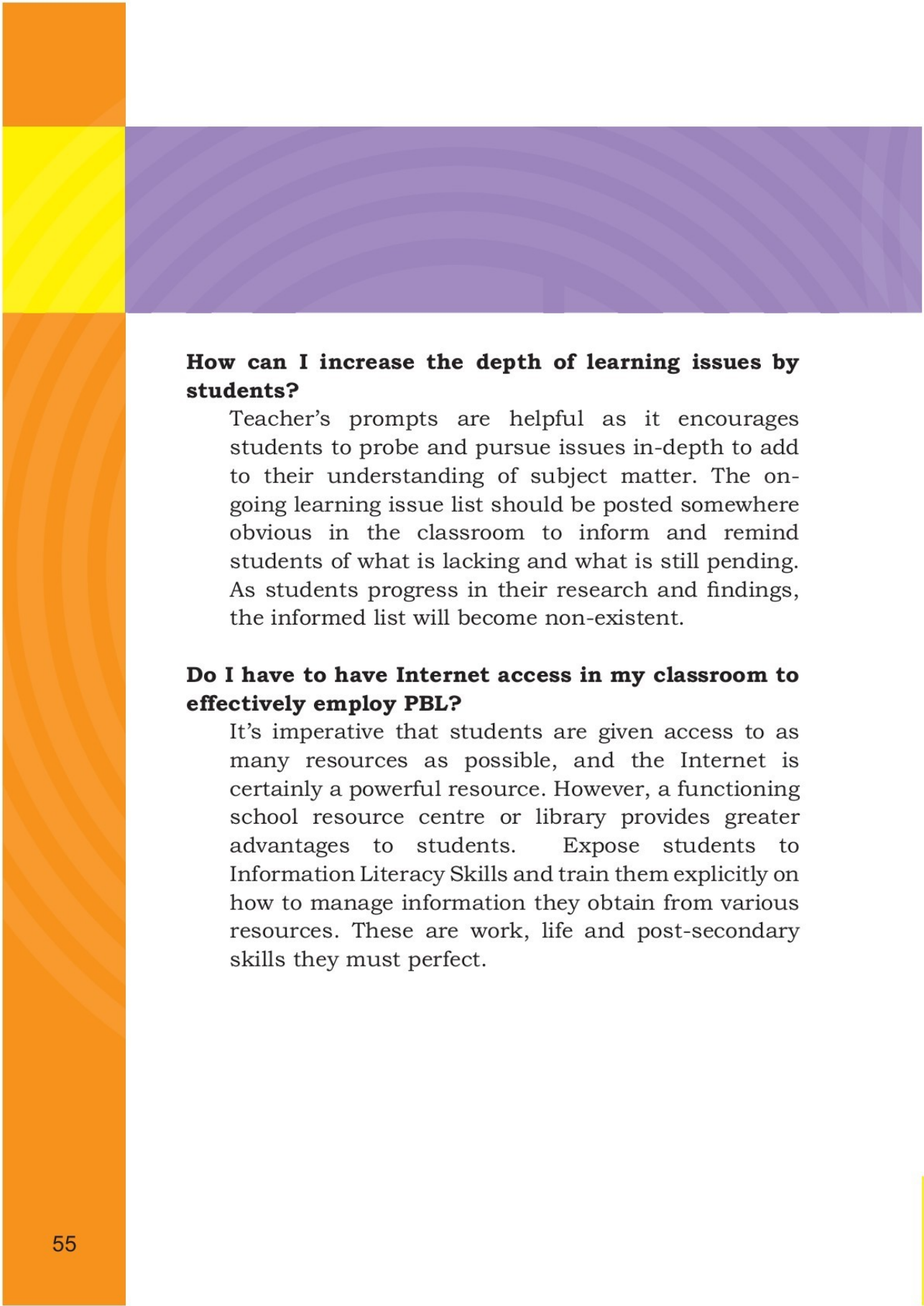
Yes, PBL incorporates all traditional teaching tools, methods, lectures, text-books, and conventional assessments. However, the nature of PBL demands students spending the bulk of the project working in groups to find answers to questions and deriving conclusions.

I do projects in my classroom. Does that mean I'm doing PBL?

No. Nearly every teacher does projects, usually as the culmination of a unit of study. Some teachers initiate a project but do not allow students to focus on activities, lectures, films, readings and group work. In a PBL, every activity, every word spoken by the teacher and student, every book read, every film watched, every lab completed is contextualised by the project's driving question. Students examine, explore and analyse content to solve problems, present findings and informed opinions.

If I do PBL, do I have to stop lecturing, giving objective tests and worksheets?

PBL complements the traditional methods of teaching and learning and gives traditional work a context. Hence, traditional students' and teachers' work are still relevant. PBL allow students to demonstrate higher-order thinking skills through assessing information and resources while answering the project's driving question.



How can I increase the depth of learning issues by students?

Teacher's prompts are helpful as it encourages students to probe and pursue issues in-depth to add to their understanding of subject matter. The ongoing learning issue list should be posted somewhere obvious in the classroom to inform and remind students of what is lacking and what is still pending. As students progress in their research and findings, the informed list will become non-existent.

Do I have to have Internet access in my classroom to effectively employ PBL?

It's imperative that students are given access to as many resources as possible, and the Internet is certainly a powerful resource. However, a functioning school resource centre or library provides greater advantages to students. Expose students to Information Literacy Skills and train them explicitly on how to manage information they obtain from various resources. These are work, life and post-secondary skills they must perfect.

How can I effectively monitor the many project groups engaged in PBL?

Assigning and rotating students' roles in small groups are useful ways to allow groups to progress without having the teacher within the group most of the time. This will allow teachers to circulate at a slower pace. Rotating roles among students, and teachers providing feedback on how they performed in their roles will allow each student to experience having to both talk and listen as well as to lead and follow.

How can I use PBL to increase students' research skills and their use of various resources?

Teachers need to review where students obtained their information, what resources used and why. Ask for a short critique of all sources accessed, if possible. Even 'junk' sources are important because it helps to develop students' critical appraisal skills. Students should be encouraged to mention resources they found questionable or to share information with other students as well as learning to cite sources so others can find them in the future.

Often argued, “There is no individual accountability in group learning as advocated in PBL.” How is it so?

PBL requires students to use specific skills, such as collaboration, teamwork, time and task management, or presentation skill, to conclude a project successfully. These skills cannot be practiced or learned through traditional transmission models of education. This approach maximises student’s individual accountability.

What is the primary role for the teacher in a PBL classroom?

Admittedly, the front load for the teacher in a PBL classroom is enormous. The entire project, all its documents, all its resources and all its assessments must be designed and put in place before students are introduced to the project. Then it gets easier. The teacher becomes a knowledge facilitator who teaches small work groups, provide individual assistance, and create specialised work groups that answer specific need to know. However, because the front load is so heavy, we recommend that teachers introduce only one or two projects in their first PBL year. It should take 3-5 years to have a fully formed PBL classroom.

Do I have to train my students to participate in a PBL classroom?

Not only do you have to train your students in soft skills, e.g. collaboration, facilitation, oral presentation; the habits of mind like inquiry and resilience but their parents, administrators and fellow teachers as well. PBL is an excellent way to get the community into the classroom to function as tutors, experts, guest speakers and panel members. Transparency is the key to a PBL classroom, “We want the public in our classrooms.” If teachers in traditional schools complain about the lack of parental involvement, it is not true in a PBL classroom.

What can I do about the variability of student performance from year to year?

Individual students as well as classes as a whole adapt and perform differently in the PBL setting. Anticipating this will lessen the discouragement. Trying new things sometimes helps, or asking students for suggestions may also be of some benefit, but there are times where even in the most experienced hands, nothing works as well you think it should, or did in the past, and the best strategy is to grin and bear it – there’s always the next year...

List Of Resources

List Of Resources
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List Of Resources

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Appendix

Appendix
Appendix

Appendix 1

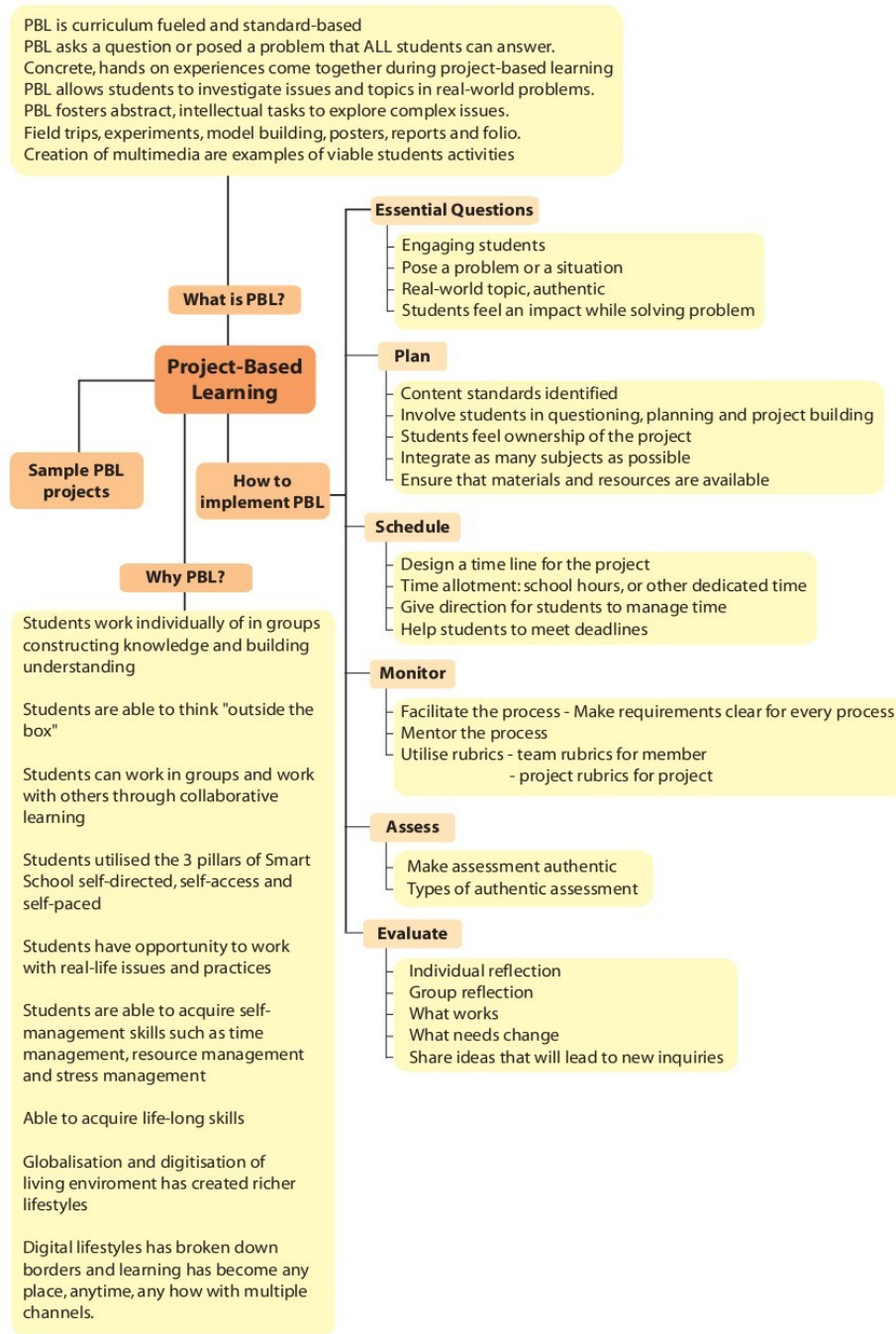


Figure 6: PBL Summary

Appendix

Appendix 2



Figure 7: PBL Rich Picture

Contributors

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Contributors

CONTRIBUTORS

Advisor	
Dato' Haji Yusoff bin Harun Director	Educational Technology Division
Editorial Board	
Ms. Chan Foong Mae	Educational Technology Division
Ms. Nur Ain Wong Abdullah	Educational Technology Division
Ms Johana Johari	Educational Technology Division
Ms. Fadzilah Arifin	Educational Technology Division
Ms. Norhaida Mohd Yusof	Educational Technology Division
Mr. Thomas Huo Kok Sen	Sarawak State Education Resource Centre
Mr. Jackson Siga	Sabah State Education Resource Centre
Mr. Mohd Zabidi Ismail	WP Kuala Lumpur State Education Resource Centre
Ms. Gan Lee Eng	Maktab Perguruan Perempuan Melayu, Malacca, Teacher Training Division
Ms. Chong Mei Yen	SMK Batu Empat Gerik, Perak Perak State Education Department, School Division
Mr. Zait Isa	Malaysian Representative for iEARN International
Ms. Chin Tih Tih	Microsoft Malaysia Sdn. Bhd.

School	
SMK Batu Empat, Gerik Perak	Perak State Education Department, School Division
SK Putrajaya 2, Putrajaya, Selangor	Selangor State Education Department, School Division