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**Developing Capacity for New Competencies:
Use of Problem-based Innovation in Singapore**

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The onset of a flu pandemic, unprecedented scale of environmental disasters, terrorism and complex political and social-economic problems all point to the need for education and the world of work to prepare citizens for a rapidly changing and sophisticated world. The ability to learn when plunged into an unfamiliar situation and to adapt positively to rapidly changing demands is a reality for every worker today. People not only need to learn to confront problems as a matter of necessity but also to develop a positive mindset of observation and taking on “problems” as a matter of inquisitiveness to improve and invent processes and products.

New competencies especially those pertaining to problem-solving acumen is developed through experience, immersion and intelligent observation. Problem solving in real world contexts involves multiple perspectives and multiple ways of knowing and multi-disciplinary learning. Knowledge in this new economy is also increasingly characterized by the creative integration of information and learning from diverse disciplines. The pace of change in the 21st century calls for the increasing ability to cope with change and to adapt. The problems confronting the world and individuals will come with increasing rapidity, complexity and diversity. Corollaries include (i) problems of increasing quantity and difficulty, (ii) newer problems and shorter time frame for solutions, (iii) more global (larger-scale) problems requiring integrated solutions.

Education needs to address the challenge of preparing the young to function in changing and new environments. It is often too easy to get locked into paradigms and perspectives. I think one of the most important things today is the ability to gain different perspectives, develop multi-viewpoints, be aware of different worldviews and paradigms and different ways of reasoning and thinking so that we can highly flexible in our thinking in new environments. Education is about equipping people with the cognitive and socio-emotional skills to be highly adaptable in fast-changing environments. In science and technology, it is now well recognized that multi-disciplinary pursuits are essential for the advancement of knowledge and applications. Examples can be seen in areas such as biotechnology, telecommunications, material science, nanotechnology, and supercomputers. In industries and businesses, innovative advances are made often without the benefit of traditional paradigms of learning. The real world thrives on both evolutionary and revolutionary innovations. What is often lacking in education today is the effective use of inquiry and problem-based learning approaches.

In Singapore one of the most important things in education and training is to innovate learning so that people develop the ability to gain different perspectives, develop multi-viewpoints, be aware of different worldviews and paradigms and different ways of reasoning and thinking so that they can highly flexible in their thinking in new environments.

(PBL) is an active-learning and learner-centered approach where unstructured problems are used as the starting point and anchor for the inquiry and learning process. By attempting to solve the problem, learners are engaged in a structured process of conducting research, integrating theory and practice, followed by the application of their knowledge and skills into developing a viable solution to the problem. In recent years, PBL has gained new momentum as a result of several developments such as (i) increasing demand for bridging the gap between theory and practice, (ii) information accessibility and knowledge explosion, (iii) new possibilities in the use of multidisciplinary problems, (iv) emphasis on real-world competencies, and (v) developments in learning, psychology, and pedagogy.

In this presentation, the author who won the prestigious “The Enterprise Challenge (TEC) Innovator Award” from the Prime Minister’s Office will share on how his ideas, concepts and implementation models of a problem-based curriculum that has innovated curricula in polytechnic education, teacher education and development of future schools in Singapore.

The challenges of the 21st century

The news headlines today record an unprecedented scale of global pandemics, environmental disasters, terrorism and complex political and social-economic problems. From the SARS outbreak to the recent H1N1 flu pandemic, from the Acer tsunami to the Sichuan earthquake, from Osama bin Laden to North Korea, these many events which leave us momentarily challenged bear sufficient testimony to the need for education, particularly in terms of preparing citizens for a rapidly changing world, a trait characteristic of the 21st century. The 21st century worker is one who is able to think on his feet when confronted with an unfamiliar situation. He is also one who is able to adapt positively to rapidly changing demands. Together with these competencies, the 21st century worker must be one who can take on problems with an inquisitive mind and armed with a constant quest to improve and innovate on processes and products.

The 21st century is an era of change, one that calls for the increasing ability to cope with change and to adapt (Ramsden, 1998). Essentially then, it is also an era that is characterized by the need to acquire new competencies, a pressing one being problem-solving. Problems will come in increasing quantity and difficulty, some of which may be global and extensive. Newer problems will arise, a number of which may be urgent and permit a short time frame for solutions. Compartmentalized knowledge may become of limited use. Instead, successful problem-solving will necessitate the convergence of multiple perspectives, usually acquired through experience, immersion and intelligent observation, and a diversity of working styles. It will call for the creative integration of information from the various disciplines.

The 21st century will see a conglomeration of different perspectives, multi viewpoints, a diversity of worldviews and paradigms, as well as different ways of reasoning and thinking. Specifically, it is a century which will call for a transformation of thought. Rather than being locked up in old paradigms and outdated perspectives, it is about flexible thinking in new environments. Examples are already abundant in areas such as biotechnology, telecommunications, material science, nanotechnology and even supercomputers. In such industries as well as businesses, innovative advances are of imperative importance. The fact is, the real world thrives on both evolutionary and revolutionary innovations. Education thus plays an important role in terms of preparing the young to acquire such cognitive skills, which are a prerequisite to function in such new and changing environments. What is often lacking in education today, however, is the effective use of inquiry and problem-based learning approaches.

The call for new competencies

In the United States, a poll of the employers highlighted some of the key 21st century skills, which included professionalism/work ethic, oral and written communications, teamwork and collaboration, ethics/social responsibility, critical thinking and problem solving among some of the important skills that present-day graduates need (Casner-Lotto & Barrington, 2006). Empirically speaking, in addition to these skills, some of the key 21st century skills include (Wallis, 2006)

- The ability to think outside the box

Thomas Friedman, author of the best-seller *The World is Flat* once commented, “It is interdisciplinary combinations that produce YouTube and Google”. In the new economy where knowledge no longer exists separately, people will need to develop the traits of creativity and innovativeness, as well as the ability to think across disciplines as these will be especially valuable to individuals and to evolving societies, in a world fraught with new social, physical and political dilemmas.

- New-media/ Information literacy

The 21st century is an era overwhelmed with humungous information and proliferating media. It is therefore important that students acquire technological sophistication and be equipped with the knowledge on how to deal with the information, which includes knowing how to manage it, interpret it, validate it and use it. It also includes the ability to research, formulate ideas and defend their own views. This will enable them to function more effectively as citizens in a high-tech globalized society.

- Good-people skills (Beland, 2007)

This includes social awareness skills, as well as self-awareness and self-management, all of which will entail social and emotional learning. People need to develop the skills to recognize and manage emotions, form positive relationships, solve problems, become motivated to accomplish a goal, make responsible decisions and avoid risky behavior. Also important will be communication skills—especially the ability to work in large teams and deal with people from different cultures—as the world becomes more and more interconnected.

- Critical thinking skills (Kay, 2009)

In an environment overwhelmed with information, critical thinking skills become particularly important in terms of evaluating the validity and reliability of information amidst the proliferation of readily accessible information. Together with this is also the ability to reason intelligently and coherently, a positive attitude and practical skills, all of which form a framework for leadership and professional development and build up their confidence as learners.

- A telescopic and helicopter worldview

Our world view must be telescopic and helicopter in nature. By telescopic, it means to be able to understand the past (where we came from and how we arrived at the present) and see into the future (intelligent extrapolation). By helicopter, it means to be able to rise above micro and fragmentary and acquire a big picture of things. We need the appropriate paradigms with the right worldviews and the right assumptions.

- Knowing how to learn

There is also a call for young people to develop skills for learning how to learn, particularly the ability to self-instruct and self-monitor learning. This is an era where they would need to interact with multiple modes of leaning and engage with creative people to help them develop processes of creative thinking and design. They would also need to learn how to gather seemingly disparate information, organize it holistically and refine it mindfully to create elegantly integrated products.

The role of education in developing the 21st century learner

In Asia, the need to refine education systems to foster creative thinking, entrepreneurial spirit and lifelong learning has been repeatedly articulated. The daily news is flooded with talks about the knowledge-based economy (KBE), the rapid proliferation of IT, information accessibility, new industrial and business challenges, and changing political and social landscapes.

To thrive in the KBE, we need to learn to solve novel problems, to assume personal responsibility for learning collaboratively and from multiple resources, and to be able to transfer learning across disciplines and contexts. This is why there is a need to push education in the 21st century towards developing intelligences, specifically the intelligence that is manifested in the ability to deal with new real-world problem scenarios (Tan, 2003). Only then will students be prepared with a different set of intelligences—from learning how to do things, to the ability to deal with novelty as well as the capacity to adapt, select and shape our interactions with the environment (Sternberg, 1990). This set of intelligences will enable them to function effectively in a new world characterized by unprecedented breakthroughs in knowledge and technology, in which traditional notions of transmissions of knowledge, skills and attitudes are already inadequate to address the need.

Hence, education in the KBE should:

- encourage lifelong learning (learning throughout life)
- foster lifewide learning (transfer of learning across contexts and disciplines)
- allow the individual to assume greater personal responsibility for one's learning
- teach the learner how to learn from multiple sources and resources
- engage the learner to learn collaboratively
- train the learner to adapt and to solve problems (i.e. to cope with change)

Back home, there is a vision to turn Singapore into a place for people to develop their potential through continuous learning. For this to happen, the mindsets of both the present and the future generations towards learning need to be changed. Firstly, learners need to assume personal responsibility for one's own learning while embracing new approaches of learning that prepares individuals with relevant competencies. Secondly, teachers need to believe that innovation in education is necessary and can work. As such, the Ministry of Education Singapore (MOE) has identified core knowledge and skill-sets for 21st century living as key focuses for education in the new economy (Ministry of Education, 2008). By 'core knowledge skills', it refers to the knowledge of world issues and current affairs as well as the literacy encompassing the numerical, linguistic, cultural, scientific and technological domains. 21st century skill-sets, on the other hand, include life-long learning skills, the ability to manage ambiguity, complexity and novelty, as well as the ability to communicate new ideas.

The missing piece in the puzzle: Problem-Based Learning

The problem-based learning (PBL) curriculum is therefore an ideal paradigm for developing the 21st century learner. Having being presented with a problem, the task is to explore it deeper so that sufficient understanding can be achieved. Group members have to first identify the information needed for a particular application before sharing responsibilities in conducting information searches (Eggen & Kauchak, 2006). They then need to consider how information can be organized into a meaningful conceptual framework. Hence, through a collaborative knowledge-building and self-directed learning environment, PBL approaches involve harnessing intelligences within individuals, from groups of people and from the environment to solve problems that are meaningful, relevant and contextualized. Such a learning environment promotes empowerment and creativity for learners. Sources that the learner can rely

on for self-directed study include actual lessons, the library, the internet, media and subject experts, all of which can assist in the solving of the problem.

In recent years, PBL has gained new momentum as an alternative, more progressive approach to instruction and one that is premised on offering opportunities for exercising creativity and for its development. Why is this so? The fact is, creativity is important. As of now, it is increasingly valued as an essential capability in this age of information which is characterized by the information explosion and accessibility, rapid proliferation of technology, globalization and demands for new real-world competencies. Creative ability is the process which gives rise to a change in perception. Hence, it will therefore be important in the new economy considering its prominence in terms of generating new ideas or new applications.

PBL uses an unstructured problem as the starting point (Boud & Feletti, 1997). The problem, which can take on various forms from a failure to perform to a need for new designs to addressing gaps in information and knowledge, is usually a real-world problem. Being open-ended in nature, it functions like an anchor for the inquiry and learning processes, such that a myriad of opportunities are available for improvement and advancement. Particularly, it must challenge students' current knowledge, attitudes and competencies, after which new areas of learning and novel learning needs can then be identified.

PBL is a learner-centred approach (Tan, 2002). It is a pedagogy based on constructivism which develops in learners the ability to deal with novelty and complexity. The learner is engaged in an active search for meaningful information along with the adoption of goal and future orientations. Students are called to engage in self-directed learning, during which they assume major responsibility for the acquisition of information and knowledge. The PBL process requires students to harness a variety of information sources discriminately. As the problem will call for multiple perspectives, the learner is called to solve by taking into consideration knowledge from different subjects and disciplines. In their doing so, they engage in learning which is collaborative, communicative and cooperative. This develops their inquiry and problem-solving skills as well as the knowledge acquisition for the solution of the problem.

The PBL Process (Fogarty, 1997)

Students are first presented with a problem, which may be in the form of a case study analysis, research paper finding, videotape recording etc. They are then required to work within their groups to organize their ideas and all previous knowledge related to the problem. Through this process, it is hoped that they will be able to define the broad nature of the problem.

Throughout the discussions, students pose questions about the problem. These are known as "learning issues" which can delineate aspects of the problem they do not understand. These learning issues are recorded by the group and used to generate and focus discussions. In the process, students are continually asked to define what they know, what they don't know, and from there, what they have to find out (in order to solve the problem).

The learning issues highlighted by the students are then ranked by the group collected. The group has to decide which questions will be addressed by the whole group and which issues will be handled by individuals, who are responsible for sharing their findings with the group. Usually, students and facilitators discuss about the strategies to tackle the learning issues as well as the resources available. At this point in time, the process is slowly developing into one with a broad overview encompassing analytical thinking, generative as well as divergent thinking to produce effective solutions. Facilitators need to engage in scaffolding efforts so as to enable conceptual clarification, knowledge building, argumentation and evaluation and thus the evolution of new perspectives. At the same time, problems can

also lead to cognition and learning. Specifically, by triggering the context for engagement, curiosity, inquiry and a quest to address a real-world concern, certain cognitive and learning processes are initiated.

The session concludes with students coming together to synthesize the previous learning issues into their new knowledge in the context of the problem (Tan, 2004). Students are also encouraged to summarize their knowledge as they connect new ideas to old ones. New learning issues continue to be defined as they progress through the problem. Through the whole process, it is meant for students to see learning as an ongoing process.

Five models of PBL

A series of PBL models exist and they are differentiated by the role of learners in the process of knowledge construction (Savin-Baden, 2006).

Model 1: Problem-based learning for epistemological competence

This model makes use of PBL as a means of 1) helping students to learn required content in the curriculum; 2) train students to become competent in applying their knowledge to solve problems. Since problem situations are the means by which students become competent in knowledge management, scenarios will be designed around key concepts which the student is required to master. The evaluation is usually aimed at testing students' understanding of the curriculum being taught with students being expected to become competent in applying knowledge in the context of solving and managing problems.

Model 2: Problem-based learning for professional action

In this model, action is the defining principle of the curriculum. Learning is both around the capabilities students will be empowered with as well as the mechanisms that are perceived to enable students to apply this ability to other kinds of problem scenarios and situations within given frameworks. The downside with this model is that students develop narrow sets of skills as a result of its focus, which may lead them to feel that learning has been interrupted. It is therefore important for this model to be integrated with concepts of skills and know-how, as well as cognitive content and professional judgment.

Model 3: Problem-based learning for interdisciplinary understanding

This model unites disciplines with skills. Learning in this model, is knowing and understanding knowledge from the disciplines, and also recognizing the relationship between them. Specifically, PBL is used to bridge the gap between the know-how and the know-that and between the different forms of disciplinary knowledge in the curriculum. The student works, learns, and develops her own understanding within subjects and disciplines. She goes on to make connections between the disciplines.

Model 4: Problem-based learning for transdisciplinary learning

In this model, students are encouraged to adopt a critical position towards knowledge, themselves and their peers, while using the PBL group as a place to examine personal and pedagogical frameworks. PBL operates in a way that enables students to recognize that disciplinary boundaries exist. Students will develop an overview of the frameworks. In addition, they will develop a highly autonomous position as individuals within a group and elect to use the group to resolve dilemmas.

Model 5: Problem-based learning for critical contestability

This model requires students to examine the underlying structures and belief systems implicit within a discipline, so as to understand the disciplinary area and its credence. Hence, knowledge is constructed by students, who will become able to build upon and integrate previously learned knowledge and skills with material that is currently being learned. PBL seeks to provide for students a kind of higher education that offers, within the curriculum, multiple models of action, knowledge, reasoning and reflection, along with opportunities for the students to challenge, evaluate and interrogate them.

Useful approaches within the PBL paradigm

Three levels can be categorized in terms of increasing authenticity, complexity, uncertainty and student self-direction.

Level 1: Academic Challenge

An academic challenge refers to student work structured as a problem arising directly from an area of study. For example, to teach nutrition in secondary schools, the following problem may be presented.

Alex is a school badminton player. He is 14 and his coach has mentioned to him about his potential to be selected for the national team. Apart from rigorous training, Alex is wondering if nutrition would help increase his chances. One day he walked into a store selling nutritional supplements in a shopping center. The salesperson told him that what he needed was more muscle without gaining a lot of weight. Alex ended up buying a jar of creatine tablets that cost \$60 and various other supplements costing \$80. Alex learned subsequently that creatine comprises amino acids and is taken by many athletes. A family member, however, told him that there are side effects and that got him worried. Many athletes are in situations like Alex's. You and your group have been selected as "young scientists" for a project on sports nutrition. Your team has been tasked to come up with a report and presentation to advise school sportsmen/women on nutrition.

In this example, the existing curricular material of 'nutrition for sportsmen' has been transformed into a problem format, and used to promote greater understanding of selected subject matter. Such problems—being relatively similar to traditional educational environments—are useful access points for developing in students the capacity to engage in active learning.

Level 2: Scenario Challenge

In a scenario challenge, students are cast into real-life roles and asked to perform roles in the context of a reality-based or fictional scenario, as in the example below.

A venture capitalist wants to invest in research on ornamental plants. He is particularly interested in cross-breeding that would produce new flowering plants of multiple forms and colors with characteristics of high rates of flower production, stem resilience, etc. Together with a team of researchers, you are involved in investigating the composition of the ultimate made-to-order multi-vitamin, multi-mineral pill, which is customized according to DNA profiles. How would you go about doing that?

The above scenario challenge works with existing curricular material by simulating many of the elements of the real world. Students are cast into real-life roles and this allows them to develop the skills and knowledge needed for success in school and beyond.

Level 3: Real-life problem

The problem scenario presented is an actual problem in need of real solutions by real people or organizations. An example is shown below.

As the geriatric population in Singapore increases, there is a growing need for services to help make the lives of the elderly easier and more rewarding. Unfortunately, there is inadequate planning rendered for aid to the elderly. The challenge is to plan, prepare and implement a way for students of your age to assist the elderly in this community. How could we get from here to the delivery of the assistance?

The ‘real’ nature of the problem involves students directly and deeply in the exploration of an area of study. This allows students to move outside the classroom to take action on issues and have a tangible impact in their own communities. As the solutions have the potential for actual implementation in the community, regional, national or even global level, they can be very powerful learning experiences.

The role of PBL in education reform

Robert Sternberg, IBM Professor at Yale University, has called for changes in the current educational practice. There is a need to reinvent education, he says, so that the many components and dimensions of intelligence can be better acknowledged and hence better developed. He subscribes to the definition of intelligence as not only encompassing the learning how-to and the actual doing of things, but also, the ability to deal with novelty as well as the capacity to adapt, select and shape our interactions with the environment.

How then, can education be reinvented, so that we can develop intelligence in learners?

The answer is straightforward—with a PBL paradigm. This has been supported by various studies, which showed that students developed a greater ability to retain knowledge better and apply it more appropriately if the curriculum required them to relate theory to practice. These students were also able to realize that real-life knowledge highlights connections between disciplines and the integration of concepts. Psychologically, they displayed increased motivation, and were able to engage in deep thinking.

This is the plus point of PBL.

Typically, traditional education programmes have an over-preoccupation with content. In my opinion, education would fail if institutions continue to teach content to students without paying careful attention as to how quickly such content knowledge becomes obsolete or irrelevant. Teachers would have failed if they continue to use learning processes that do not exert any impact on lifelong learning.

In essence, it is no longer how much content we disseminate in our classrooms but how we engage students’ motivation and independent learning that is important.

It is imperative for education to foster the development of a critical mass of individuals with greater creativity and higher levels of thinking skills. By creativity, I refer to the four cognitive traits namely, fluency, flexibility, originality and elaboration. This means we need to move from “doing things right” to “learning to do the right things right”, with the emphasis on the learning. This would mean discarding

things that are efficient but are no longer effective in the new environment. Hence, for this to happen, educators cannot only merely be transmitters of knowledge. They need to assume new roles, such as being designers of the learning environment. They also need to ask themselves if the skills imparted in traditional curriculum are indeed transferable to the workplace.

The revamp in curriculum content, delivery and assessment is also hastened by the Internet revolution. With information access and retrieval now available at the click of a mouse, we need to seriously re-examine our assumptions of knowledge acquisition and participation in learning. Are teachers still assuming absolute authority as knowledge experts? I am afraid not. The readily available information provided by the World Wide Web has eroded this status. This is why the role of teachers needs to change dramatically if it is to remain relevant to a new generation of students.

This is also why a problem-based approach may be the ideal reinvention for education in the next century. By utilizing more “real-life” problems rather than contents to serve as anchors, students can be trained to learn how to learn. As learners function as active problem solvers and teachers as mediating coaches, the learning paradigm would shift towards attainment of outcomes desired in a knowledge-based era.

A problem-based approach will also enable us to inculcate in learners the spirit of engaging in lifelong learning. The truth is, not every single lesson in life is available in textbooks. If we want to develop in students the spirit of entrepreneurship, or foster ability to be discriminative towards information, we need to let students take greater ownership of their learning – particularly the acquisition of facts. The 21st century is a KBE. There will be an explosion of information. We need learners who know how to manage the information and make sense out of it.

A problem-based approach is the ideal paradigm for educational reform. Its efficacy in preparing individuals with new competencies—such as learning to learn, being engaged in continuous learning, assuming personal responsibility for one’s own learning and embracing new approaches of learning—is just the thing we need to kick-start the mindset change of both the present and future generations.

Impact of PBL on Learners

- Engages the learner holistically

PBL presents potential not only by developing cognitive awareness, but also in engaging students in learning for the whole person (Lee & Lee, 2006) by:

Increasing the motivation of learners which lead to self-directed learning

PBL requires learners to actively participate in the problem-solving process. Through the process, they gradually acquire knowledge as well as problem-solving skills. Students tend to feel that they are involved with real life situations and not just theoretical concepts. Along the way, they begin to take on more responsibility for their learning, delving deeper into issues that are of interest (Morrison, 2004). As a result of the personal investments they make regarding the outcome of the inquiry, their motivation and interest is increased.

Raising the learner’s sense of self-awareness

There is an enhanced sense of knowing oneself (Savin-Baden & Major, 2004). Through collaborative learning communities, there is an interplay of ideas between the individual and the community, between the individual and ideas, and between the individual and one’s own learning processes. PBL encourages

learners to assemble their own body of knowledge, and formulate their decisions about the relevance of the material. In addition, along the way, as they work with one another to clarify their values, abilities, interests and goals, they become more self-aware in the process and are more proficient in self-evaluation.

Enhancing the social dimension of individuals

The group setting of PBL sets up a ready forum for the exchange of ideas and perspectives. In the process, members listen to one another share their point of view before making judgments and decisions. This builds trust and rapport among members. As trust develops, interpersonal relations strengthen and deepen, and the probability for mutual learning and strengthening of relationships is increased (MacKinnon, 1999). In essence, group cohesion is enhanced. In addition, through the process of interacting with others, individuals rediscover themselves and their perspectives. Gradually, they become more accommodating and receptive to varying viewpoints and perspectives.

- Promotes higher-order thinking

Learners are no longer stuck in the paradigm of guessing which answer “the teacher wants me to find”. Instead, the ill-structured problem necessitates learners to gather information pertaining to the problem and be engaged independently in assessing its credibility and validity. In the process, they may acquire domain-relevant skills, which include factual knowledge, technical skills and special domain-specific talents. In addition, they may acquire creativity-relevant skills, such as critical (Weissinger, 2004) and creative thinking (Tan, 2000), when generating novel problem-solving ideas.

Through the Value of Questions

The PBL learning process entails inquiry and deliberation, critical-mindedness and intellectual curiosity as well as tacking uncertainty and ambiguity. Learners have a primary task of discovering the problem. For this to happen, they will have to acknowledge the vital role questions play in their learning. As learners work through the questions collectively in a group, intellectual curiosity is fostered. Individually, they will come to realize that others have the same doubts, questions and difficulties and that it is all right to live with unanswered questions.

The role of constructivism

PBL processes involve getting the learner to make connections—through reflection, articulation, learning—to see different perspectives. The teacher can assist in two ways. One, by scaffolding. Teachers can help learners clarify the nature of their questions as well as develop cognitive connections (Ho, 2004). Two, by the structure of lessons. The teacher can pose problems of emerging relevance to learners and build lessons around foundational concepts and ‘big’ ideas. This will assist learners in trying to make connections between the old and the new. Learners can then apply analytical thinking skills, such as comparing, classifying, logical thinking and inferential thinking, to the new data to construct new cognitive structures or enhance existing ones (Nelson et al., 2004). This leads to deep understanding of the material at hand.

Encourages the process of learning how to learn

PBL promotes metacognition and self-regulated learning by providing students with opportunities to identify existing gaps in their knowledge. As learners generate their own strategies for the learning processes—defining problems, gathering information, analyzing data, building and testing hypotheses, comparing strategies with those of other students and mentors, and sharing methods and conclusions—they also develop the ability to construct new and different knowledge (Hmelo & Lin, 2000). Also, in the

process of working with others, they are given the opportunity to reflect on their own understanding while constructing internalized representations of the concepts.

Fosters new and different learning experiences

PBL enables students to explore and to develop their own tacit understandings towards the problem scenario (Major & Palmer, 2001). In this process, reflection plays a key role and hence, has been regarded to be the catalyst that prompts ways of working with and through their learning, often enabling them to link new experiences and knowledge to those of the past and thereby prompting new meanings.

- Maintains authenticity and the relevance of learning to the real world

Working with real-life problems, PBL avoids queries that commonly arise with the traditional curriculum, such as, “Why are we learning this information?”, “What is the connection of the school curriculum with the real world?” Along the way, students will develop a tolerance for the ambiguity and complexity of real-life situations as well as the refined skills necessary to solve complex real-world problems. In addition, PBL assesses learning in ways that demonstrate understanding. This minimizes the chance that learners are merely replicating the knowledge from textbooks.

- Enhances connectivity

The PBL process helps to develop flexibility and helicopter views by enhancing connectivity through the following links:

- a) connecting with prior knowledge
- b) connecting with prior experiences
- c) connecting with the real-world context
- d) connecting with theories
- e) connecting with other people’s perceptions
- f) connecting with new facts and ideas

Cognitive strategies—such as thinking out of the box, accessing alternative causes—will be engaged during the problem-solving processes. Through these strategies, learners can go about determining particular key linkages between ideas, which will then lead them to become more aware of the different ways of thinking and hence develop their problem-solving competencies. Also, through the process of collecting, connecting and communicating information, the learner is given an opportunity to sharpen his/her thinking.

- Fosters collaborative learning

The active exploration of new knowledge, peer learning and collective inquiry and deliberations directed toward the resolution of the given problem is designed to motivate the formation of a learning community. Through partnership, working in small groups and networking with people, the collaborative learning activity is driven by questions, problems, or the challenge of discovering something “new” (Sharp & Primrose, 2003).

The collaborative learning approach includes the following essential elements.

- 1) Stimulates thinking through dialogue

Dialogue ensures that we are not locked into our own limited or prejudiced perspectives. In fact, it is important for developing critical thinking and reflection. Through mutual exploration, meaning-making,

and feedback, we sharpen our tools in problem solving and learning occurs when complementary skills interact and create a shared meaning which none could have come up on their own (Goh, 2006).

2) Necessitates an atmosphere of critical openness

Group members come in with a mindset for interchange of ideas and of varying perspectives. Collaborative learning is carried out through the process of interacting with others, which results in individuals rediscovering themselves and hence expanding their perspective (Lee & Tan, 2004).

Conclusion

In Singapore, the Educational System is one that has been continually adapting to suit the times.

You will remember that over the years, the curriculum we have instituted has evolved to one that is broad-based and holistic. Schools have become more diverse as they initiate their own flexibility within the curriculum structure. We are getting students to learn more even when teachers are teaching less content.

I am often asked, “Are these changes necessary?” Instead of answering that, let me raise what I feel is a more meaningful question, “What is our stand on education?”

Socrates once argued that education was about drawing out what was already within the student. Modern-day theorists will tell you education is cultural, it being the process by which society intentionally transmits its accumulated knowledge, values and skills from one generation to another through institutions.

I think they are both right. For us, a country with Asian roots, education is essentially about nurturing the whole child. We subscribe to education as the means of developing the child morally, intellectually, physically, socially and aesthetically. On top of that, education is also our key to survival. For a small country amidst the whole lot of developed nations, there is a need for Singapore to be on par in terms of development. We need our people to be able to think on their feet. We need them to be equipped with excellent problem-solving skills, who are able to think out of the box and work collaboratively with one another to come up with creative solutions.

Education that keeps up with the demands of the changing times, thus, is the key. For us at this point in time, PBL is the best paradigm.

There is meaningful application of knowledge and skills. Learners become competent with the different kinds of information resources. Learning experiences are built on the interdependent attributes of meaningful learning. Team members work together to build learning contexts that support knowledge construction among learning communities.

PBL not only addresses the complex challenges that the 21st century brings; it also challenges students and brings out the best in them.

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