A DO-IT-YOURSELF ESTIMATION IN MEASUREMENT: USE OF PROBLEM –BASED LEARNING

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Abstract

How can we help children develop a feel for measurement? Measurement estimation is a basic skill. Yet despite the recent widespread support for giving more attention to it in school mathematics programs, much remains to be done. Evaluation of measurement estimation, for example, continues to be one of the most neglected areas of test development. Estimation is deservedly receiving a great deal of emphasis in current curriculum planning. Estimation in measurement activities is equally important. Students need to develop the skills to get a ballpark figure and then a move refined estimate in measurement as much as in computation. However, measurement is usually taught by having students perform only the mechanics of measuring without the practice of estimating measurement. Basically there are two purposes for teaching estimation in measurement: first, to help students develop a mental frame of reference for the size of units of measure relative to each other, and second, to provide students with activities that will concretely illustrate basic properties of measurement. Certainly one could add a third: giving students a means for determining whether a given measurement is reasonable. In this paper, the author will share and discuss how problem-based learning will influences pupils in Primary School thinking much more than information that they have read or told. An important reason for having pupils to do-it themselves through problem-based learning is to help gain insights that will enable them to understand the subject matter and look at from different perspectives in estimation of measurement. Therefore, the most appropriate times for us to use problem-based as a teaching strategy are when we want to develop our pupils' thinking and reasoning skills- that is, their ability to analyse situations, to apply their existing knowledge to new situations, the recognize the difference between facts and opinions, and to make objective judgement. Careful planning is required. The author will share how the instruction will become more active, meaningful, motivating and fun through do-it yourself and problem-based learning.

A Do-It-Yourself Estimation In Measurement: Use Of Problem – Based Learning

Introduction

Estimation is deservedly receiving a great deal of emphasis in current curriculum planning (Malaysian Ministry of Education, 2000). Techniques of computational estimation, such as front-end estimation and rounding off, are now being included in district mathematics objectives.

Measurement provides a way to answer questions about "how many," "how much" and "how far." It is an in dispensable component of business, manufacturing, art, medicine and many other aspects of dairy life. We describe the sizes, capacities and values of many things, from the large distances involved in space travel, to the very small quantities in computer design and microbiology, to the varying values of currencies in international monetary exchange. All people must be able to choose an appropriate level of accuracy for a measurement; to select what measuring instruments to use and to correctly determine the measures of objects, space and time.

These activities require people to be able to use standard instrument including rulers, volume and capacity measures, timers and emerging measurement technologies found in the home and workplaces. Children need to understand the attribute to be measured as well as what it means to measure. Before they are capable of such understanding, they must first experience a variety of activities that focus on comparing objects directly, covering them with various units, and counting the units. Premature use of instruments or formulas leaves children without the understanding necessary for solving measurement problems.

Estimation should be emphasized because it helps children understand the attributes and the process of measuring as well as awareness of the sizes of units. Everyday situations in which only an estimate is required should be included. Since measurements are not exact, children should realize that it is often appropriate, for example, to report a measurement as between eight and nine or about three hours.

Time, unlike other measurement concepts, is not applied to physical objects: rather it is a concept that people apply to events. Time concerns duration-how long it takes for events to happen-or the placement of above the head. The children willingly "copycatted" teacher movements: several led the group in different poses. "we can make angles with our arms". "Move our arms this way. 'round and round'". For example, to explore angle concepts further, a teacher of a primary class might gather the children near the classroom door and predict the appearance of the angle made by the door as it opens. Then as a teacher opened the door wider and wider, the children laid more pieces of yarn to outline the angles. The teacher allowed time for the children to manipulate the door and talk about its angles.

Estimation in measurement activities is equally important. Student needs to develop the skill to get a ballpark figure and then a more refined estimate in measurement as much as in computation. However, measurement usually taught by having students performs only the mechanics of measuring without the practice of estimating measurements.

Problem-Based Learning

Problem based learning is an important technique of learning mathematics, and that method continues to receive significant attention in recommendation for primary mathematics and mathematics educations. To achieve change in the mathematical thinking in primary school, we ought rather look carefully at the environment in which students learn and the system of ideas, which that environment represents.

A problem can be defined as any situation in which some information is known and other information is needed. The problem might be something that gives rise to doubt or uncertainly, or something that is hard to understand, or a difficult task or question, or an inquiry that start from given conditions to investigate facts or principles. Problem based learning can be considered as the process of applying existing knowledge to a new or unfamiliar situation in order to gain new knowledge. Thus, problem based learning can help students to realize that the knowledge they have already gained can be applied to new situations, and that this process can lead them to gain new knowledge.

When problem based learning is used as a teaching strategy, the emphasis should be on students learning about the subject, rather than simply learning to solve problems.

The need to foster creative thinking, entrepreneurial spirit and lifelong learning has been repeatedly articulated. The search for educational paradigms that address these needs appear to have a confluence in the use of problem-based learning (PBL) approaches. This paper will discuss how PBL may be used to innovate primary education curriculum and illustrate how PBL may be used to enhance teaching and learning in estimation measurement.

In Malaysia there was several documents calling for new agenda and action. These challenges are common across education world wide. The Ministry of Education redefined the desired outcomes of primary education to include characteristics such as the ability to think, reason and deal confidently with the future: to seek, process and apply knowledge: innovativeness: a spirit of continual improvement: a life-long habit of learning and an enterprising spirit in undertakings (Ministry of Education, 2000).

Mathematics Education would fail if schools continue to teach content to students without paying attention to how quickly such content knowledge becomes obsolete or irrelevant. Mathematics educators need to ask if the skills imparted are really transferable to the workplace. Teachers would have failed if they use learning processes that do not impact on life-long learning. The challenge is indeed for educators to design new learning environments and curricula that really encourage motivation and independence to equip students with learning skills, thinking and problem-solving skills.

Measurement is a vital mathematics topic for young children because of its pertinence to everyday life, as well as its potential for involving children in interesting activities. Most physical objects have a variety of measurement attributes-length, area, volume, and angle, for example. Mathematics educators can help children focus on these attributes with non-standard and standard measurement units. Children's understanding of measurement attributes grows slowly and must be based on experience and must be based on experience and conversation about those experiences. Development of concepts such as telling time or the effects of temperature on people's activities should develop throughout the school year. School experiences are complemented by extensions at home and by activities where the teacher helps children set up and work with materials designed to focus attention to specific measurement attributes.

If we define the curriculum as not only the intended learning outcomes but also there environment for bringing about these outcomes then what we are saying is that there must be shift in the way we look at the curriculum. By a curriculum we refer to all the experiences that the individual learners have in a programme of education (Parkay & Hass, 2000) as well as the design of the learning environment.

Establishing An Appropriate Learning Climate

We cannot expect students to learn through problem-based learning unless we create and maintain an appropriate learning climate. Teaching and learning in schools are inextricably and elaborately linked.

A Problem-based environment based on constructivist rather than a behaviourist view of learning. It is assumed that students actively construct their own understanding of skills and knowledge rather than having it delivered to them by the teacher. The lesson emphasized both a deep understanding of what the process and answer meant and skill performance, rather than focusing on performance of the skill alone. It acknowledged the social nature of learning with high levels of interaction between the lecturer and students and students with each other. Teaching need involve to creating a situation for teacher and student interaction to encourage student learning, and building up student confidence. Engaging students in their learning and development is key students can improve their problem-solving skills by working in pair or co-operative groups.

It has been said that 'how we learn is what we learn. " Are we designing the learning environment and facilitating learning that is motivating students to learn in ways that empower them for tomorrow? Are we escaping the responsibility of tomorrow by evading change in our practices?

Problem-based Learning in Primary Education

In Problem-based learning (PBL), learning begins with meeting a messy, unstructured real world problem. The problem triggers the learning by having students define the problem, analysis the problem generate hypotheses and identify learning issues. Students then work in small groups to discuss the problem scenario. They ask themselves questions. Such as what they know from the problem scenario presented, what they need to know and what ideas come to mind. Following the brainstorming and

inquiry students are expected to draw up their learning objectives and to seek the necessary information on their own.

Let's look at the example.
What to do: Set up situation where children of primary school move objects and compare the results. Let the children make and flypaper airplanes, use half-sections of straws to Styrofoam bits on the floor, or racecars from a cardboard ramp. After some practice trials. Let the children take turns testing their objects and comparing the results. Younger children can identify the longest and shortest distances: older children can use non-standard or standard units of measurement to estimate and record distances.

Adjustments: Let the children suggest ways to vary the activity. Standard Two and three can record results for three trials each. Then identify their longest distances.

Ongoing Assessment: Observe children work to determine if individuals work cooperatively. Initiate conversation about lengths compares lengths and use measurement tools.

After comparing and ordering lengths, children measure lengths with non-standard units, working with units such as strips of paper or hands in first and second year; many curriculums include work with standard units such as centimetres and inches. Conversion such as 100 centimetres equals 1 meter is handled in exploratory ways rather than with formulas. Standard three students often explore decimetres and yards. Other standard measures of length.

In the primary grades curriculum, metric units-based on tens-are often presented along with place value. Customary units-inches and feet-are often handle later in the school year. In work with either measurement system children must develop pictures or benchmarks of the units. Finding lengths at home and make a meter help children use benchmarks.

In the group discussion facilitated by their PBL facilitator, participants refine their learning objectives into more pertinent questions that require the acquisition of deeper knowledge and insights important for their professional practice. Learning outcomes are often stated in the form of questions. The question provides the parameters and motivation for learning. Thus, instead of being passively presented with content knowledge through didactic teaching, in PBL the students interact with a problem that triggers their seeking of knowledge pertaining to these areas. The learning objectives are attained through self-directed learning and group discussions mediated by the facilitator. An important reason for having students solve problems is to help them gain insights that will enable them to understand the subject matter and to look at it from different perspectives. Therefore, the most appropriate times for us to use problem-based learning as a teaching strategy are:

- When we want our students to gain a deep understanding of the subject matter, rather than just remembering bits of it (Vernon & Blake, 1993)

- When we want to develop our students' thinking and reasoning skills-that is, their ability to analyse situations, to apply their existing knowledge to new situations, to recognise the difference between facts and opinions, and to make objective judgements.
- When we want to develop our students' problem solving skills-that is, their ability to assess and respond to new situations.
- When we want to intellectually challenge our students.
- When we want to encourage our students to take greater responsibility for their own learning.
- When we want students to understand the relationships between what they are studying and the real world (if we like, the relationships between theory and practice).
- When we want our students' learning experiences to be varied and interesting.
- When we want students to become competent in information-seeking skills (Vernon & Blake, 1993; Albanese & Mitchell, 1993)

Developing Students' Thinking Skills

If we are to be able to use problem-based learning as an effective teaching strategy, we might first have to spend time helping our students to become effective thinkers. One of the difficulties in teaching students to think is that we do not have a simple language as a control system for our thinking. A solution to this problem, students can be taught to make deliberate choice about the type of thinking they use, and so that they have a simple language for discussing their thinking processes. The following list of thinking skills might help us to plan ways to enhance students' thinking (and our own thinking):

- Focussing Skills
- Information-gathering skills
- Organizing skills
- Analysing and integrating skills
- Evaluating skills

From the pedagogical perspective PBL is based on the constructivist theory of learning (Schmidt, 1993: Savery & Duffy, 1995: Hendry & Murphy, 1995). In PBL understanding is derived from interaction with a problem scenario and the learning environment. The engagement with the problem and the problem inquiry process creates cognitive conflicts that stimulate learning. Furthermore collaborative process in learning in PBL require social negotiation and evaluation of one 's understanding, and these in turn lead to the construction of knowledge.

Teaching Strategies in Estimation

There are several strategies for teaching estimations in measurement:

- Compare the object to be measured with a referent.
- Estimate, measure, and check. Have students do this enough times to improve their estimation ability, but don't let them overdo it. Be sure to point out that in many situations an actual measurement is never done-either because it's impossible or because an estimate is good enough.

- Have students attempt to estimate within a given amount or a given percent of the actual measurement.
- Present activities and allow only a brief time for solution, thus compelling students to estimate rather than compute.

The activities were selected to illustrate a variety of uses of estimation as well as important techniques and skills involved in estimating accurately. An effort was made to choose examples that would appeal to adults and also be suitable for use in the classroom. Activities that had not previously been tried were tested in the classroom and evaluated by the staff before being included in the workshop.

It quickly became apparent in the planning process that estimating enters into decisions made in dozens of daily activities; this makes it a potential link between mathematics and nearly every other part of the curriculum. Suggestions for activities came from cooking, sewing, shopping, drawing woodworking, energy use, driving, travel, sports, business, home finance, child rearing, politics, history, and many other spheres of endeavour. Skilful estimating, it appeared, could save one from being late, being cheated, spoiling a snapshot, overpaying income tax, and any of other calamities. The examples chosen for the workshop represent only a few of the hundreds of possibilities.

Let's look at another example, this activity provide an excellent opportunity for students to review measurement and estimation skills while having fun at the same time. In small groups, students are given a measurement and asked to predict what object in the classroom is equal to that specific measurement. The teacher's can asks, "What in this room is 32 inches long?" In cooperative groups students need to explore and agree on they feel is 32 inches long. After several examples, students can take turns measuring the actual objects. They need to arrange their data in a table, which includes the prediction-object, measurement, and what is the difference of the actual measurement compared to their prediction. This activity can be modified in many ways to suit your individual classroom needs. If data collection is pertinent, have students devise their own charting system. A great cooperative learning activity would be to have students devise their own method of determining who made the closest predictions. Problem-based learning encourages learner as active problem solvers and teachers as the mediating coaches. It helps promote the development of lifelong learning skills in the form of open-minded, reflective, critical and active learning.

Another example, twenty other activities were set up as learning stations. Participants were invited to choose partners with whom to discuss and try the activities. When all had visited each station, estimates and techniques were discussed and everyone computed his or her score, using a scoring system based on what the staff considered reasonable results. A workshop such as this can be organized by any group wishing to explore the topic or share its own ideas and experiences with others.

What made this joint effort possible was an initial brainstorming session, the purpose of which was simply to get ideas on the table without any judgments or analysis? Since nearly everyone uses estimation consciously or unconsciously every day, all could

contribute. The mix of suggestions was, infect, much richer than it would have been had the planning been restricted those with experience in teaching mathematic.

Such a procedure allows a group – whether teachers, administrators, or staff developers- to design a workshop tailored to the interests, experience, and comfort level of its own members. A brainstorming session, followed by a work period in which ideas are sorted and evaluated and specific activities are designed can constitute an entire workshop for a group wishing to explore estimation on its own. Brainstorming alone can be a stimulating introductory activity in a workshop conducted for others, since it creates an awareness of the enormous range of situations in which estimating is useful and exposes the techniques we already know and apply.

Measurement is a topic with much potential for engaging young children in active learning. As they work with measurement concepts young children explore many attributes such as length, weight, and time. Children start building measurement ideas by comparing sizes. They later progress to using ordinary objects as units of measurement, and finally use standard units of measurement such as inches, kilograms, and hours. Work with measurement strengthens children's number concepts and estimation skills: it lets children use geometric ideas. Measurement is topic that lends itself well to integration with other subject areas and real-life applications. Therefore a broad mathematics curriculum emphasizes measurement.

What might children do as they engage in measurement activities? For example, the children studied healthy habits and compared their heights. Weights and lengths of various body parts such as feet, arms and smiles. The children compared body parts directly standing in lines of three or four, holding arms side by side, and so on. They cut paper strips and pieces of yarn to represent their measurements.

Next we could introduce the idea of using small classroom objects- paper clips and blocks-as units of measurement. As they laid paper clips on paper footprints and counted the clips to determine the lengths of the prints. Children found objects that could be linked in manageable sizes- interlocking cubes beans. They found that their bean strips had the advantage of being flexible-they bent the strips around wrists or ankles. Thus the children "invented" tools comparable to tape measures for determining length.

The children used numbers and comparative words naturally as they worked. They used measuring tools to verify statements such as the table are shorter than the door. The children worked well together. Helping each other, settling differences and suggesting ways to streamline their work. We also need to consider individualization of the measurement activities as we plan. Education must foster the creation of a critical mass of more creative individuals as well as higher levels of thinking skills. We can decide to let children help devise some learning centre activities for more on length. We can also planned to have the children compose a story about their activities to share in his monthly family newsletter.

Make And Use Measurements In Everyday Situation

We need to emphasize the importance of the process of measurement – choosing attributes to be measured selecting suitable units, covering or balancing objects with units and counting the units. For weight, children must handle objects, lifting and comparing them. They might use a balance scale as a tool for measuring, and verifying ideas. They might place the box of crayons in one pan of the balance and use pennies in the other pan until the pans balance. The number of pennies expresses the weight of the crayons.

All measurement is approximate errors are inherent as people use and read measurement tools. Therefore educators should encourage children to use words such as about or almost as they report measurements.

The *Curriculum and Evaluation Standards* indicated that as children use non-standard units for their initial explorations, they develop some understandings of units and come to recognize the necessity of standard units to communicate (NCTM, 1989 p. 52) Finally, the authors stress the importance of measurement in natural, problem situation, measuring attributes of real objects and making objects of chosen sizes. Textbook experiences cannot substitute for activities that use measurement to answer questions about real problem (NCTM, 1989 p. 52)

Practice of Estimate Measurement

Children must use physical objects as they measure, including classroom materials, items from home, and the children themselves. Almost any real item has a variety of attributes the children can compare and measure. Measurement tools are also important. Some devices can be made from paper. For example, children can use strips of paper cut to equal lengths to measure length. For area, children can cut and use paper squares: they can use squared paper placing flat objects on top, then count squares to determine the approximate areas. To measures angles children can fold paper plates in fourths or eights, cut apart the sections, and use the pie-piece wedges as units.

Rope or string makes inexpensive measures of length. Six-year-olds might cut lengths of string and use them for comparison. Finding objects about as long as their string, and longer and shorter than their strings. Older children might mark smaller, equal units on strings or ropes thus making multiunit measuring devices similar to tape measures.

As they study time, children and teachers can make models of both analog (with hands) and digital clocks are favourites: they can be taken home after classroom use. Digital clocks are easily prepared with strip of paper that show numerals
through window cut in cardboard backings (Figure 1).

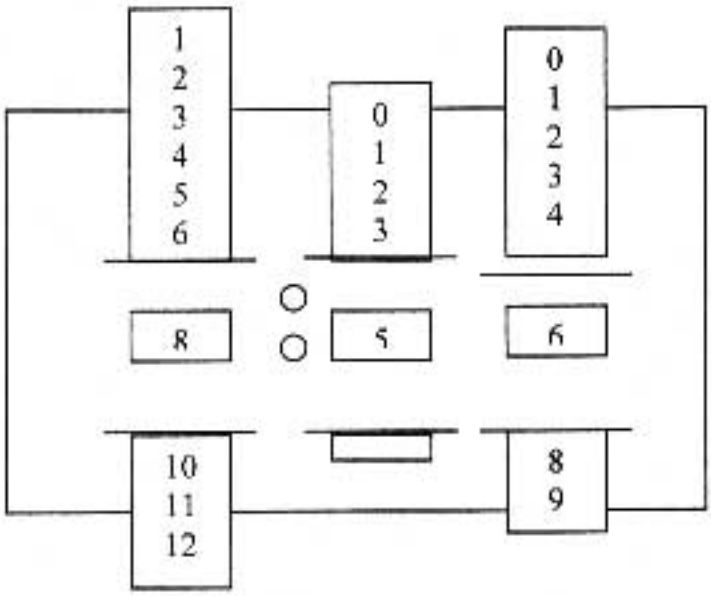

Figure 1: Digital clock made from cardboard.

For primary grades, purchased measuring equipment is a good investment useful throughout the school for measuring activities. For measuring length, educators should purchase simple rulers, perhaps calibrated in centimetres or in inches and half inches. Yard and meter sticks are needed for measuring longer length. Tape measures wrap easily around curved objects. For longer distance. Trundle wheels, devices that children push has clicking devices to signal each meter that is travelled.

For measuring capacity sets of plastic cups and cylinders are available. Educators should purchase capacity measures marked with large numerals. Sets of measures including units of 100,250,500 and 1000 millilitres (1 litter) and _ cup 1pint, 1quart are useful. Children study of volume measures in cubic units. Is enhanced by using small cubes in cubic centimetre or cubic inch sizes.

Finding Lengths At Home

Locating objects of various lengths at home enhances children's development of measurement benchmarks and consciousness of sizes.

Focus: Measurement–comparing finding benchmarks, communicating, connecting on the real world.

What To Do: Help primary children make paper strips of specified lengths- non-standard units such as the lengths or widths of their hands. Or strips of standard sizes such as 5 Or 10 or 20 centimetres Ask the children to use the strips at home find several objects close to the lengths of the strips, and bring one objects to school. Let children set up a sharing table of their objects. Adding sing to tell their length.

Adjustments: Suggest that children trace or draw pictures of objects that they cannot bring school. Let children cut pieces of yarn or string to use as measuring devices. Ongoing assessment: As children present their objects, try to judge their interest asking what they like about the activity and ways to improve it. Observe children abilities to find objects of designated lengths and communicate findings.

Scales are indispensable as children work with weight. Balance scales feature plastic pans or hoppers in which children can place a variety of objects. Sets of weights, calibrated in grams and ounces go with the scales. Inexpensive spring scales let children read a gauge to determine weight. Step-on scales allow children to weight themselves and hold other heavy objects.

Many devices are commercially available for telling time. Large clocks with geared hands let children set time s with hour and minute hands in the correct positions. Inexpensive analog and digital clocks are useful. As are small clock with movable hands. Stamp sets simplify the task of drawing clocks

For measuring temperature, thermometers are essential tools. Simple inexpensive thermometers calibrated from below freezing to about 50 Celsius or 120 Fahrenheit is available.

Length is a linear concept answering questions such as how long / how wide? And how high? Most young children have a sense of length- related words. To enhance and deepen such a sense a teacher of three year olds might play music and ask the children to walk around stop and stretch to be very tall then bend making themselves shorter and making themselves shorter still by squatting and crouching. Children might hold their arms at their sides stretch their arms a little. Then stretch to make themselves wide wider and wider still

To complement their naturally occurring comparative language, children can continue exploring length concepts with activities such as, "How far did it go?"

Implication to Teaching and Learning

Measuring is a human activity that can develop fundamental mathematical ideas. Measurement is concerned with comparing, with ordering, and with valuing, and all societies value certain things (Gilmer, 1990). However, the precision and the types of units used depend on social contexts. Many everyday experiences have a measured dimension to them. When we time a run, fill up tank, or bake some scones we engage in measurement tasks. Measurement clearly provides natural links between our experiential world and the world of number. It is the intention to develop a methodology that develops ways these links can be made tangible and meaningful to our students.

The challenge for teachers is to provide students with sufficient meaningful measurement tasks that require students to modify their understandings. Throughout the measurement strand learning can be exemplified as an adaptive process: a process by which students make sense of the world they have experienced. The application of the

mathematics associated with measurement is also continuous in that, aside from the higher order cognitive skills such as problem solving and logical reasoning, "a very large part of the mathematical needs of employment" (Cockcroft, 1982) summarises as developing a feel for measurement". This feel, which is the responsibility of teachers to foster, involves the development of a broad set of skills and concepts.

Conclusion

Students who have succeeded on a task are usually eager to do more of the same kind of task. They are motivated to achieve learning goals that they consider relevant to their needs. A learning goal is an instructional purpose, aim or objective that is set before students as a means of encouraging learning. Students usually aim to achieve goals that they perceive as interesting, realistic and attainable. Mathematics can be a creative activity involving intuition and invention. Mathematicians often explore mathematical ideas with a specific goal and discover new and interesting relationships. Students were given an opportunity to use activities to explore mathematical materials, concepts and ideas freely to assist them to develop their own intuitive ideas about measurements.

As we know that mathematics students often need time to think about the problem before gaining an insight into possible solutions. Students' insights may open up further possibilities for creative endeavour. The activities that involved reflecting problem-based process is an exciting and creative process for students and teachers. When solving problems students involved in creative processes such as:

- Creating and recognizing patterns
- Searching for alternative methods of solving a problem
- Experimenting with different ways of communicating mathematical ideas
- Creating personal hypotheses

When students perceive learning to be interesting, fun, personally meaningful, and relevant and the context supports and encourages personal control, motivation to learn and self-regulation of the learning process occur naturally (Brophy, 1987; Lepper, 1988; Noraini, 1999). Learning activities and experiences that students find interesting and stimulating are usually inherently motivating. When students' interests in prescribed learning have been aroused, there is usually little need for other incentives or reinforces. To make learning interesting and challenging to students, there needs to be sufficient variety in the nature and type of planned activities.

To take advantage of the vast potential of activities for all students, teachers will need to make significant changes in their pedagogy. They will need to form working relationships with students that allow for creative, higher order thinking to emerge. They will need to break traditional barriers that impose restrictions on the potential benefits to be realized from technology in classrooms, and they will need to be willing to make ongoing efforts to be successful in the implementation process.

Changing pedagogy expects that teachers will be proficient at using materials as an instructional tool. In addition, teachers may no longer follow the well-travelled road of traditional education, but must be visionary in the potential opportunities for learning

and their shift from teacher to guide and facilitator. The teachers need to structure mathematics lessons differently. They have to change in terms of the entire process, focus, and outcomes of educational expectations. Teachers are not only transferring knowledge to students but they are also engaging in different roles as students experience different processes of learning as suggested in Problem-based learning.

The activities were able to motivate the learner, identifying what is to learn, and providing active involvement. With the use of activities, students were also able to compare, classify, analyze errors, or construct support that they encounter in the course of solving problem.

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Title : **A Do-It-Yourself Estimation in Measurement: Use Of Problem-Based Learning**

Presenter : Assoc. Professor Dr. Noraini Idris, University of Malaya

Date & Time : 13 August 2003, 10.30 a.m. – 11.30 a.m.

1. **Content of the Paper**

1.1 The presenter highlighted on the need to help children develop a feel for measurement. This can be done through activities that stresses on practice in estimating and to actually do the measuring.

1.2 Pupils need to do the measurement themselves in order to gain insights, look at different perspectives, develop thinking and reasoning skills, analyse situations, apply existing knowledge to new situations, recognize between facts and objectives, and to make objective judgement.

1.3 The purpose of teaching estimation are two-fold, to develop a mental framework of reference of measurement and to provide pupils with activities that will concretely measure.

1.4 Problem-based learning is learning that results from working with problems. The scenarios to be understood also require learning. In this matter, the objective of student's presentation of the scenario are to present the problem and the learning related to the problem.

1.5 The presenter demonstrated an activity on measurement and highlighted that students will learn practical reasons for measurement, the use of various tools for measurement, how and why those tools are chosen, and the need for uniformity and agreement on definitions of measurement.

2. **Discussion - Question and Answer**

2.1 *Mr. Isa Othman of Limbungan Primary School of Malacca, Malaysia* commented that schools have embarked on many activities according to the Integrated Primary School Curriculum but these activities do not seem to have much impact on students.

Answer
In seminar, participants are exposed to various methods of teaching and learning, it is up to the teachers to adopt and adapt to their teaching methods. There is no one best method. Look at the syllabus and the skills the children need to acquire. Sometimes, teachers need to discuss among teachers and headmaster to come up with suitable methods of teaching and learning.

2.2 *Associate Prof. Dr. Jamaludin Md. Ali of University Sains of Malaysia* suggested that the teaching of mathematics and science can be integrated with other subjects such as language and religious subjects. A teacher can also teach more than one subject, eg. Mathematics and Islamic studies.