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TEACHING STRATEGY: THINKING SKILLS USING QUESTIONING TECHNIQUES

Abstract

Educationists hold varying views on the standard of today's examinations but concur on one issue: Malaysia is producing rote-memorizers which could be behind the better results. They agree that a different approach could result in more intelligent and creative students. The younger generation could be pushed and challenged further by scrapping objective and quantitative questions and replacing them with more open-ended ones. This would allow them to be more creative besides using their intelligence. This study explores teachers' perceptions and practices on the teaching of thinking skills via questioning techniques which was conducted using questionnaires, observations and interviews. Findings showed that the infusion of thinking skills in the teaching and learning is still at the introductory stage and there are still lots of room for improvement.

Keywords: *education, teaching and learning, thinking skills, and questioning techniques*

Recently, the Malaysian government has envisioned a reconceptualization of the school curriculum that includes dramatic social and academic changes. It involves an innovative analysis of the implementation of a new mode of thinking for the classroom. This is a powerful starting place for a quest to make our citizens become a more rigorous and empowered thinker. The STAR in its January *Comment* proclaimed that, 'System not turning out thinkers.'[1] The nature of exam determines the kind of education however; typically these exams test specific memorized facts. A mind trained to regurgitate a prescribed knowledge will incline to the blinkered perspective of ready-made systems and solutions and to a less discerning acceptance of dogma. Such an exam dictated and dedicated system ignores not only basic skills but those fundamental to living and employment such as communication and interpersonal skills, teamwork, group decision-making and tolerance.

During the launching of "Pelan Tindakan Pembangunan Pendidikan 2006-2010 at Pusat Konvensyen Antarabangsa Putrajaya (PICC) Datuk Seri Abdullah Ahmad Badawi wants schools to give more emphasis in developing creative and innovative students. He wants schools to produce students who can 'think outside the box' so that they are more creative and innovative when they join the workforce.[2] Consequently, he said the school curriculum must give emphasis in the effort to produce students who are not only literate but also intelligent. He added that this is in accordance with the type of human model that the government wants to produce, that is a generation of intelligent people who posses the mental strength to face the competitive challenges in the future. This effort is placed in the hands of today's educationists to produce a generation of excellence, not only for vision 2020, but after that.

In addition, the *Far Eastern Economic Review* quoted by Professor Emeritus Datuk Khoo Kay Kim (a professor of history in the University of Malaya then) "Students in Malaysian tertiary institutions do not want to ask." Echoing similar sentiments, Professor Emeritus Datuk Osman Baker, a former Deputy Vice-Chancellor (academic) at the University of Malaya, once said: "The students are extending their spoon-fed learning at university. They depend too much on lecture notes."[3] He was against the objective question approach, said even the British were concerned that the standard of tests was less rigorous compared to the past. "There seems to a trend all over the world not to fail so many people as possible, in the end, what kind of students are your schools producing?" "We are not giving them the opportunity to think about the subject and ask questions. That kind of education is worthless. They come to university and they stay the same. They expect notes from the lecturer and answer exactly how the lecturer asked them to answer. What is the point of having that kind of education?" Almost all pointed to the importance of the curriculum and the quality of teaching. Khoo feels the Education Ministry should test students more rigorously if it wanted to produce quality students." Students should be able to explain what they have studied. That is a major part of the proof that he understands what he is talking about. His verdict is the examination papers are very mechanical, forcing students to think within the box. "I think we should give pupils the opportunity to express themselves and encourage them to ask questions."[4]

Central to the idea of implementing "thinking skills" in the classroom is the idea that, in order to teach thinking, teachers must be critical thinkers themselves. Teaching is a complex process, and the

development of competence and expertise in the profession is tied to critical learning. This sets up one of the most important battles in contemporary educational politics: the role of teachers in the educational process. Should teachers be empowered critical thinkers who develop curriculums and direct their own professional lives or, should teachers be rule followers who simply execute standardized curricular materials and instructional practices developed by experts? Teachers are consistently represented as incapable functionaries who simply don't have the ability to think critically. However, brilliant teachers continue to teach, despite attempts to control their work and represent them as incompetent. Teachers, who are critical thinkers, will be able to analyze their dilemma in the larger socio-political context and explore the ways it affects the profession and the teaching and learning process. Critical thinking teachers overcome restrictions and become theorizers- teachers who engage in inquiry along with action. Conversely, in most school context, a good teacher is someone who enforces rules devised by outsiders to the teaching process, consequently, in such a context, critical thinking by both teachers and students is crushed.

Thinking involves hard work with purposeful and sustained effort. Teachers should teach the thinking skills as well as develop the attitudes and dispositions that will assure that these skills are utilized in real or simulated contexts. Many approaches can be utilized to teach the various thinking skills including problem-solving, decision-making, creativity, and critical thinking. These approaches differ in terms of their breadth or specificity, their theoretical and/or philosophical underpinnings, and the degree to which the thinking skills are taught separately and explicitly or embedded in the context of specific subject matter, like science, geography, English and moral studies.

Respondents

The study was limited to classroom-based observation to several primary and secondary schools in Perak, in particular, on teachers teaching Science in English. As such, it was almost impossible to apply the findings to other classroom based science teaching in Malaysia. The findings, hence, are applicable only to the teachers and students participants under observation. Beyond that, the participants were second language teachers and learners of English and their first language were Bahasa Melayu, Chinese and Tamil. Accordingly, they will think in their first language. This focused on second language learners and therefore it cannot be applied to other types of learners.

The choice of participants for the study was a mixture of Science and English teachers as well as students from primary and secondary urban and rural schools. In addition, they were also of mixed ethnicity: Indians, Chinese and Malays. Thus, the findings of the study cannot be applied to other modes of combinations, namely stereotyped of similar levels of proficiency and one race grouping. The school setting were a mixture of grade A,B and C schools, in urban, semi-urban and rural settings.

Significance of the study

Teaching thinking skills has become a much needed tool for all levels of people be it in society, education, industries, entertainment, medical, and organization as well as the government management sectors. Typically, exposure to thinking skills among educators, especially teachers is a must in order to create a knowledgeable society who can think globally. Most obviously, educators must be equipped with thinking skills to be able to compete in this era of globalization. Owing to that currently teachers' role experienced a transformation from the feeder and giver to be the facilitator and planner of knowledge.

Learning activities should therefore be geared towards activating students' critical and creative thinking skills and not be confined to routine or rote learning. Students should be made aware of the thinking skills and thinking strategies that they use in their learning. They should be challenged with higher order questions and problems and be required to solve problems utilizing their creativity and critical thinking. The teaching and learning process should enable students to acquire knowledge, master skills and develop scientific attitudes and noble values in an integrated manner. The learning of science is not limited to activities carried out in the school compound. The latest trend in science education is to encourage smart partnership between the Ministry of Education and various organizations such as institutions of higher learning, other governmental agencies, nongovernmental agencies and private corporations to provide new ideas, opportunities, strategies and skills.

Studies by Lee [5] and Ho[6] noted that teaching wise, the teacher's mode of delivery in the science class showed that science teaching is teacher-centered, rigid and do not give emphasis to the skills of science process. A study by Tan showed that teachers' utilize 'chalk and talk.'[7] Similarly, Lee[8] noted that 76.2 % of practical activities were conducted using teacher-demonstrations. Also, Mat Tah (1988) noted that teachers were spoon-feeding facts and this was also noted by a study conducted

by Educational Planning, Research and Development Sector that noted the way the teachers teaching science.[9]

The teaching and learning of science observed in the studies were contradicting to the ideas forwarded by Hogan that is science instruction should be conducted so that students can acquire the abilities to construct understanding and evaluate ideas, rather than passively accept scientific information.[10] Also, Abruscato believed that science is a discovery process, whereby, 'science time will give you wonderful opportunities to help children become better thinkers and that prospect has profound importance for today and tomorrow.[11]

Besides, good question will enable students to (a) participate actively in lessons, (b) provide an opportunity for students to express their ideas and thoughts, (c) allow students to hear divergent opinion from fellow students. He added that through questions, students will draw attention to important points during a teaching process and it will develop confidence and a feeling of success. However, we should realize that there is no indication for all educators that one type of question is better than the other. Educators need to realize that each type of question is effective for a particular instructional goal. The challenge for them is to clarify instructional objectives for a particular lesson, analyze students' ability levels and then plan appropriate types of questions.

The vision of a classroom as a community of learners challenges traditional views of teaching, learning and questioning. The conventional model of teaching as "knowledge transmission" treats students as sponges that absorb a teachers' wisdom. In the traditional classroom, knowledge is static, inert and independent of learners. Learning involves listening to the teacher, reading and studying in order to recall information on demand. Primarily, teachers use classroom questions to evaluate students' ability to remember information.

Current reports issued by professional associations in mathematics, reading, science, writing and art support this new view of teaching, learning and questioning.[12] Among the recommendations proposed by these national curriculum reports: less, whole-class, teacher-directed instruction (e.g. lecturing), less student passivity (e.g. listening, sitting, receiving, absorbing information), less presentational, one-way transmission of information from teacher to student, less classroom-time devoted to fill-in-the-blanks- worksheet, workbooks and other seat works, less student time reading textbooks and basal readers, less attempt by teachers to thinly 'cover' large amounts of material in every subject, and less rote memorization.

Professional organizations recommend more experiential, inductive, hands-on learning, more active learning, and more emphasis on higher order thinking, more responsibility transferred to students for their work, and more cooperative collaborative activity to develop the classroom as an independent community

The following is a summary of responses from teachers and administrators attending a workshop at Teacher's Resource center (*Pusat Kegiatan Guru*) in Perak. The responses are typical of those the researchers encounter in workshops throughout Malaysia. Firstly, research reports that 80 % of the questions posed in both primary and secondary classrooms are at the recall or comprehension level. Among the factors which contribute to this situation are: time constraint to cover syllabus content, textbook and workbook; recall questions are easier for students to answer (in the text explicitly); teachers are trained to ask low level questions; teachers lack the knowledge and skill to ask higher order questions; and majority of exam questions are content based.

Secondly, research reports that most teachers call on students perceived as high achievers more frequently than they call on low achievers, for the following reasons: more likely to get a correct answer from the high achievers; do not want to embarrass students who do not know the answer; lack of patience to wait on students (low achievers); time constraints to practice wait-time; and teachers feel successful when students can answer

Thirdly, research reports that when teachers ask questions to students, they usually wait one second or less for students to begin their responses. Teachers gave the following justifications: a waste of time and teacher must keep the lesson going on; when teacher allows a student to take time to answer, the other students might make noise and become rowdy; teacher cannot focus on the few low achievers as this will make the other students become impatient; and teacher must keep the majority of the students active and engaged.

Fourthly, research reports that teachers frequently give a student the answer to a question when the student cannot answer correctly or immediately. Teachers gave the following reasons: time constraint as teachers cannot waste time waiting for the correct answer; the other students want to hear the correct answer; other students are uncomfortable with silence and waiting and teachers do not know how to prompt and probe students to get to the correct answer

Lastly, research reports that students ask less than 5% of classroom questions. Students initiated few questions for the following

reasons: no idea of what to ask; limited vocabulary to compose the right question; do not know how to construct correct questions; embarrassed to ask questions and teacher does not give opportunity for students to ask. In short, in the Malaysian classrooms, majority of teachers do not practice higher-order questioning skills with the students.

Methodology

In this study the sources of data comprise researcher's observation of teachers' teaching and students' learning, interviews, and audio recordings of the science lessons. In addition, we conducted semi-structured interviews and classroom observations on a smaller sample of respondents for cross validation purposes. After the observations we directly conducted a two-minute interview inviting teachers' immediate comments on the lesson and subsequently by an extended semi-structured post lesson interview, intended to stimulate an account, grounded in the observed lesson, of teachers thinking about their practices. We designed questions and prompts to elicit teachers' perceptions regarding the contributions of questioning techniques to the success of the lesson and achievement of their lessons objectives. Also, we recorded and transcribed observations and interviews as well as compiled lesson plans, activity sheets, samples of students' work and digital photographs provided additional records.

For each case analysis, observations and interview data we collated and summarized the data. Then, we noted the similarities and differences in the teaching and learning approaches. By referring back to lesson observations we corroborated emerging themes to triangulate the interview data. We elected two researchers who work independently to minimize bias when analyzing data. Furthermore, we sought counter examples to analyze data. The principal observer reviewed the summaries and conclusions of each case study.

The respondents were from eighteen schools (urban, semi-urban and rural) situated in Perak, West Malaysia. The subjects comprised twenty-nine (29) male and fifty-four (54) female teachers (see Table 1). This is considered reflective of actual gender ratios in the teaching profession in Malaysia. The study involved eighty-three (83) respondents from eighteen (18) schools currently teaching Science and EST in both primary and secondary schools. The population group involved in the study was school administrators, science teachers and students from selected primary and secondary schools. The study was conducted between February to September 2007. The researchers conducted

purposive sampling to ensure equal sampling from eighteen selected rural and urban schools in Perak.

The survey was in the form of a self-completion questionnaire sent out to schools in October 2007. It was not compulsory for schools to participate. Also, we included representatives from all stages within the primary and secondary sectors, including additional support needs units, senior management teams and teacher specialists. Beyond that, we constructed semi-structured interviews and classroom observations on a smaller sample of respondents for cross validation purposes.

Findings

Table 1. *Respondents' Qualification*

	Percent	Frequency
SPM	12.0	10
M.C.E	7.2	6
STPM	6.0	5
Diploma	2.4	2
Bachelor	66.3	55
Masters	6.0	5
Total	100.0	83

Table 1 shows the science teachers' qualifications, with a majority 66.3% (55) of the respondents with Bachelor degree, 2.45(2) Diploma and 6% (5) Masters degree. At the lower end were the untrained science teachers 25.2% (21) who possessed certificates like, SPM, MCE and STPM.

Table 2. *Teachers' Teaching Experience*

	Percent	Frequency
1 - 4	13.3	11
5 - 9	24.1	20
10 - 14	13.3	11
15 - 19	20.5	17
20 - 24	15.7	13
25 - 29	9.6	8
30 - 34	3.6	3
Total	100.0	83

Table 2 shows that the science teachers teaching experiences which were categorized into three groups. Those with less than 10 years experience forms 37.4% (31); between 10 to 20 years 43.8% (28); and those with more than 20 years experience 26.9% (24). In other words,

there is an equal distribution of science teachers from all three categories.

Table 3. *Teachers' attitude towards the use of thinking skills*

	Mean	SD
I am challenged when devising activities that incorporate thinking skills	2.5783	0.60728
Thinking skills can improve the quality of my teaching	2.8171	0.38899
I am capable of devising quality activities that incorporate thinking skills	2.3976	0.71465
The ability to utilize thinking skills is important in teaching	2.8415	0.36749
Thinking skills are essential in learning, just like reading, writing and counting	2.8193	0.41744
To be successful, one must have thinking skills	2.7439	0.49219

Table 3 lists 6 items related to attitude in the use of thinking skills among science teachers in the state of Perak. Analyzing using mean for every item shows that the overall mean is moderate, that is within 1.8 to 3.6. The highest is at M=2.8415, the ability to utilize thinking skills is important in teaching. This shows that from the perspective of attitude in the use of thinking skills among the school science teachers, overall the respondents have moderate attitude, with items: I am challenged when devising activities that incorporate thinking skills (M= 2.5783, SD 0.60728), thinking skills can improve the quality of my teaching (M= 2.8171, SD 0.38899), I am capable of devising quality activities that incorporate thinking skills (M= 2.3976, SD 0.0.71465), thinking skills are essential in learning, just like reading, writing and counting (M= 2.8193, SD 0.41744), and to be successful, one must have thinking skills (M= 2.7439 SD 0.49219).

We selected two excerpts (1a, 1b) from observations of Teacher 10 to illustrate the practical implementation of thinking skills using ICT in the teaching and learning of science in English.

Excerpt 1a:

T : Do you know what 'heat capacity.' is (HE). Heat capacity is the amount of energy needed to raise the temperature. For instance, if we heat both oil (500 g) and water (500g), which one will heat up faster?

T : The rise of temperature for oil is faster, because oil and water has different heat capacity.

[*Teacher asked and answered his questions. There was no opportunity for the students to reflect, think or to guess for the answers. Teacher did not practice 'wait-time' when asking questions.*]

[*Here, the teacher did not allow the students to have 'hands-on' experience to find out by themselves. Teacher provided the input and explained on the white board the various calculations for heat capacity. I have a question, so how hot is 840 joules? What will happen to the 1 kg and 5 kg glass when it was heated up from 30 to 31 degree centigrade? How does 1 kg of glass look like, is it a block of glass, or powder glass?*]

[Reflection: Are our students going to become future scientists just by watching the demonstration via ICT and teacher-talk? Do they learn just by taking down notes, memorize the formula to calculate heat capacity, and watched the calculation demonstrated by the teacher on the whiteboard?]

Excerpt 1b:

[The teacher instructed the students to try out an experiment. Assembled on each long table were some apparatus to conduct an experiment to measure the heat capacity for iron. The students were assigned in groups of five, to conduct an experiment to measure the heat capacity for iron. They were given a block of iron with a hole in the middle which was filled with oil and a thermometer. Then, they had to connect the equipment to a machine that will heat up the iron block.

During the experiment the students conducted the experiments as instructed by their teacher. They conducted the experiments without asking any questions, either to the teacher, or to their group members. In fact, I had some questions: Why do we put oil in the middle of the iron block? Why do we use energy from a machine? How do we measure the heat capacity, in joules? Why are there two types of wire used: a red and a black wire?

Consequently, I approached and posed the questions to some students?

Student 1 (a Chinese student): Saya tak tahu macam mana nak explain dalam Bahasa Inggeris. Saya faham , boleh terangkan dalam Bahasa Cina.

Student 2 (a Malay student): Saya tak berapa faham sebab cikgu cakap dalam Bahasa Inggeris.

Student 3 (a Chinese student): I understand the lesson, but tak boleh ceritakan dalam Bahasa Inggeris.

Student 4 (an Indian student): Yes, I can understand, but I don't know why oil is placed in the middle of the iron block.

Student 5: (a Chinese student): I think the oil is used to transfer the heat from the machine to the iron block.

In winding up, based on the data compiled from the questionnaires and the observations we could infer that thinking skills is still at the introductory stage for this class. In fact, there was no scientific process in the sequence of teaching and learning events.

Similarly, the researchers' observation in some of the schools (especially rural schools) noted that the teachers did not infuse thinking skills. To illustrate, an excerpt (Teacher12)

Observation and interview Teacher 12

[There were 3 standard four classes, and this was the weakest class. The students were from the low social economic group, and this was obvious from their badly worn out and smelly school uniform .The teacher, initially, declined to let me observe him teaching the students science in English. He disclosed that he did not use the English language for the students, who were mostly Malays and a few Indian students hardly understood English. He confided in me that he taught science in Bahasa Melayu to make the students understand. Also, he added that the students were weak in science, so he had to explain in Bahasa Malaysia.]

R: How do you explain the concepts to the students?

T: I explain in Bahasa Malaysia, it is easier. In fact, the students prefer to learn in Bahasa.

R: Do you give your students activities that will make them think?

T: Sometimes, but they cannot do the activities. In the end I have to give them the answer.

R: Do you make them work in group?

T: Yes, but they end up making lots of noise and fight.

R: Did you train them how to work as a group?

T: Yes, at first, but it's useless, for they are very weak and do not think. They prefer to take down notes and copy from the whiteboard. Besides, it makes my work easier, if they were to copy the correct answer.

In line with that, another teacher (Teacher 4) hinted:

T: Even the teachers are not able to explain the concepts to the students. Teachers read from the text book like a parrot, and make the students learn by heart, to memorize the facts in preparation for the exam.

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T: Teachers totally depend on the workbook and the LCD presentation to relate the content. Teachers do not simplify and elaborate to suit the students' cognitive level, because the teacher has limited English language skills. Generally, teachers resort to use Bahasa Malaysia to explain the concepts.

R: What about thinking skills, where and when do you implement thinking skills in your lesson?

T: Students, especially those in the lower classes are lazy to think. If you give them some simple problems to think also, they are lazy to think.

Developing students' metacognitive awareness is crucial in enhancing thinking skill ability. Teachers have to provide opportunities for students to develop these skills: planning, monitoring, redirecting and evaluating thinking., specifically encouraging them to redirect their thinking, closely followed by opportunities to 'evaluate' thinking (Fisher, 2003).Similarly, opportunities for evaluation at the end of a task must be encouraged by the teacher reminding them to check their work. Conversely, in this respect, during the observations conducted we noted that evaluation is covered only in a superficial way, and often it is not the actual thinking skills that was being evaluated but neatness of writing and basic grammatical errors. It is possible that students are not becoming fully regulated, as they are not thinking about their thinking, but thinking about the presentation of their work.

Interview 1:

R: How do you teach science in English?

T: Well, with the good class, like Two K, 1 used the inquiry method, where the students will conduct an experiment. These students can think, so 1 provide them with the materials, and they will look for the answer by working in group. But with the weaker class, like Two B, where the students are rather weak, 1 made them copy the notes in their exercise book to memorize for the test or exams.

R: Do you mean to say that the weak students can't think, so you do not give them challenging tasks?

T: Yes, in a way, for the weak students, 1 had to explain the scientific concepts in Bahasa Melayu. They don't understand English. Besides, they are weak in sentence construction and grammar. 1 use the English terms, that is important, for they must know the terms, but 1 have to elaborate in Bahasa Melayu to make them understand better.

R: Why don't you explain the content in English, by using simple language?

R: What do you think will happen by 2008? Do you think it is possible to fully implement the teaching of science in English by that time?

T: Frankly speaking, I personally think that it is not possible especially with the low IQ students, for they can't make inference, can't express themselves well... it is the language factor, basically that's what hinders them.

Interview 2:

R: Do you integrate thinking skills in your science lesson?

T: Yes, I ask lots of questions to provoke them to think and answer?

R: Are they responsive to your questions?

T: Sometimes, yes, but very little.

[Below is an excerpt to show the questioning-answer session conducted to teach the concept: 'Parasitism and Mutualism.' The picture of a dog and a flea was shown on the LCD. This is a Science 1 class, the best science class in the school]

T : What kind of relationship exist between the dog and the flea? Apa itu flea?'[What is 'flea?']

SS : Kutu,[Bahasa Melayu] teacher.

T : Who is at advantage? Dog or flea?

SS : Flea.

T : Why do you say that?

SS : The flea sucks the dog's blood.

T : Good.

Observation

The lesson was more of a cookbook method and pre-packaged curricula and textbooks turning the laboratory into a dull place. [The students were rather passive, sitting straight on the high stool chair listening attentively to the recorded tape and watching the recorded CD. The lesson was very teacher-centred. The teacher talked intermittently with the recorded CD elaborating on some of the difficult concepts. This technique seemed successful and effective to this particular class because they were good students, highly motivated, with the two observers at the back, well the class seemed very organized and manageable. Students seemed to follow the lesson, but there was no evaluation exercise to justify whether they have grasped the lesson objectives for the science lesson.]

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Table 4. *Students' Level of Proficiency and Competency in Learning*

I teach thinking skills using ICT in my teaching since my students are very weak in their studies.	M=3.8630	SD=0.92944
All students who are potential future leaders, such as doctors, engineers, and educators have to be trained in thinking skills.	2.0284	0.99242
My students need thinking skills for the examination.	4.0000	0.93218
Students weak in academic do need to be trained in thinking skills.	4.0552	0.93377
Thinking skills are important because it can help students to do well in their examination.	4.1310	0.86003

Table 4 shows that majority of the teachers acknowledged that thinking skills are important because it can help students to do well in their examination (M=4.1310). In fact, four items were categorized under the scale of high: students weak in academic do need to be trained in thinking skills (M= 4.0552); my students need thinking skills for the examination (M= 4.000); I use ICT and thinking skills in my teaching since my students are very weak in their studies (M=3.8630).

Observation: Teacher 1

Teacher distributed students' name tag (students have to wear the name tags when they were in the science laboratory). The teacher seemed to be very authoritative and systematic.

T: What subject are you learning today? (repeat 2x)
What is science? What is definition?

[Teacher asked many questions, but the students were not responding. The teacher wrote on the whiteboard. "Definition". One student referred to his dictionary and gave the BM version,"*mentafsir, memberi makna.*" Teacher wrote on the whiteboard and instructed the students to write in their Translation notebook. Teacher walked around the class to make sure that ever student wrote the word in their Translation book. Then, teacher instructed the students to refer to page 2 of their Science textbook]

T: Bagi contoh. Give me an example. What is a butterfly?
SS 1: Rama-rama
T: Apa nama anak rama-rama?
SS2: Kepompong
T: Bagaimana rama-rama terjadi? Beginning from what?
T: dari telor
SS3: Kepompong
T; Bagaimana kesan rama-rama keatas environment?

[Teacher resorted to tap on the students' prior knowledge and no thinking skills were involved in this lesson.]

[Then, teacher showed a video recording on a topic," Around the schoo1."]

SS4: Keliling sekolah

[Teacher highlighted some things in the picture, using the curser, for example; a butterfly, a bird, trees, flowers, colourful stones, etc. The students listened attentively.]

T: Why do things fall down and not up?
SS: Tarikan gravity

[Teacher read aloud some of the English vocabulary and translated the words into Bahasa Melayu]

T: Why do stones have different colours?
T: Boleh faham ke? Kau cakap atau dengar? (He scolded a boy who was talking to his friend)

[From what I observed, the teacher did not seem to have any teaching objectives when teaching the science lesson, he moved from one item to another item without any distinct learning objectives. First, he was talking about the butterfly, then he talked about gravity and then he went on to relate about the colorful stones.]

Discussion

During the classroom-based observations we noted that the students did not ask any questions. While watching the ICT demonstration, I (the researcher) had lots of questions to ask, such as,

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During the classroom-based observations we noted that the students did not ask any questions. While watching the ICT demonstration, I (the researcher) had lots of questions to ask, such as, what is pure ice and pure water? How can one determine pure ice and pure water?

We noted that the students were not doing the experiments, like a real scientist would do. In fact, I am not sure whether the students were following and understood the lesson. They just sat straight on the high wooden stool like statues.]

[Suggestions: The teacher should pose questions as he was demonstrating the lesson via ICT, to ensure that the students were following and could understand the lesson, step by step. Besides, the questions will prompt them to think.]

Questioning and students' thinking

Teacher questioning is one method of teaching that can prompt students to think. Teachers should practice questioning techniques more frequently to make students think about what they are reading and writing. Currently, there are critiques of the Malaysian system of education, as in other nations. Professor Emeritus at the University of Malaya, Khoo Kay Kim, argues that Malaysia should revolutionize its education system as soon as possible to produce more analytical minds.[13] Selected research argues that some of the learning and teaching process tended to be uni-directional from teacher to student (Joseph, 2005).School administration follows the lead of local officials who have mandated a strict curriculum. Malaysian education is content and examination centered. According to Hussin :

There are many implications of posing questions aligned to the national examinations. From one perspective this type of instruction will not elevate students' level of thinking. While the curriculum stipulates what students should be taught how to learn, teachers have been teaching their students what to learn.[14]

Generally, students who are high achievers are readily given opportunities to engage in high-level thinking, the assumption being that they have acquired 'the basics' and can now engage in critical and creative thinking. In contrast, students who were low achievers were ordinarily given simplified courses of study in which the emphasis was on the lowest levels of cognition, the assumption being either that they were not ready for high-level thinking or they were not capable of it.

At any grade level, teachers should invite high-level thinking when they encourage students to bring their own perspectives to a lesson by asking questions such as *What do you think?* and *Why do you think so?* Teachers can engage students in high level thinking when they devise ways of challenging students to tackle more complex, unfamiliar material in ways that lead to success. The can provide opportunities for high-level thinking when they ask students to represent their learning in a variety of creative forms. In fact, effective teachers actively seek ways of making high-level thinking a regular part of their students' classroom work.[15]

Generally, literature on questioning approaches the topic from the perspective of teachers rather than students (Pedrosa de Jesus et al, 2003).Thus, questioning seems to be viewed as something teachers do to students, a one-way flow of interrogation that is occasionally interrupted by answers to teachers' questions. However, it has been documented that teachers typically ask 96% of the questions in a classroom environment and that student questions in the classroom are very infrequent and unsophisticated.[16] In fact, studies at different educational levels and contexts indicated that learners do have questions but avoid asking them[17] ; students do not want to call attention to themselves, for asking questions in class can generate feelings of exposure and vulnerability .[18]

Studies proposed that teachers should encourage and involve students in questioning: by systematically making room for students' questions in the class agenda; welcoming and inviting questions; waiting patiently for them; and teach students good questioning skills.[19] Needless to say, research need to be devoted to building teaching styles that both encourage and facilitate learners' questioning styles with their learning styles, in turn, mesh with different approaches to teaching. Majority of teachers are not aware of what it means to teach and what it means to learn.[20] Walsh and Sattes forwarded some classroom practices that support teacher questioning.

Classroom practices that support effective teacher questioning[21]

Classroom Design	Questions for Reflection
Classroom norms to assist students understand the role of questions and questioning in their learning	Does the culture of my classroom support quality questioning? Have I formulated a set of norms that will support a culture of inquiry and thoughtful dialogue? Have I presented these norms to my students and provided them opportunities to think about how these norms can

	thoughtful dialogue? Have I presented these norms to my students and provided them opportunities to think about how these norms can support their learning?
Structures to scaffold new student behaviors	Do I use a variety of formats to engage students in the answering of questions? Do I use visuals and auditory signals to facilitate smooth transitions from one format to another?
Teacher and student's roles and responsibilities	Do I see myself as a facilitator of student learning, rather than a content expert to whom students turn for all knowledge? Are students responsible for their learning and accountable for constructing their own answers to all questions? Do students approach learning as a collaborative endeavor, in which they work together and with the teacher to achieve learning goals?
Students (and teacher) value quality questions and questioning.	Do you understand the implications of research on questioning for your class-room? Have you taught your students rules and procedures associated with quality questioning?

Most schools acknowledged the importance of 'thinking skills using ICT'. Some have embarked on thinking skills programmes and view 'thinking' as a discrete subject. Conversely, the issue of how to teach thinking skills remains widely contested between the infusion and discrete approaches. Within the Malaysian curricular guidelines thinking skills are incorporated for most curricular areas. By way of example, the English language curriculum encourage opportunities to be provided for students to 'ask questions' experiment, design and make, solve problems, sort and categorize things into groups. Similarly, in the objectives for science and mathematics, teachers are directed to provide opportunities in 'thinking': for example, speculating; hypothesizing; discovering; reflecting; generalizing; synthesizing; classifying and evaluating. However, the guidelines do not explicitly direct teachers to teach students thinking skills. In fact, it is widely recognized that the curricular guidelines are outdated and need to formally recognize new priorities

Endnotes:

[1] *The Star,* January, (2004), p. 19.

[2] *Harian Berita,* (2007)

[3] *New Sunday Times* (2006).

[4] *New Sunday Times* (2006).

[5] L. L. Lee, "Acquisition of Science Process Skills and its relationship to cognitive development." (Dissertasi Master of Education. University of Malaya. Unpublished. 1991).

[6] Y.K. Ho, "Level of Inquiry of Activities in Form Two Science Textbooks and its relationship with the Acquisition of Science Process Skills." (Dissertasi Master of Education. University of Malaya. Unpublished, 1997).

[7] Tan Juat Ngor, The development and Implementation of the Primary School Science Curriculum in Malaysia. (PhD. tesis. University of East Anglis. Unpublished, 1999).

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[9] Sharifah Maimunah.bt. Syed Zin & Lewin, K.M. (eds.). (1993). "Insights into Science Education : Planning and Policy Priorities in Malaysia. Paris International Institute for Education Planning. UNESCO. network-based language learning.' in Warschauer M. and R. kern (eds). *Network-Based language Teaching: Concepts and Practice.* (Cambridge University Press. Cambridge, 1993)

[10] K. Hogan, "Thinking Aloud Together A Test of an Intervention to Foster Students' Collaboration Scientific Reasoning," in *Journal of Research in Science Teaching.* Vol.36 (10). (1999), p. 1085.

[11] J. Abruscato, *Teaching children Science.* (Boston: Allyn and Bacon, 5th ed., 2000), p. 7.

[12] J.A. Walsh and B.D. Sattes,*Quality Questioning: Research-Based Practice to Engage every Learner.* (California : Sage Publications, 2005).

[13] Y. Ghani, When quality is absent, meritocracy matters not: Educationists. *Essay Info.* Retrieved July 31, 2005. from http://essayinfo.com/articles/a04.php. (2004).

[14] H. Hussin,. "Dimensions of questioning: A qualitative study of current classroom practice in Malaysia, " in *Teaching English as a Second or Foreign Language,*10(2), (2006), p. 9.

[15] D.D. Nessel and J.M. Graham,*Thinking Strategies for Student Achievement: Improving Learning Across the Curriculum,K-12.*, (California : SAGE Pub.Corwin Press, 2nd ed., 2007), p.5.

[16] A.C. Graesser, and Person,N.K. 'Questions asking during tutoring,' *American Educational Research Journal* .31(1), (1994)., pp. 104-37.

[17] J.T. Dillon 'The remedial status of student questioning', *Journal of Curriculum Studies* 20 (3),(1998), pp.197-210.

[18] G., Marchbad-Ad, and Sokolove,P. 'Can undergraduate Biology students learn to ask higher level questions?' *Journal of Research in Science Teaching* 37(8), (2000), pp.854-70.

[19] See: A.C. Graesser, and Person,N.K. 'Questions asking during tutoring,' *American Educational Research Journal* .31(1), (1994)., pp. 104-37; J.T. Dillon 'The remedial status of student questioning', *Journal of Curriculum Studies* 20 (3),(1998), pp.197-210.

[18] G., Marchbad-Ad, and Sokolove,P. 'Can undergraduate Biology students learn to ask higher level questions?' *Journal of Research in Science Teaching* 37(8), (2000), pp.854-70.

[19] See: A.C. Graesser, and Person,N.K. 'Questions asking during tutoring,' *American Educational Research Journal* .31(1), (1994)., pp. 104-37; J.T. Dillon 'The remedial status of student questioning', *Journal of Curriculum Studies* 20 (3),(1998), pp.197-210.

[20] J.A. Walsh and B.D. Sattes,*Quality Questioning: Research-Based Practice to Engage every Learner.* (California : Sage Publications, 2005).

[21] J.A. Walsh and B.D. Sattes,*Quality Questioning: Research-Based Practice to Engage every Learner.* (California : Sage Publications, 2005), p.19.

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