2010 NATIONAL ACADEMIC TEACHING EXCELLENCE AWARD (SCIENCE) PORTFOLIO FOR TEACHING EXCELLENCE EVIDENCES

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DR JJ’s TEACHING PHILOSOPHY &
TEACHING AND LEARNING INNOVATIONS

Journey towards Enrichment and Balance by utilizing Arts and sciences in Teaching and learning

- DR. JJ -

"If you are, you breathe. If you breathe, you talk.
If you talk, you ASK. If you ask, you THINK.
If you think, you SEARCH. If you search, you EXPERIENCE.
If you experience, you LEARN. If you learn, you GROW.
If you grow, you wish. If you wish, you FIND.
If you find, you DOUBT. If you doubt, you QUESTION.
If you question, you UNDERSTAND. If you understand, you KNOW.
If you know, you want to know more.
And if you want to know more, YOU ARE ALIVE"

- National Geographic -
TEACHING PHILOSOPHY &
INNOVATIONS OF CLASSROOM TLAśs

by

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1. Thermodynamics. Innovation-PeFaLeC
2. Philosophy of Science. Innovation-APPiE
3. Basic Physics. Innovation-5Es & PODS
TEACHING PHILOSOPHY

I have been teaching at UiTM since January 1987. In my earlier days of teaching, I resorted to only one approach of teaching, the Traditional Approach or the Transmittalist approach. After all, I am what I am today, after experiencing this type of instructional approach when I was a university student. This approach of teaching employs direct instruction, follows a cookbook lab manual and solves textbook problems for and at times with the students in tutorial sessions. It is commonly used by teachers at high school and at the universities. In other words, I taught using approaches of how I was taught as a student.

My Novice Approaches To Teaching

When I began my career as a university teacher, I found myself struggling in “preparing” for my classes. I was only guided by prescription detailed in the course syllabus; a list of topics and subtopics similar to those found in textbooks The struggling I experienced, happened regardless of whether I was teaching a low-level physics class in the learning areas of mechanics or teaching the more advanced learning area of modern physics. I struggled because I had problems in understanding concepts, principles and generalizations of those principles. While I was able to define concepts, draw graphs and labeled its axis with quantities and units, solved many textbook problems that required me to use physics equations or derived physics relationships from fundamental equations, I failed to explain much of what I did. In other words, my conceptual knowledge was just at the proficient level, at best. It would have been very helpful if my understanding was deep rather than surface. It would have been very helpful that I could state, defined, described, able to provide in-depth explanation, provided reasons along with specific examples to clarify vague problems and if I could offer a few alternatives in solving problems. Not only that, it would have been really helpful if I could convince myself and my peers as to what, how and why I chose certain solutions for a given problem.

Often, as a student, I never saw what the end product of courses will be except to receive a grade that would indicate my competency in the courses I took. Indeed, I did very well and getting good grades in the mathematics, the physics and other science courses I took but I did not understand the concepts well enough and I did not understand how the concepts were linked to each other especially from one learning area to another.

Teaching is aimed at producing change. Changes are to be achieved not only in the cognitive domain but also in the practical skills and in enhancing the emotional intelligence of the students. Teaching is supposed to help learners change from a novice state to a state short of being an expert in a certain discipline. Teaching is a process that will push the content as the input to achieve the goal and the outcomes of a course. The ultimate prize, then, is the take-away from any learning experiences. What counts is not just the grade but the functional knowledge, the ability to use the knowledge and understanding that students will take with them after the completion of a course. It is the ability to apply the knowledge and understanding in analyzing authentic problems related to the discipline and those that are related to living and to their career. The take-away or products of education can be achieved only if the appropriate and aligned teaching activities are employed and the aligned assessment strategies are employed to assess the change or achievement of the learners. Hence, teaching must strive for the learners to be able to know and be able to perform by utilizing what they know. The oft-cited National Geographic commercial “Live Curious” ought
to be a driving force in any learning experiences at all certification levels. I quote below the phrases from the commercial:

“If you are, you breathe. If you breathe, you talk. If you talk, you ASK. If you ask, you THINK. If you think, you SEARCH. If you search, you EXPERIENCE. If you experience, you LEARN. If you learn, you GROW. If you grow, you wish. If you wish, you FIND. If you find, you DOUBT. If you doubt, you QUESTION. If you question, you UNDERSTAND. If you understand, you KNOW. If you know, you want to know more. And if you want to know more, YOU ARE ALIVE…”

MY CONVERSION

When I was doing my PhD in physics in 1991, I found out that the lack of understanding was preventing me from solving advanced and complex problems in areas of electromagnetism, mechanics and quantum mechanics. The challenges were more pronounced when I took the compulsory comprehensive examinations to qualify me to become a PhD candidate at the Physics Department. For this reason alone, I embarked on a journey towards learning how to teach and assess meaningfully by taking classes in the Education Department and by choosing to do my research in Physics Education, a stark contrast to my experiences and to my initial goal. That marked the beginning of a whole new experience and there was no turning back after that. I took it upon myself to shift and transform from a surface and strategic learner to a deep learner; questioning my existing mental models and probing for ways to learn, unlearn and relearn

Today, 16 years after I earned my doctoral degree in Physics Education from the Physics Department, Kansas State University, I am a classroom practitioner who combined both the art and science of teaching while coaching my “students” in achieving the learning outcomes.

Today, my teaching and learning is guided by my belief:

“Journey towards Enrichment & Balance by utilizing Arts and sciences in Teaching and learning, acronymed JEBAT.”

For the past 20 years, I have been utilizing the literature in physics education research (PER), psychology, assessment and education research-validated best practices to practice constructively aligned teaching and assessment and ensure attainment of lesson and course learning outcomes. Occasionally, I try to contribute to the literature. Over the same period, I have also honed my presentation and communication abilities in speaking, listening and recognizing the non-verbal and the unspoken signals the students are sending me during class sessions. I believe that the Art of Teaching is an important, effective and necessary tool in creating a fun, harmonious, respectful and active classroom environment. Hence, in all of my classes, I engaged the students in the learning process, making them activate the action verbs they are supposed to acquire upon completion of the lesson. To this end, I created an extensive physics Lesson Learning Outcomes (LLOs) for each learning area in order to help the students achieve the Course Learning Outcomes (CLOs) and to guide their learning during the face-to-face and non face-to face learning activities. To date, the lesson learning outcomes for various physics themes that I generated are applicable at the matriculation, diploma and first year university courses.
Meaningful learning in a classroom or lecture hall is greatly assisted when the coach or lecturer is an excellent communicator. It is only natural that communication plays a vital role in engaging the students. As part of communicating, I believe that all teachers must attempt to be personal with all the students in order to command meaningful classroom and out of class communication. To this end, I have and still require students to share with me their personal biodata which include their family background, their vision and mission in life, their interests, their academic background, courses they learn most and least so far, reasons for learning most and least, suggestions on how they would change the teaching and learning in the courses they learn least and their expectations for the course they are presently taking. Often, the students will do a brief introduction during the first day of class where they will quickly introduce their commercial name, their family background, whether or not they have their own durian and rambutan trees near their homes and if they are committed in a relationship. I usually follow-up the brief introduction with a request that they email me a more detail account of themselves along with their photo. The photo helps me to identify them by name while in class especially when the number of students in the class exceeded 30. Having the students’ biodata helped me to become personal with the students on a commercial name basis. This leads to class sessions that are more of an intellectual gathering among extended family members who share the same goal, rather than just another formal academic classroom.

Complementing the Arts of Teaching is the science of learning. The science of learning involves utilizing research-validated practices in pedagogy and assessment that are developed and proposed by psychologists and educationists. In my case, it is research-validated practices in Physics Education Research or PER (since I am a physics teacher) developed by researchers such as Arnold Arons, Robert Karplus, Lilian McDermott, Edward Redish, Leon Lederman (physics Nobel recipient), Richard Hake, Dean Zollman, Priscilla Laws, David Sokoloff, Ron Thornton, Carl Weiman (physics Nobel recipient), and Eric Mazur, just to name a few.

Robert Karplus was the physicist who gave up doing hard core (fundamental nuclear physics) physics research and shifted to PER. He initiated the use of The Learning Cycle in teaching high school physics science which is later adopted for science education at tertiary level. Eric Mazur, a physics Professor at Harvard introduced Peer Instruction Instructional Approach (the reader may be more familiar with the think-pair-share instructional approach) at Harvard University after he discovered that his physics students failed to proficiently demonstrate conceptual understanding even though they are good at solving algorithm and quantitative problems. Carl Weiman, the 2003 Physics Nobel recipient, started a physics education research group at the University of Colorado, Boulder and his group developed a range of simulations to allow a more visual approach in understanding of physics and science concepts and principles. Today, Prof Weiman heads the Education group at British Columbia to find ways of improving and aligning the curriculum, the teaching and learning and the assessment methods in mathematics and sciences for undergraduate education. His effort has earned him a spot as an Associate Director to Obama’s administration responsible to design and implement science initiatives in undergraduate education for the North American universities.

Another influential Physics Education Researcher is Priscilla Laws (along with David Sokoloff & Ron Thornton) who started Workshop Physics where computers are used as enablers for learning in lecture-free, workshop style, calculus-based physics courses at the Dickinson College. These pedagogical approaches are the product of physics education research which is guided by findings from psychology findings into how the human brain works and how people learn.
A significant contribution to the science of learning involved learning theories proposed by constructivists and in part, the Theory of Intelligence by Sternberg and of Multiple Intelligences by Howard Gardner. Constructivists assert that learners learn best if they built on an existing mental models and schemata as suggested by Piaget. In fact, learning is a scaffolding process and new knowledge can only be constructed or understood if it is built upon existing knowledge. Research evidences strongly suggest that if the existing knowledge is non-scientific or misconceived, it will interfere with meaningful learning of new knowledge. This interference usually manifests itself in the form of memorization and regurgitation.

As part of promoting deep approach to learning, I adopted the use of diagnostic tests to probe and identify any existing misconceived or Aristotelian physics knowledge before I began my classes. The diagnostic instruments used are called Concept Inventories (see for example the oft-cited Force Concept Inventory and the Force Motion Conceptual Evaluation) which were developed through scientific, research-validated processes. My teaching and learning approaches are designed by first considering the misconceived knowledge revealed from the diagnostic tests. If indeed the concept and understanding is Aristotelian and non-scientific then I will create a classroom scenario where students undergo a conflict in their belief system and begin to QUESTION the validity of their existing mental models. Alvin Toffler refers to this situation as the process of unlearning in order to enable a relearning process to take place. This stage is a critical stage, yet overlooked by many teachers. In fact, using the research-validated CIs as pre-post assessment tools will help identify the effectiveness of instructional approaches. In addition, the learning gains obtained from the pre-post assessment can serve as indicators towards course and program improvement.
MY EXISTING TEACHING & LEARNING APPROACHES

Even though identifying the misconceived beliefs or existing mental model is crucial to promote learning, it is also equally important for me and for the students to identify their strength and weakness in the eight intelligences. The way we teach should involve the most efficient way that students receive, perceive, process and understand information. Hence, I subscribe to Felder’s Inventory of Learning Styles to identify the students learning preferences. From the findings of Learning Preferences Inventory, I found that 80% of the students are visual learners rather than verbal learners. As a result, I minimize the use of textual information and my own continual talking to the students during class sessions. Instead, I talk WITH the students utilizing concrete and visual representation of concepts.

In addition to identifying student’s learning preferences, I also advocated the use of Concept Mapping (CMap) by using the IHMC software (interested reader can google up IHMC CMAP to download the free software) so that students may construct a visual representation of concepts, objects and events that they know. The CMap connect concepts via linkwords to form propositions in a hierarchical manner. Propositions are just sentences that connect concepts together via link-words. In a way, this is quite similar with the more familiar Mind Mapping but the strength of CMaps are the propositions where linkwords are used to connect two concepts together. During the first or second class session, students are given practice on how to construct simple CMaps manually and by using the IHMC software. After the skills begin to strengthen, students will then advance to CMaps that will involve combining together concepts from various learning areas. The learning sessions involve students choosing concepts and linkwords from a pool of concepts and linkwords and match them in blank boxes provided in the CMAP. As they become more familiar with the mapping process, they will begin to use the IHMC CMap software to construct their own CMaps.

The use of a variety of teaching approaches that involve students’ active engagement is what active learning is all about. It involves making the students actively engage with the action verbs they are supposed to know and able to do. While most students are active learners in ways that they process new information, the method to be active can take on a variety of techniques ranging from a normal dialogue to musical or scripts in a drama. The cycle of active learning consist of making observations, engage in self dialogues and followed by engaging in peer dialogues in the attempt to process information especially the abstract information, before deep and meaningful understanding can take place.

In promoting students to capitalize on technology and Information Communication Technology as enablers for teaching and learning and as tools for life-long learning, I believe that students must engage with and continuously use the enablers. For this reason, I advocated the use of mobile phone texting (short message service), email and social networking platforms such as Facebook, so that students can communicate, exchange data and obtain information from me. Hence, students are required to know the number for my mobile phone and to open email accounts. In fact, on occasions, I will display the screen capture of email exchanges for the week so as to identify and encourage those who were still not utilizing the existing enablers to initiate its use. Students who have their own laptops are strongly recommended to bring them to class in order to complement the face-to-face learning experiences. The laptops are needed for students to run simulation softwares either during the classroom group discussion or to confirm and disprove their predictions on selected phenomenon related to the LLOs.
I also believe that students ought to be given full access to any lecture notes, keys to selected assignments and past year summative assessments or any other documents that can assist students in achieving the LLOs and CLOs. Despite the abundance of information available from the internet, I still believe that information created by me, the coach, is of essence to students’ learning experiences. Hence, since 1997, I utilized the world-wide web and setup a multi-page website. The website provides most of the necessary materials regarding course outlines, course outcomes, lesson outcomes, assessment information, formative assessment instruments, lecture notes, and all other pertinent and relevant materials for the course. In addition, the website also provides opportunity for the students to advance their learning in other domains of knowledge through hyperlinks that will connect them to relevant websites around the world. Students are highly encouraged to download these documents to their own computers for use before, during and after the face-to-face interaction. The website is designed and maintained by me on a daily basis, whenever the needs arise or when I have the luxury of time and as long as the connection to the university’s server is available. In 2001, I further enhanced the website to keep abreast with the current trend of webpage presentation and to ease the information sharing with both the students and the academia at large.

As a teacher, I believe that utilizing the science of learning is a responsibility of all teachers. Hence, I believe that teachers must be made accountable in finding out, internalizing and practice the pedagogy that are research-validated and relevant to their discipline. Furthermore, students must also be engaged in using tools for thinking such as knowing about the strength and weaknesses of their multiple intelligences and about methods of the most effective learning strategies.

In aligning with constructivism and scaffolding in learning, teachers ought to also assess the students’ initial beliefs or misconception beliefs (meaningful learning can only happen through construction of knowledge based on existing knowledge) by using Concept Inventories (CIs), a standardized research-validated measuring instrument. Examples of research-validated CIs in physics include the oft-cited Force Concept Inventory (FCI), the Mechanics Baseline Test (MBT), the Force & Motion Concepts Evaluation (FMCE), the Electric Circuits Concepts Evaluation (ECCE) and the Conceptual Survey in Electricity & Magnetism (CSEM). I translated the FCI and MBT into Bahasa Malaysia in 1997 and the translated versions are available at both my website (http://drjj.uitm.edu.my) and at the University of Arizona's website (http://modeling.asu.edu/R&E/Research.html). For the past 15 years, I have been constantly using these instruments for pre and post assessment to determine the normalized gain (Normalized gain as proposed by Hake, is the ratio of the measured gain to the highest possible gain. Gain as used in this context is the difference between the % score after to the % score before the learning experiences) from my instructional strategies. At times, I embed items from these instruments in tests and formative quizzes to determine learning gains after a certain period of learning experiences.

In addition to the physics (chemistry, biology and math) CIs, I have also been assessing the quantitative, proportionate and scientific reasoning of my Philosophy of Science students by using the Lawson’s Classroom Test of Scientific Reasoning (LCTSR). I translated the LCTSR and I am currently using both the English and the Bahasa Malaysia versions to assess students’ science reasoning. Both versions of the instrument are made available on my website. The findings are not encouraging. The mean score using the Bahasa Malaysia version of the instrument is just 48% while the score using the English version is just 44%. My plan of action will have to include all faculty members but first, I shall have to initiate the transformation process.
In supporting the CI, I had also been identifying students’ knowing and learning of science, particularly Physics and Chemistry by using *Views of Science Survey* (VASS), an instrument developed and validated by Halloun et. al. at University of Arizona. *Views of Science Survey* (VASS) is a paper-and-pencil instrument consisting of 30 items and intended to probe the personal beliefs about the nature of science and about the learning of science. Beliefs about science were probed within three scientific dimensions pertaining to the structure, methodology and validity of science. Beliefs about the learning of science were probed within three cognitive dimensions pertaining to learnability, reflective thinking and personal relevance of science. I translated the surveys into Bahasa Malaysia and had been collecting data to correlate student’s science beliefs and their conceptual gains in the respective field of study.

Measures of learning gains and science beliefs and its findings have led me to realize how much gap existed between our goal, our curriculum, our instructional approaches, our methods of collecting evidence of student’s attainment and the way we report and act upon that achievement. For example, in a research I did with tertiary level chemical-related students using VASS and Chemical Conceptual Survey (CCI measures conceptual understanding of general chemistry despite its name, a survey), those whose science beliefs which are consistent with science experts (the Experts Profile and High Transitional Profile groups categorized by their score in VASS), scored significantly higher in CCI and thus higher learning gain than those whose beliefs fall in the category of Low Transitional Profile and Folk Profile. This result is independent of gender, MQF levels of certification, year of study at the university and types of chemical-related programs. This result informed me that our programs have failed to develop the type of graduates that are required not only by the stakeholders but also the demands of societal and personal positive growth.

The failure could be related to many factors but as a teacher, I am accountable to identify the source and provide remedial approaches. One particular source I have identified is the readiness of faculty members to admit their own shortcomings in all areas of TLAs, assessment and curriculum design. It is this readiness that can generate understanding leading to transformed classroom practices. Terminologies such as constructively aligning instructional approaches and assessment methods to the attainment of outcomes of courses and programs are just concepts which are superficially understood. In fact, the whole concept of constructing knowledge, aligning TLAs, aligning assessment and engaging students during the TLAs are simply not aligned with the current traditional practices; practices which faculty members have been implementing ever since they begin their career at the university and practices they experienced when they were students at the university.

As a result of both the gap and the realization that faculty members need to be assisted and coached on TLAs and assessment, I begin a journey of making them aware about the significance and impact of Scholarship of Teaching & Learning, research-validated pedagogies and research-validated assessment instruments in making learning more meaningful. My goal now is to assist them towards transforming their thoughts and practices in producing meaningful classroom learning experiences. I strongly believe and support the Outcomes-based Education philosophy adopted by MOHE and MQF and the Outcomes-Based Teaching & Learning practices recommended to all higher education providers. The principles of OBE and its OBTL implementation at the HEPs level has been a topic of interest to many HEPs educators and top leaders. Many are grappling with the philosophy and the OBTL implementation since it redefines the concept of curriculum design, teaching and assessment.
To this end, I have been conducting many workshops for teachers and program managers on Outcomes-Based Curriculum Design, Outcomes-Based Teaching & Learning Activities (OBTLAs), Outcomes-Based Assessment (OBA) and Outcomes-Based Grading (OBG). Teaching and learning involve teachers, students, content and environment. Since most tertiary level teachers are either novices or advanced beginners in understanding and implementing OBTL, my website provides free access to all the tools and materials that I developed and used for my Outcomes-Based lectures and workshops which include curriculum design, OBTLAs, OBAs and OBGs. It really excites and rejuvenates me when my website records an average of 800 page views per month. This is a great indicator that my website is providing some form of interest to teachers, students, academicians and internet users world-wide. I end this part of the essay with the following reminder:

“In the heyday of the psychometric and behaviorist eras, it was generally believed that intelligence was a single entity that was inherited; and that human beings - initially a blank slate - could be trained to learn anything, provided that it was presented in an appropriate way. Nowadays an increasing number of researchers believe precisely the opposite; that there exists a multitude of intelligences, quite independent of each other; that each intelligence has its own strengths and constraints; that the mind is far from unencumbered at birth; and that it is unexpectedly difficult to teach things that go against early 'naive' theories which challenge the natural lines of force within an intelligence and its matching domains.” Howard Gardner
MY SPECIFIC INNOVATIONS

In the earlier paragraphs, I had described my teaching philosophy and what I had been using and will continue to use in providing my students with the appropriate learning experiences in all of my science classes. The ultimate goal of teaching is a change of state in the cognitive, psychomotor and affective domains of the learners. In this 21st century, learning is not just focusing on knowledge and understanding (Lower Order Thinking Skills - LOTS) but must also target the achievement of the Higher Order Thinking Skills (HOTS). Furthermore, 21st century learners are expected to be able to rephrase, interpret, describe, explain, reason, reflect, empathize, be resilient, be self learners and always eager to extend the frontier of knowing and understanding.

Hence, when designing lesson learning outcomes to ensure achievement of course learning outcomes, I had adopted the use of Bloom’s Revised Taxonomy where the six original levels in Bloom’s original taxonomy is further clarified by the introduction of a two-dimensional taxonomy; the knowledge dimension (factual, conceptual, procedural and meta-cognition) and the complexity of cognitive processes (remember, understand, apply, analyze, evaluate and create). The use of the 2-dimensional taxonomy table allows me to constructively align my teaching & learning activities and my assessment approaches more precisely. I shall now focus on the specific innovations I had done and am still using in my courses.

Innovation in THERMODYNAMICS course (PeFaLeC) – 1997-2003

The Peer-Facilitating Learning Cycle (PeFaLeC)

Laws of thermodynamics and the concepts in thermodynamics have always been challenging for students to discuss and explain. Many of the concepts are abstract and involve understanding of concepts from various learning areas of physics, mathematics and chemistry. While many students can state the first law of thermodynamics and write the mathematical representation of the law, most are not able to explain how it is related to energy conservation and the different forms of energy involved in the energy exchange processes. It gets even more difficult when it is applied to authentic devices. Since the concepts are fairly abstract, I believe that the students need coaching in stating, concreting and operationalizing the concepts.

In fact, a good starting point would be to use the most basic concept of energy, work done and thermal properties of objects before proceeding with the laws and chaos nature of thermal interaction. Hence, for the Introduction to Thermodynamics class, I advocated group interaction approach in introducing and operationalizing the concepts. This was done by the strategy I coined as Peer-Facilitating Learning Cycle Approach (PeFeLaC) (unpublished), as shown in Figure 1. It was a generic approach similar to the approach introduced by Robert Karplus (and Lawson) and practiced by Dean Zollman at Kansas State University. At the end of this section, I show you a visual representation, a concept map answering the focus question, “What is Thermodynamics?”.

Before the PeFaLeC can be employed, I spent a lot of time generating learning guides and self-assessment items which were used for the teaching and learning activities. The learning guides, The Peer Facilitating Leading Questions (PeFaLeQ), the Peer Facilitating Learning Notes (PeFaLeN) and the Peer Facilitating Self-Assessment Instruments (PeFaSAI) were developed continually from 1999 until 2004. During the first semester of its use, I worked through the guides and the self-assessment instruments into the early morning hours every
day of every week since the guides and instruments were to be used by Thursday of that week. Every semester after its first use in 1999, I continued to make the necessary addition, changes and adjustment to make it more comprehensible, user-friendly and more relevant to the learning and assessment tasks. Today, I am not aware whether these guides and self-assessment are still being used since I was taken off the course in 2004. Even so, there have been verbal reports by those who teach Introduction to Thermodynamics elsewhere, that they are using my materials. Perhaps I could probe this claim or perhaps I should publish this innovation.

Each PeFaLeC comprised of mentor-mentee meeting, mentor-mentee picnic session, peer facilitation and classroom concept reinforcement. Figure 1 show the cycle utilized in PeFaLeC.

Due to the complex and abstract nature of the concepts and given that the students’ cognitive attainment is below average, I initiated picnic sessions over the weekend with selected students. The number of students depended on the number of groups in the class. It ranged from 6 to 13 students. These selected students were the group facilitators or simply the person playing the leading role in the discussion with their group members during class time. Every picnic sessions involved different groups of students. The picnic sessions were held on Sundays for about 3 or 4 hours. I usually provided the students with light meals such as fried noodles or sometimes pizza during these sessions. Further explanation in the PeFeLaC is described below:

Stage 1 Mentor-Mentee Meeting

Prior to the picnic, a mentor-mentee session was held for about 2 to 3 hours between the peer facilitators and me on either Friday evenings or Saturday morning. At this time, I distributed guided or leading questions (PeFaLeQ), simplified notes (PeFaLeN) and a Likert-type self-assessment survey (PeFaSAI) to all the peer-facilitators. These materials were continually developed by me between 1999 until 2003. The self-assessment survey consisted of statements of understanding or learning outcomes pertaining to the concepts and principles to be achieved for the week. Peer-facilitators were chosen from those who had the highest CGPA in each of the groups. In ensuring a good mix of gender and academic achievement in a group for each of the

![Figure 1: Peer-Calilating Learning Cycle.](image-url)
groups, I am the one who selected group members for each group. Group members remain the same throughout the semester.

The role of peer-facilitators before the mentor-mentee session were to read the guided questions and self-assessment survey and to rate their perceived knowing for each of the items in the survey. By the end of the mentor-mentee session, peer-facilitators will email me their responses to each of the items in the survey. I will then evaluate the level of knowing and understanding to prepare for the picnic session by doing statistical analysis on the responses provided by the group.

Stage 2 Picnic Session

During the picnic session, each of the survey statement was discussed by using the guided questions, the self-learning notes and the textbook as references. Each facilitator will take turn to discuss, explain, rewrite, rephrase, draw and redraw and identify the relevant values from the property table of pure substances. This is necessary so that they can demonstrate their competency in achieving the outcomes as stated in the survey items. Often, though, it was me who ended up doing the explaining during the picnic sessions. Nevertheless, the picnic sessions allowed me to identify the competency and comfort level for each facilitator to lead the classroom discussion. Alternative methods were then explored in helping the facilitators to be more comfortable in starting, sustaining and controlling the upcoming group discussion.

The common problems faced during the picnic sessions were the preparedness level of the peer facilitators. Even though they had been given the responsibility to be in the leadership role, many were quite hesitant and were uncomfortable to take up the role. In addition, most did not perform the assigned reading. As a result, the task of explaining by each of the facilitators was not accomplished and they would rather have me do the explaining instead of them doing it. Nonetheless, there were a lot of engagement and interaction among themselves and between me and them. The engagement was mostly focused on understanding the concepts and laws. At their level, the abstractions were indeed challenging and this resulted in less than satisfactory outcomes from the picnic session. At the end of the picnic session, each facilitator committed themselves towards taking the role of facilitating their designated group discussion even though their understanding was not satisfactory. Before they left, they will once again respond to the self-assessment survey items to indicate if there was any perceived learning gains.

Stage 3 Peer-Facilitated Classroom Group Discussions

The cycle continued when all the students met during the regular class session. Before the class session, all the students had already emailed me their responses to the self-assessment survey items and I had already statistically analyzed the responses. The responses and the statistics for each group were shared with the designated peer-facilitator before they lead the group discussion. In addition to the self-assessment survey, all students were given full access to the guided leading questions and the self-learning notes available on my website. The group numbers ranged between 3 to 5 members per group. If the numbers dropped below 3 due to absentees, then the members were asked to join other groups and this usually led to
The group having 2 peer facilitators. The presence of 2 peer facilitators resulted in enhanced confidence for both the peer facilitators and the group members.

The typical difficulties faced by peer facilitators were how to start and sustain the ongoing discussion. Often times, peers in the group were not participating in the discussion or they just drifted away. They attributed this to be a result of either not being prepared for the discussion (not having read the guided questions, the notes or the textbook) or lack of confidence with the peer-facilitator. During the discussion, I would go from group to group to listen to the intensity of the discussion or to answer questions posed by the facilitators and by group members. Common questions were addressed to the whole class rather than just to a group. At the end of the class session, all students will email me the post self-assessment survey and I would then perform the statistical analysis to detect perceived learning gains and in which particular concepts or laws. The result is then used for continuous improvement in the upcoming class session.

Stage 4 Closing the Loop: Reinforcement & Formative (scored but ungraded) Assessment

The perceived pre and post self-assessment survey responses provided me with an indicator on how much cognitive change may have occurred from the peer-facilitated group discussions. This was a form of formative assessment that I did throughout the course as part of the continual improvement cycle. Of course, in the absence of any control group, (groups who underwent the traditional passive listening), it is not scientifically justifiable to conclude that the Peer-Facilitating Learning Cycle Approach (PeFeLaC) promoted positive cognitive change among the students. It did however, promoted teamwork and life-long learning skills.

Nonetheless, the statistical analysis of the perceived pre and post self-assessment survey indicated an increase of the median by as much as one Likert scale. Since the change was not statistically determined for its significant difference at the 95% confidence level, I am quite skeptical to attribute the increase to the PeFeLaC. Hence, without losing any value to the PeFeLaC, the last stage was targeted towards reinforcement of the concepts addressed in the guided questions and in the self-assessment survey. This was the time where students can post any questions, for me to post and respond to questions and for the students to seek further clarifications. At the end of the session, a short 20 minute quiz was given to formatively assess on the actual cognitive change. The PeFeLaC then began a new cycle with a different group of peer-facilitators, a new set of learning outcomes and a new set of learning materials and this cycle continued until achievement of all the lesson learning outcomes for the course had already been addressed.

The first year of PeFaLeC implementation saw a lot of challenges in students’ and faculty members’ acceptance since the TLAs and formative assessment strategies were very alien to them. The concept of mental models, constructing and owning of knowledge and engaging in learning tasks, deviated from their norms of classroom learning. At the time PeFaLeC was introduced, the traditional direct instruction (lecturing TO the students), tutorial and cookbook laboratory sessions were the norms in the science disciplines (a very strong norm in Malaysia higher education TLAs). Classroom learning was perceived as lecturers doing the talking while students’ role was more of being a stenographer. I challenged that perception
by challenging the students, faculty members and the administration. Often, I failed to attract interest in lecturers and I miserably failed to induce interest in administrators. In 2003, I lost my battle with all three groups but I didn’t lose the war. The top management of the university, Prof. Datuk Ahmad Zainuddin Ahmad (currently Deputy Vice Chancellor of Academics at Sunway University) and Dato’ Prof Sahol Hamid (currently UiTM’s Vice Chancellor) (I am also thankful to the course tutor, Puan Zarila Mohd Shariff and the Dean, Hajah Asiah Abdullah who supported me during the early years of PeFaLeC), provided a lot of support and encouragement for me to march on and continue with my innovations. So I did...

In addition to challenges posed by students, peers and faculty administrators, I also needed to decide on whether to use technology as learning enablers. In the first year of PeFaLeC, hard copies of the guides and assessment were provided to the students. The pre and post self-assessment responses were also exchanged using the same media. This mode of assessment forced me to spend a lot of time to key-in responses and perform the statistical analysis. As a result, I decided to utilize technology and ICT as learning enablers.

In order to expedite analysis of the pre and post self-assessment responses, I chose to use email for students to send their spreadsheet self-assessment responses. I also chose to place the learning guides, the self-assessment instruments, the lecture materials and other relevant learning materials on my website. I salute, appreciate and thanked the administrator and personnel at the Center of Integrated Information System for allowing me to use their server space so that I could create email accounts for the pre and post assessment and for housing my website until this date. Folks, we are talking about the year 2000 where websites and email accounts for a course ranged from rare to nonexistent.

Despite the challenges, PeFaLeC utilized technology and ICT as learning enablers at the Faculty of Applied Sciences in the year 2000, the second year PeFaLeC was put in motion. Many students were not keen on the use of these enablers due to the lack of computer access and the limitation of internet access on and off campus. I tried to minimize their worries and uneasiness by providing them with alternatives. Those who prefer to access the guides and self assessment directly from me were provided with soft copies of the materials. Hard copies of the materials were also made available.

In encouraging the students to be internet savvy as part of their life-long learning skills and because internet access was limited, I worked closely with the nearby cybercafés. I approached owners of the oft-frequented cybercafés and provided suggestions on how to best access my website. I also suggested softwares they could install on their computers such as EXCEL spreadsheet and Acrobat readers. Unfortunately, by 2002, a new Program Head and Dean were appointed. By 2004, I was also teaching the Physics students instead of the Applied Chemistry and Industrial Chemistry students. The physics students were only interested in listening to me talk while in class and were not interested at all in PeFaLeC. They maintained that group discussion is just a waste of classroom’s time. They also maintained that the additional hours to go through the guides and the self-assessment beyond classroom contact hours were an abuse of the existing system (I had already initiated the concept of academic load as being student learning time in achieving learning outcomes. The outcomes were the formative self-assessment items listed out for every week of learning in the semester). By the end of 2004, I was taken off from teaching the course and PeFaLeC was no longer practiced at FSG Shah Alam.
Innovation in Philosophy of Science Course (APPIE)

2005 till April 2010

**Assisted Peer-Provocation Interactive Engagement (APPIE)**

Philosophy of Science is a 2 credit hour once a week Face-to-Face (F2F) class which requires about 80 hours of student learning time (SLTs) and is taken by all baccalaureate candidates at FSG. Upon successful completion of the course, students will be able to philosophize issues concerning the scientific method and the environment. During the F2F teaching & learning activities, I would introduce issues for about fifteen minutes following which students will be given a relevant issue to think about for about three minutes. At other times, a video will be shown and upon completion of a certain unit, the students were given a few minutes to reflect and share with the rest of the class. Some issues took longer depending on its complexity. For example, the concept of data and information versus knowledge as justified true belief (JTB) would take longer compared to issues regarding ghosts and initial beliefs.

After the three minutes period, students will then take about 5 minutes to convince or discuss with their learning partners (their neighbors). Then the exciting interaction began. I usually called upon a volunteer but the students were reluctant to volunteer. I attributed this to the Asian culture. However, this reluctance changed dramatically after the fourth meeting because they were aware that a minimum participation of twice is required for them to pass the course. So, when volunteers are not available, I called upon an individual by using my weak red laser pointed at the person's right shoulder. Even though the students answered in broken English or Manglish (I usually corrected them by clarifying their response and by using grammatically correct English), an interaction had taken place. There is no right or wrong idea; it is the communication and the reasoning that drives the interaction. After that, I often followed up the response by either challenging the worthiness of the response to the same students or got another student to respond to the earlier response.

Since the class was made up of students from different programs, I will call upon representatives from different programs to respond to or debate on the initial response given. This would go on with at least 3 to 5 responses before I did the closure and moved on to the next concept or issue. The cycle is then repeated until class is postponed for the next meeting. In a way, this approach is similar to the Think-Pair-Share approach and to Eric Mazur’s Peer Instruction except that in my situation, students were not answering conceptual objective questions displayed on the screen. They were responding to issues or concepts in an open-ended way. The purpose of the activity was to get them to think, discussed and communicated their ideas to peers and to me. By doing so, they were philosophizing. As the weeks go by many would have been engaging, some of them more than others.

Interactive Engagement is attributed to the students engaging with themselves, interacting with their peers and interacting with me throughout the session. Assisted Peer-Provocation is attributed to the debate that I created from the responses provided by each student. The provocation was initiated by the first student who responded to the issue. I then assisted the provocation by probing and questioning the logic of the argument. The initial provocation and my further Socratic probing fueled further arguments from other peers whose participation were assisted by my laser pointer pointed at their shoulders. Hence, I coined this innovation as Assisted Peer-Provocation Interactive Engagement (APPIE).
Philosophy of Science course was where I embedded the achievement of reasoning skills, social skills and character-building rather than the knowledge and understanding. This was done by getting the students to philosophize through informal debate sessions during the regular classroom meeting and in the formal debate sessions during the last 3 weeks of the semester. Two groups from different programs were paired to debate on contemporary issues concerning the science methods, science discoveries and environmental issues. All the pairing was done by me through a matrix I designed to ensure that opposing teams were from different programs.

The debate was adjudicated by lecturers from the respective programs to assess each individual’s verbal communication ability, the accuracy of the arguments and their teamwork cohesion. The end of the two or three week debate was capped with the PREMIERE DEBATE represented by the top 10 debaters from various programs. The premiere debate was organized by the students but the arrangement was made by me. Judges for the premiere debate were the Program Heads, Deputy Deans and Heads of centers of UiTM. In the Jan-April 2010 premiere debate, the judges were the top UiTM management including the Chairman for UiTM Board of Directors, Tan Sri Dr. Wan Mohd Zahid Mohd Noordin.

In addition to the debate and APPIE, students also experienced the need to be original in their writing. All of their essays were first screened through the software TURNITIN which will inform them of their originality index. After 2 attempts to submit short essays to TURNITIN and knowing about their originality index, the mid-term and the final-term essays were submitted to TURNITIN to be scored and graded. The cutoff for failing the course was set at the originality index of 0.60 which meant at least 60% of the writing was to be their own original writing rather than copying and pasting from internet sources or from their peers’ work.

Acceptance from the students to the APPIE was quite varied. The initial few weeks saw students being reluctant to respond to the class interactive engagement but the momentum began to peak up after the 5th meeting. If by the end of the 14 weeks of face-to-face sessions there were still students who had not fulfilled the minimum of 2 classroom interactive engagement, I would initiate a special session for these students to debate with me on the issues of my choice. This way, I helped the students to improve on their verbal reasoning and they will not fail the course. Grades for the course were given on a Pass/Fail basis. Hence, criterion-referenced assessment was employed and the criterion used to pass the course was just the minimum performance demonstrated by interactive engagements, debate and 60% original writing in 2 essays. I end this essay with a quote from Aristotle:

"If you ought to philosophize you ought to philosophize; and if you ought not to philosophize you ought to philosophize: therefore, in any case you ought to philosophize. For if philosophy exists, we certainly ought to philosophize, since it exists; and if it does not exist, in that case too we ought to inquire why philosophy does not exist -- and by inquiring we philosophize; for inquiry is the cause of philosophy."
Innovation in Basic Physics II—an algebra-based physics for Technologists (5Es & PODS)

Workshop Learning Cycle via Prediction-Observation-Discussion-Synthesis or PODS

As technology advanced, physics education researchers found that learning experiences involving the use of concrete and visual objects helped students to understand abstract concepts and relationships. Even though Piaget claimed that the formal reasoning stage of intellectual development begins to develop at the age of 14 years of age, his theory was not agreeable by psychologists. In fact, research evidences showed that many who are more than 14 years old have not reached the level of formal reasoning. (Formal reasoning is the ability to deal with abstraction by performing mental experiments.) Hence, I had advocated the use of simulations in this course to help concretize concepts and physical events that are usually very abstract.

As an example, the concept of charging by induction, transfer of charges, electrical forces experienced by charged particles, electric field created by charged objects, current that branched out at a node or junction are all abstract concepts in the study of electrostatics and electricity. The laws that are derived from phenomenon in these learning areas such as the Coulomb Law or the Inverse-Square Law involved a lot of abstraction and require concrete experiences of the phenomena to be understood well by the students.

Basic Physics II course is a 3-credit hour course involving 120 hours of student learning time. Out of these 120 hours, almost 40% of the time is spent by students to experience the learning outside of the F2F classroom time. 20% of the time is used for students to discover and uncover relationships through laboratory and simulated scientific investigations while another 20% of that time is dedicated for face-to-face classroom activities. The remainder of the time is for the students prepare and sit for summative assessments.

In maximizing the uncovering and discovering, I advocated the use of both Workshop Physics and the Karplus Learning Cycle approach. The Karplus Learning Cycle involved using of 5Es. Students were to Engage (establishing connection between event and prior knowledge), Explore (guided hands-on activities to explore phenomena or objects), Explain (explain concepts and processes as a result of the exploration and new concepts are introduced as necessary), Elaborate (activities allowing use of concepts in context and build on what is known and understood) and Evaluate (assess the achievement and performance). Another version of the learning cycle is the Predict-Observed-Discuss-Synthesize (PODS) learning cycle.

The 5Es and the PODS were all done in a lecture-free 5 hours a week workshop session. Using a combination of free JAVA applets simulations and FLASH simulations such as those offered by the Physics Education Technology (PHeT) at the University of Colorado, Boulder, along with actual laboratory activities, students engaged, explored, explained, developed relationships and applied the relationship to physical phenomena related to electrostatics, electricity and magnetism. Some of the simulations were to be explored before coming to class consistent with the student learning time specified in attaining the credit hours for this course. In fact, they are to collect data from the simulated activity before coming to the laboratory for them to do an authentic exploration. Students contrasted and explained data collected from the simulation with the data they obtained from the laboratory investigation. Whatever differences they found were to be clearly identified and explained. As part of the learning experience, students were always required to make Predictions before each Exploration. Throughout the exploration stage, students practiced to record everything that they observed in their laboratory journal.
This course involved the use of journal to record every action, observation, processes and happening or events that took place throughout the engagement, exploration, uncovering and discovering process. The journal is an official record of all the activities that students observed with and engaged with while in the workshop sessions. The journal was assessed formatively during the first 3 uncovering tasks. Rubrics were used to grade the journal but the grade was not added to the final grade. Towards the end of the semester, the journal reporting for the last 3 tasks and for the laboratory examination were scored and graded as part of the summative assessment.

The use of simulation helped students to recognize and identify with tools and equipments and familiarized the students with the process for a particular investigation technique. On certain occasions, simulations were used to replace the authentic investigations because the investigation cannot be performed physically and visualization is not possible in an authentic investigation. I believe that telling the student about the inverse square and showing them the formula will not promote deep learning. My belief is supported by many articles that can be found in physics education journals and science education journals. Deep learning can be achieved when students developed the relationship by exploring and uncovering through the use of both simulations and laboratory activities. As part of the uncovering activities, students acquire skills of systematically collecting data, representing the collected data in an organized table, transforming the raw data into graphs and analyzing the raw and transformed data using spreadsheet software such as EXCEL.

Hence, I strongly support and practice talking and engaging WITH the students rather than TO the students based on the outcomes of their scientific investigations whether it is an authentic investigation or a simulated investigation. I support and practice the use of technology as enablers in achieving the cognitive and psychomotor learning outcomes. I had and continue to use the PODS learning cycle in a workshop teaching and learning environment as it aligns with research-validated pedagogy and is capable of improving students knowing, understanding and applying of the concepts and laws. Examples of the simulations used in engaging, exploring, discovering and modeling for my Physics classes are shown below (interested readers may google up PHeT):

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<tbody>
<tr>
<td>✓ Sparkling or lightning.</td>
<td>✓ Charging of insulators by friction or rubbing.</td>
<td>➢ Strength.</td>
</tr>
<tr>
<td>Simulation: John Travolta acquiring charges by rubbing his feet on the carpet.</td>
<td>✓ Gaining/losing charge.</td>
<td>➢ Direction.</td>
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<td>When he has acquired enough charge, the charge buildup will produce &quot;lightning&quot; or sparking between his first finger and the door knob.</td>
<td>✓ Opposite charge attracts.</td>
<td>➢ Attractive.</td>
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<td></td>
<td>✓ Coulomb’s Law.</td>
<td>➢ Repulsive.</td>
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<td>Simulation: A balloon or balloons become negatively charged when rubbed with a wool sweater and resulting in the sweater becoming positively charged. The</td>
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<td>Repelling electrical force strength by the length of its line.</td>
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<td></td>
<td></td>
<td>Electric Field.</td>
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<td>Simulation: The hockey</td>
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The amount of electrons transferred from the sweater to the balloon depends on the intensity and the duration of rubbing. This simulation also depicts, in part, the time taken for the negatively charged balloon to be attracted and travel to the positively charged sweater. “Puck” can be +ve or –ve charge. Bringing in a +ve or –ve charge as the “hockey stick”, caused position change and velocity change for the “puck”. The velocity change in 1 second depends on the separation between the “stick” and the “puck” and the strength of the “hit” (amount of charge on the “stick”). The idea is to score a goal by utilizing attractive force, repulsive force, electrical field & Newton’s Laws of motion.

**Concepts & Laws:**

- **Electric Field**
  - Strength
  - Direction
  - Factors affecting the strength
  - Sum of field at a point in space
- **Electric Potential**
  - Strength
  - Factors affecting its strength
  - Sum of electric potential at a point in space.

**Simulation:** Place a charge in the region to visualize the electric field produced. Measure the strength by

**Concepts & Laws:**

- **Capacitance**
- **Factors affecting capacitance**
- **Relationship between capacitance, amount of charge on capacitor and the voltage used to charge the capacitor**
- **Energy stored by a capacitor and factors affecting it.**

**Simulation:** Charge a capacitor with a battery and then observe how the capacitance, the amount of charge stored and energy stored are affected when the plate separation, the plate area and the medium used between the plates are

**Concepts & Laws:**

- **Electric Current**
- **EMF**
- **Bulb Intensity**
- **Relationship between current and EMF**
- **Relationship between current and resistance**
- **Relationship between bulb intensity and current**
- **Current & resistances in series & in parallel**
- **Bulb intensity for bulbs in series and in parallel**
- **Kirchhoff’s Current & Voltage Law.**
- **Ohm’s Law**

**Skill:** Connecting a simple & an extended circuit in series & parallel

**Simulation:** Construct a
using the field sensor. Vary the position of the sensor and measure how the strength of the field changed. Measure the electric potential with the equipotential meter. Move the meter around and measure how the sign and the strength changes. It can be repeated with a few different configurations of charges.

| varied. | simple circuit by connecting a bulb & a battery via connecting wires. Observe bulb’s intensity as EMF battery is changed or bulb’s resistance is changed. Place ammeters along the circuit to measure current flow. Use voltmeter to measure potential drop or potential difference between 2 points. Construct series, parallel circuit and 2-3 loops circuit. |

Even though I aspire and introduced innovative TLAs by using technology as learning enablers, I found that students have not improved much in their learning. This is evidenced from the standardized CI instruments or CIs items I used either in my pre-post assessment or when embedding these items in summative tasks (I used the Conceptual Survey in Electricity & Magnetism – CSEM and the Electric Circuit Concept Evaluation – ECCE). In fact, in items requiring them to explain, many did not do the explanation. Many were still banking on using just diagrams and quantitative approaches to respond to the item.

Even though a lot of classroom TLAs involve group discussion and interactive engagement involving the verb describe and explain, it is as though those engagement did not matter when they responded to summative assessment tasks. Formative assessment and feedback to the lack of evidence was continuously done during classroom engagement. In addition, many examples were also provided on the course website to assist the students in responding to items requiring them to describe, draw and explain but responses provided in assessment tasks do not provide much evidence that they can engage with the action verbs. In a way, I am quite frustrated… I attribute this lack of evidence to the students’ self-knowledge and self-motivation which, to a certain extent, is beyond my control.

One of the changes made in Bloom’s revised taxonomy was the introduction of the fourth dimension of knowledge, the introduction of meta-cognitive knowledge. Ultimately, self-motivation and self-knowledge is really lacking in my students. Checks on their use of non face-2-face student learning time revealed that they only utilized about 20% of the non F2F SLTs. Even a written commitment from them to the effect that they will change their attitudes did not help attain the outcomes.

As a result of not utilizing the non F2F SLTs, much or the engagement and exploration were minimally accomplished when they come for the F2F sessions. Many have not performed the simulations and have not even plan for either the lab activities or the interactive engagement lectures. Some had never even visited the course website until it was already to the end of the semester even though they have their own laptops and access to internet. This is indeed a big challenge. Coupled with the lack of oral communication abilities using English as the medium of instruction, this has forced me to seek beyond the classroom setting in order to understand the students’ perspective of learning.
Informal interviews revealed that many of my students still believe in last minute studying and last-minute accomplishment of assignment and assessment tasks. Their concern is more on just passing tests and examination. They are not “seeing” the big picture of education and how they will contribute towards the growth of this beloved nation. They could or perhaps would not relate their learning experiences at the university as part of the cognitive, psychomotor and affective self-growth. The big question for me now is not so much what to use or how to engage F2F TLA activities but rather how I can prepare the students to internalize the notion of self-knowledge and self-motivation.

I believe that concerned and caring champions must emerge among us to identify, propose and help implement ways to guide the students to attain self-knowledge. For the nation to be a high-income nation by 2020, this sorry state among our students must be dealt with at the earliest opportunity.

Innovation in University Teachers’ Professional Development

**Outcomes-Based Curriculum Design, Deliveries & Assessment of Students**

Since teachers who teach at universities are employed for their certification in their disciplines, their knowledge and understanding of Outcomes-Based Teaching & Learning need to be transformed.

In helping them transform, I have been assisting the university’s training unit, ILQaM, in conducting lectures and workshop since 2003. Much of the workshop in the earlier years of the millennium focused more on teaching and assessment approaches consistent with psychological findings on how people learn. Beginning in 2007, the lectures and workshops shifted towards Outcomes-Based Education (OBE) curriculum design, deliveries and assessment.

My lectures are aided by my power point presentations and compiled documents regarding OBE that are placed on my website. The lectures are aimed at helping faculty and program managers along with university teachers to be aware of and to internalize the paradigm shift from the traditional teacher-centered curriculum design and deliveries to the more student-centered approach in curriculum design, deliveries and assessment.

In helping them functionalize the understanding of OBE curriculum design that is consistent with the requirements of MQA accreditation and MOHE curriculum design, I developed an EXCEL template to assist curriculum designers in producing the LOKI (Learning Outcomes-“Kemahiran Insaniah” or simply soft skills) curriculum matrix. In the process of developing the matrix, all teachers that involved in the development will be able to understand their role and the role of the courses they are teaching, in supporting the achievement of our country’s aspirations of the graduates and the university’s vision and mission.

This curriculum matrix is a two-dimensional matrix which presents the courses offered by a program and how these courses are structured to support achievement of the program learning outcomes, the competency level for all the three domains or taxonomy of learning and the how the courses are structured to support attainment level for each of the much needed soft skills or generic student attributes.

The template helps minimize the time required to produce the curriculum matrix and the student learning time determination for a course and for a program. The template is quite user-friendly and it also comes with a guide on how to use the features. The initial
development (alpha version developed in March 2009) and its continuous enhancement (the present version is Jan 2011) are done by me despite my full teaching load equal to other lecturers at UiTM. The beta version (June 2009) involved some design and features enhancement assisted by Assoc Professor Dr Hadzli from Faculty of Electrical Engineering, UiTM. At the moment, the template is being used by all programs that are doing curriculum review and by all proposed new programs at UiTM. It is also being used by Universiti Sains Islam Malaysia (USIM) and a number of private universities in this country.

In addition to developing the template, I also developed a set of generic Program Educational Objectives (PEOs) and Program Learning Outcomes (PLOs) for MQF certification levels 4, 5, 6 and 7. These PEOs and PLOs were initially developed in March 2009 and have been revised numerous times to ensure it is relevant and consistent with the mission and vision of UiTM and the generic learning outcomes proposed by MOHE and MQF.

At present, I am actively lecturing, facilitating and coaching faculty members in improving their factual, conceptual and functional knowledge of OBE through ILQaM's "Kursus Asas Pengajaran" lecture series and through ILQaM's occasional workshop series on Outcomes-Based Teaching & Learning. In these lectures and workshops, I employed similar TLA approaches that I used for my classroom TLAs; interactively engaging the teachers during the lecture sessions and requiring them to develop the curriculum matrix and the SLTs. Effectiveness of my lectures and workshops is demonstrated by the numerous well-designed curriculum matrices which have been endorsed by MOHE and MQA. The effectiveness is also demonstrated by the highly positive remarks and grades endorsed by the participants in those lectures and workshops (I do not have access to the data and results but I have been verbally informed that I am the highest ranked facilitator/lecturer/coach for ILQaMs programs). I end this part of the essay with the following quotes:

“Paradigm Shift is a change from one way of thinking to another. It's a revolution, a transformation, a sort of metamorphosis. It does not JUST happen, but rather, it is driven by agents of change. Scientific advancement is not evolutionary, but rather is a "series of peaceful interludes punctuated by intellectually violent revolutions", and in those revolutions "one conceptual world view is replaced by another". Thomas Kuhn, 1962. The Scientific Revolution

“Learning is not a spectator sports. You do not learn much just sitting in classes listening to teachers, memorizing prepackaged assignments, and spitting out answers. You must talk about what you are learning, write reflectively about it, relate it to past experiences, and apply it to your daily lives. You must make what you learn part of yourselves.” Arthur W. Chickering

“The goal of intellectual education is not how to repeat or retain ready-made truths... It is in learning to master the truth by oneself at the risk of losing a lot of time and going thru all the roundabout ways that are inherent in real activity.” Jean Piaget