



## OPEN UNIVERSITY MALAYSIA: WAY FORWARD IN SCIENCE AND TECHNOLOGY EDUCATION

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### ABSTRACT

One of Malaysia's national agenda is to move towards a scientific and progressive society. Government strategies for Malaysia described in this paper highlights the importance of life long learning in achieving its national agenda. Open University Malaysia as a pioneer in open and distance education has a role in promoting life long learning in Malaysia. This paper highlights the key features of the university i.e. blended learning mode and e-learning platform which offers various benefits that could provide supports for creating an innovative society. In the context of science and technology, creating an innovative society means creating manpower with good foundation in basic science knowledge and science skills, a sense of appreciation of contributions and innovations in science and technology, positive attitudes and awareness on ethical issues. This paper proposes strategies to invest in the future by retraining man-power, promoting basic science and increasing the quality of technical courses.

**Keywords:** *Innovative Society, Policies, Science, Technology, Human Resource, Strategies, Investment*

### INTRODUCTION

Open University Malaysia (OUM), the nation's first open and distance learning university was established on 10 August 2000 to promote life long learning in the country. OUM has taken the challenge for the past eight years and has made its mission to be the leading contributor in democratising education; to develop quality education through multimode learning technologies; and to develop and enhance learning experiences towards the development of a knowledge-based society. OUM aims to contribute to the creation of knowledge-based society by removing boundaries and democratising education. This is inline with the nation's objective to establish a scientific and progressive society. The 2007 Malaysian Science and Technology Convention (MASTEC 2007) dated December 10<sup>th</sup> to 11<sup>th</sup>, 2007 held in Putrajaya Marriott Hotel themed Malaysian Science, Technology and Innovation: Strategizing and investing in The Future highlights the national agenda for moving from resource-led economy to innovation-led economy. Such agenda requires great progress in science and technology, and democratization of science and technology education for the working adult learners.

This paper describes key features of OUM, particularly its blended learning mode and e-learning platform and how these features can help to create innovative society. In the context of science and technology, creating an innovative society means creating manpower with good foundation in basic science and science skills, a sense of

appreciation of contributions and innovations in science and technology, positive attitudes and awareness on ethical issues. This paper also proposes strategies to invest in the future by retraining man-power, promoting basic science and increasing the quality of technical courses.

## CORE EDUCATIONAL STRATEGIES IN MALAYSIA

The innovation-led economic model consists of a balanced approach between market-driven and technology-driven innovation. The critical factor in this model would be the human capital. In his plenary talk, Dato' Dr. Mohd Taib Ibrahim, Deputy Secretary General, Ministry of Higher Education outlined the following plans which forms the core strategies for Malaysia to become a regional educational hub.

- Third Outline Perspective Plan (OPP3), 2001 - 2010
- Knowledge-based Economy Master Plan (KEMP), 2002
- 9<sup>th</sup> Malaysian Plan, 2006 - 2010
- National Higher Education Strategic Plan, 2007 – 2020

The OPP3 emphasizes lifelong learning as a platform to continuously upgrade the quality of workforce. Distance education and online education will be developed as an important element in education development strategies, providing another option of education for working adults. Public and private universities are also encouraged to develop centres of excellence through collaboration with industries or foreign partners. In line with OPP3, government will continue to give priority to intensify the use of ICT in all schools and higher learning institutions (Mohd Taib Ibrahim, 2007).

KEMP was developed to provide strategic directions for the nation to move into a knowledge-based economy over a ten year period. Developing knowledge-based human resources essentially encompass education, training and retraining, lifelong learning and sourcing of global talent. This efforts are also emphasized in the 9<sup>th</sup> Malaysian Plan, which aims to improve access and quality of education at all levels; producing tertiary institutions of international standing; nurturing top quality research and development, and scientific and innovation capabilities (Mohd Taib Ibrahim, 2007).

The National Higher Education Strategic Plan aims to produce graduates who are knowledgeable and competent and able to put into practice the knowledge gained. The graduates must be innovative, possess high cognitive skills, multi-lingual, able to communicate effectively and technology savvy, able to inculcate good values and contribute to the well-being of the society, nation and the global community. In order to achieve these, seven strategic thrusts were established under the Strategic Plan.

1. Widening access and increasing equity;
2. Improving the quality of teaching and learning;
3. Enhancing research and innovation;
4. Strengthening of higher education institutions;
5. Intensifying internationalisation;
6. Enculturation of lifelong learning; and
7. Reinforcing the deliver systems of the Ministry of Higher Education.

## ROLE OF OUM AS AN ODL INSTITUTION

The above educational strategies highlight the importance of an open and distance education. As a pioneer in this field, OUM has always reflected its position and strategize towards nation building.

OUM uses technology as an enabler to bring education to the masses. The use of ICT in education offers flexibility and wide access to learners throughout Malaysia. To date, OUM has 61 learning centres across Malaysia. Twelve of the learning centres are located across the sea in Sabah and Sarawak, thereby, removing the borders between the different states in Malaysia in the context of education. The centres are not only distributed geographically, OUM has also extended its educational service from the heart of Kuala Lumpur to rural areas such as in Keningau, Sabah. Having a successful borderless education framework in the country has encouraged OUM to expand. At present, OUM has learners in other countries such as Indonesia Singapore, Maldives, Baharin and Yemen.

An interesting aspect of OUM is that it has a concentrated pool of academic manpower that is supported by a large external academic manpower, mainly from public universities in Malaysia. The limited pool of manpower of 73 permanent academicians is from a wide range of disciplines. It has 5 faculties:

- Faculty of Information Technology and Multimedia Communication,
- Faculty of Education and Languages,
- Faculty of Applied Social Sciences,
- Faculty of Business and Management,
- Faculty of Science and Technology.

This interesting structure enables OUM to employ the latest approaches in the teaching-learning process in various fields and promote cross-field studies. Such setting allows OUM to offer academic programmes that cater to the demands of industry and marketplace in general. It positions OUM as a strategic centre that able to collaborate and integrate between organisations of various backgrounds: government and industry; and local and international.

### Blended Learning Mode

OUM uses blended pedagogical approach of learning to deliver its open and distance education programmes. The blended learning mode consists of three primary components:

- a. Self-managed learning using self-instructional modules
- b. Face-to-face tutoring
- c. Collaborative Online Learning

Learners are guided in their learning through self-instructional modules. Every module includes a course guide section which introduces learners to a recommended study plan, course synopsis along with recommended reading materials and the assessment method for the course. The study plan would show a learner the breakdown of actual hours for a course. About 80% of the total study hours are recommended for self-managed learning using self-instructional modules.

After every two-weeks of self-study, a learner can attend tutorial sessions along with other learners to discuss the course content with their tutor. It involves group learning facilitated by a tutor. This guided classroom session is an option offered to

mediate the learners who are accustomed to traditional classroom interactions. The tutor would initiate discussion of concepts and conduct activities involving problem-solving. Learners work together to resolve any unclear concepts introduced in the course. Learners also engage in group activities to enhance their problem-solving skills.

Throughout the entire semester, a learner is supported by myLMS (my Learning Management System), which is OUM's internally-developed web-based e-learning platform. It supports asynchronous online forum where collaborative online learning takes place facilitated by the face-to-face tutor. Collaboration, in simple definition, means work jointly to achieve a common goal. This session is similar to the tutorial session, except it is asynchronous and is online. It can be accessed from anywhere and at anytime. Learners and facilitators contribute to the process of knowledge construction by providing ideas and opinions, sharing experiences and simultaneously engaging in deep learning activities (Kaur, K. & Zoraini, 2004). Through collaborative online learning, learners can test their understanding and problem-solving skills they have acquired through discussions and solving problems in their respective groups. In distance education, discussion and sharing experience have been identified as two of the most effective means by which adults learn (Williams, B., 2004).

At OUM, one of the first courses learners must register for is the "Learning skills for Open and Distance Learners" course. Upon registration for this course, learners are provided with "The Learning Skills for Open and Distance Learners" module (OUMH1103 Module) which is the primary learning material for them to manage their learning. This course will ensure that they will be ICT savvy and learn the basic learning skills and search strategies for information retrieval.

The blended mode encourages the training of learners as self-directed learners who are motivated and in control of their own learning. Active learning incorporated in the blended mode tends to capture the interest of the learners. In addition, this mode of learning encourages individuals to be result oriented, able to work independently, able to collaborate and work in a team, able to discuss and express their opinions (written and oral), as well as being equipped with basic ICT skills.

The blended mode learning strategy is often supported by additional learning materials such as courseware CDs, virtual laboratories CDs, e-content and others. For example, Motion, Fluids and Waves course introduce learners to physical quantities, vectors, kinematics, dynamics, work, power and energy, uniform circular motion, rotational kinematics and dynamics, fluids, periodic motion, progressive waves and mechanical waves. The learners are guided to understand difficult concepts by visual using a courseware CD for this course. Some of the experimental exercises given are determination of the earth gravitational acceleration and generation of stationary waves.

### **OUM Programmes**

In year 2002, OUM had the first inaugural intake of about 2,500 teachers through its collaboration with the Ministry of Education (MOE). The Bachelor of Education (Science/Mathematics/Engineering) with Honours programme is tailor-made for in-service teachers attached to the MOE and constitutes an integral part of MOE plan to ensure, by the year 2010 all science teachers under the Malaysian secondary school possess university degree. The development of the curriculum is designed to increase the learner's pedagogical knowledge, teaching and student-assessment methodology and to improve knowledge in science. In line with the government policy to increase usage of

English Language, self instruction materials are developed in English language while the tutorials are mostly conducted in English.

In the Bachelor of Education (Science) programme, OUM in collaboration of other Universities organize chemistry, physics and biology practical in various sub-disciplines. These are listed at the end of the modules. Complex laboratory experiments from the listed experiments are chosen for the development of the virtual laboratories on CDs. Six virtual laboratories developed by OUM supplement the scientific laboratory skills learnt by the students in the conventional laboratories:

- Physical chemistry
- Basic techniques in laboratories safety
- Microbial diversity and physiology
- Plant and animal diversity
- Cell biology and cellular biochemistry
- General genetics

The content for the virtual laboratories are developed by Subject Matter Expert or by a group of experts. The content is written up for discussion with technical experts and graphic designers from OUM's ICT and Center for Instructional Design and Technology. After several discussions the contents with interactive animated laboratories exercises are put up for student's interactive learning. There are two aspects in the virtual laboratory:

1. Preparing the laboratory lessons based on the content of the existing module and testing for its standards and acceptability by the laboratory coordinators at various centres and selected students.
2. Developing technical tools or utilizing and adapting available tools or both for students' access and learning at their own time.

A study conducted by Mukherjee et. al. for both General Genetics and Cell Biology and Cellular Biochemistry reveals that the students appreciate the virtual laboratories that further enhance their scientific skills (Mukherjee, Azizah, Ch'ng and Kumar, 2006).

Bachelor of Nursing Science Nursing with Honours is another programme endorsed by the Malaysian Nursing Board. The programme seeks to enhance the knowledge and skills of diploma holders in nursing through a post-registered degree programme and contributes to the advanced health care needs of the nation, community and the future development of nursing care and profession. This robust programme covers in-depth knowledge, professional and clinical skills as well as the caring attitudes as the role of an expert nurse and leader in nursing. The clinical specialties courses include Critical Care Nursing, Trauma and Emergency Nursing, Paediatrics Nursing, Mental Health Nursing, Oncology Nursing and Renal Nursing.

OUM has also collaborated with the industry partners such as Nestle Malaysia to enrich their employees with professional qualifications through the executive diploma programme in manufacturing engineering. In this project, OUM's Institute of Professional Development pulled its resources from both the Faculty of Science and Technology and the Faculty of Business and Management to design a program to cater for the specific need of the program. The subject matter experts in this programme involve experts from both the academic and the industrial manpower. This joint venture gives OUM an excellent experience and an upper hand towards creating programmes that meet the market demands.

Such collaboration are not only limited to links within the country. OUM has established good working relationship with few universities from various parts of the world. In recent years, it is actively involved in creating educational programmes for various market needs outside Malaysia. The Institute of Professional Development of OUM for example has collaborated with the Ministry of Education of Saudi Arabia, Maldives, Bangladesh and Sri Lanka.

The future direction of OUM must be paved in ways that it would give the university a competitive advantage. This paper reviews the idea of creating an innovative society and how the way forward in the area of science and technology can be strategised.

### **OUM's ROLE IN CREATING AN INNOVATIVE SOCIETY**

An innovative society refers to a society capable of original and creative thoughts. Such society would have a very high potential for development. In a country like Malaysia, which has a service and manufacturing based economy, this can be a push factor to move forward and to become a fully developed country. There are many contributing factor that can lead to such success.

In the context of science and technology, the desired outcome would be human capital with good foundation in basic science and science skills, sense of appreciation of contributions and innovations in science and technology, positive attitudes and ethic and safety awareness. Science is a culture. It has to be instilled, nurtured and developed through excellent education programmes and creation of a stimulating environment. Dr. Larry Weber in his address at MASTEC2007 emphasized the importance of basic science which enables applied science to flourish. Some of his recommendations includes: education systems that equip students with foundation for future inquiry in technical subjects; workforce training systems to improve skill; create innovation ecosystem; international collaborations (man-power); sustain and strengthen the nations commitment to long term research, and ensure continuity (most innovation comes from basic research was conducted at the time it was conducted had no demand); and investment in basic research, facilities, and instruments.

OUM plays a very important role in this aspect. Some of the fore-mentioned recommendations by Dr. Weber's are already implemented. The degree programme for in-service teachers described in the above section, involve primary and secondary school teachers. At Faculty of Science and Technology, these teachers are enrolled as learners in the bachelor of education programme with major in Science, Mathematics, or Engineering (Electrical/Mechanical/Civil). These workforce training programmes are designed to support MOE's attempt to improvise the teaching and learning of science in schools and to create an innovative ecosystem. The programme includes courses such as professional ethics and current issues in science as part of the strategy to produce innovative society.

### **STRATEGIZING AND INVESTING IN THE FUTURE**

Creating of manpower to promote the creation of innovative society needs a thorough planning and long term investment. The plan should cover from pre-school to tertiary education and has to be integrated. Nevertheless, a short term plan to create such manpower is also needed. A good short term plan is retraining the existing manpower. At OUM, programmes involving working adults can be used as a route to retrain existing manpower. Programmes can be structured as a training ground to create innovative and competent K-professionals. K-professional should have eight competencies: strategic

thinking skills, knowledge responsibility, continuous learning, contribution in innovative teams, professional disciplines, innovation and creativity, solution focus mindset and personal improvement (JT Frank). Courses such as creative thinking, interpersonal skills can be part of the curriculum.

OUM can be a strategic centre to promote basic science by creating e-community made of science teachers and researchers from all over the country. Using its very own instructional design support, OUM can promote the teaching and learning of basic science by creating web-based interactive learning materials which introduces basic science, the application of basic science in the real-world as well as in laboratories, and innovations in science and technology to its e-community and school children. The strong connection between youth and ICT can be used to capture learners' attention. Virtual-world could draw attention to interesting phenomenon, technology and innovations, thus connecting them to science in the real-world as well as in research laboratories. Today's youth are Visio-spatially intelligent and talented and may need to experience instruction that is visual and that requires active participation. The virtual lab experience combines visual and auditory modalities and requires students to be actively involved (T. A. Stuckey-Mickell & B. D. Stuckey-Danner, 2007).

Technical courses taught in an ODL can be more interesting and effective in its delivery compared to the lecture-based teaching. Research shows that active learning strategy incorporated in self-instructional materials encourage learners to think and construct knowledge as they read and it can happen at their own pace. The long prevailing issue in science and other technical courses in ODL is the implementation of the laboratory component. The quality of ODL structured science and technical courses can be improved tremendously by resolving this issue. At present, OUM uses external laboratory facilities and supports some of the technical courses using e-contents that feature virtual laboratories. Virtual laboratories gives learners a chance to visualise an experiment; and placed within an e-content it also encourage learners to think, by incorporating active learning and support learning by providing required information. This feature can be further enhanced by introducing science in a new light. Practical work should not be seen as a task that must be completed in order to pass/ excel in a course. Every experiment or project should be introduced as a phenomena or a solution to be discovered. The emphasis should be on the process of arriving at the discovery or solution. Science and technology must be seen as part of human life, and this should be clearly indicated in every practical work assigned to the learners. Creating a high correlation between learners and their learning objectives is critical for effective learning, especially for adult learners. It also helps to motivate the learners to excel in their learning.

Good foundation in science and creative thinking supported by able engineers lead to technology novelties. In today's world as pointed out by Prof. Ahmad Zewail in his public lecture titled, "Investing in the Future," 2007, the trend is to move away from single area of expertise. In order to create an innovative society we have to realise the importance of integration and create man-power capable of such process across various field of expertise. The above highlight on OUM as an ODL institution pointed out its strategic setting to engage in cross-field studies. OUM has the right environment to excel in this area and create an international centre of theoretical studies. It has the ability to collaborate, work and gain support from various research institutions (local and international).

The above are few strategies that OUM can embark as an investment and a way forward in science and technology. The objective of these strategies is mainly to contribute to the collective effort of creating an innovative society in Malaysia.

## CONCLUSION

OUM as a pioneer ODL institution in Malaysia strategise along the nation's interest to move towards a scientific and progressive society. The importance of life long learning in achieving its national agenda is clearly indicated in the government strategies. OUM's blended learning mode and e-learning platform offers various benefits that could provide supports for creating innovative society by creating manpower with good foundation in basic science and science skills, a sense of appreciation of contributions and innovations in science and technology, positive attitudes and awareness on ethical issues. The way forward strategies proposed in this paper include retraining of man-power, promotion of basic science using e-community, increasing the quality of technical courses and moving towards cross-field studies.

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