

THE HUMAN RESOURCE PERSPECTIVE
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THE NATIONAL STRATEGIES IN THE REORIENTATION OF STUDENTS' INCLINATION TOWARDS SCIENCE AND TECHNOLOGY

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INTRODUCTION

I would like to begin by looking at a brief history of our educational policy since we gained independence from Britain in 1957 with particular reference to the National Strategies in the Reorientation of Students' Inclination towards Science and Technology. We inherited the British Colonial Educational policy and made changes to prepare ourselves for independence. At the beginning of independence the Razak Report became the basis of our present day educational policy and practices.

During the British Administration students obtained secondary education through the medium of English. At that time students studied General Science up to school certificate level. In some selected schools Additional General Science was offered as an extra qualification to enable students to go for further studies in science related fields such as medicine, engineering and architecture. Only a handful of students managed to grab the opportunities. Most of them find some difficulties during their studies at higher levels.

At the early stage of independence we experienced shortage of science and mathematics teachers. Most of our trained teachers were hardly qualified to teach Additional General Science because their knowledge of science was only confined to General Science. Most of the science teachers came from overseas as contract officers. They were put to teach Additional General Science and most of them returned to their own countries after completing their contracts.

SCIENCE CURRICULUM

The Razak Report introduced new science curriculum for immediate implementation in order to orientate students' inclination towards science. The Additional General Science subject was scrapped and in its place pure science subjects of Physics, Chemistry and Biology were introduced at school certificate level. In stages, Bahasa Malaysia was made the medium of instruction in secondary schools replacing the English Language.

For the first three years students learned science as an integrated subject where science concepts, principles and theories were taught as related knowledge. After "Sijil Rendah Pelajaran" examinations, the students who obtained good results in science and mathematics were channelled into the science stream or given places in technical schools. The rest of the students were put in the arts streams. Selected students who obtained weak passes were sent to vocational schools on their own choice. Thus, we have provided for both education in science and technology which was limited to technical and vocational fields.

Students in science and technical streams did not perform as expected in school certificate examinations. This might be due to many reasons:-

- (1) Students had to study too many subjects, at least eleven, consisting of Bahasa Malaysia, English, Agama/Chinese/Tamil, Geography, Mathematics, Additional Mathematics, Physics, Chemistry, Biology, Civics and Physical Education. Some schools offered Accounting/Commerce as an optional subject.
- (2) At Sijil Pelajaran Malaysia (SPM) examinations most students in the science stream sat for ten subjects including Special English paper (1119). Only top students made the grade and the majority of average students either obtained low grade or failed. Their peers in the arts stream mostly did better than them. As a result they were discouraged from learning science.
- (3) Most schools could not provide enough facilities, resources and manpower to make the teaching-learning of science effective. The students could not learn science through discovery, inquiry, problem solving, experimentations, inferences and hypothesis testing to make it more meaningful, interesting and challenging.
- (4) Many science teachers were not trained in the new methods of teaching science. Teacher training, retraining and inservice training programmes were not properly conducted and some of the teachers found difficulties in converting the medium of instruction from English to Bahasa Malaysia. This may look like a trivial matter but its implication to the learning process can be tremendous.

INTEGRATED SCIENCE CURRICULUM

The Integrated Science Curriculum was introduced to improve the teaching and learning of general science during the first three years of lower secondary schools. However, the new curriculum created more problems rather than solve pertinent problems in the learning of pure sciences.

The curriculum was adapted from the Scottish Integrated Science which was planned for the first two years of secondary education in Scotland. The Malaysian integrated science was extended to three years to provide the basic knowledge for students to proceed to pure sciences at fourth year level.

The time interval of two years in Form Four and Five might be too short for average students to progress in the study of pure sciences based on integrated science knowledge. The integrated concepts, principles, inferences and conclusions might produce barriers to learning in the forms of mental blocks and locks. The students might need guidance and help to overcome these barriers before they could proceed to the levels of understanding, mastery and retention of pure science knowledge.

Students have to unlearn integrated knowledge which could become barriers to specialised knowledge of pure sciences. These barriers can create all sorts of problems in the teaching and learning of the subjects. They might not have ample time to unlearn the barriers. As a result they might not be ready to sit for the school certificate examinations.

Workbooks have been used extensively in the teaching-learning of Malaysian Integrated Science. These workbooks have standard formats which allow students to fill up information without having to carry out experiments. This approach would lead students away from discovery and inquiry methods of science. The rigid formats in the workbooks do not encourage the processes of thinking and creativity in science lessons.

The Scottish Integrated Science uses worksheets only during the early stage to lead students to acquire the basic skills in learning science concepts and principles. These worksheets also lead students to improve their observations which are used to obtain inferences and conclusions. In the

next stage teachers and students have to work together as teams of simulated scientists to study science in the proper perspectives of discovery, inquiry, problem solving and decision making based on learning, thinking and creative skills.

Teachers of integrated science need proper training to be able to function effectively in the teaching-learning of modern science. They need to experience the modern techniques of science in order to help students to master the science knowledge and skills effectively. Most teachers find difficulties in teaching integrated science because they have learned science through the traditional approach. It is just like trying to solve today's problems using yesterday's method.

The teachers need to be involved in the development of integrated science curriculum in order to experience the new materials and techniques to be used in the classrooms. Without this experience they will find difficulties in teaching the new science. Most of the teachers were not involved in curriculum development since there is hardly any curriculum development activity in schools.

PURE SCIENCE CURRICULUM

Pure science curriculum was based and adapted from Nuffield Science developed by a group of British scientists for the main purpose of training future scientists. The Nuffield Science is a five year curriculum starting from first year of secondary education. We have adapted the learning materials for a two-year period with some changes in the techniques and methods of learning science. Naturally we would be facing a lot of problems due to unrelated contents, unfamiliar techniques, insufficient resources and lack of trained manpower.

There seems to be a lack of continuity between our integrated science curriculum and the pure sciences. The former curriculum is based on integration of science knowledge but the latter curricula requires the students to master the specialised knowledge of physics, chemistry and biology. On the surface this problem seems trivial but the differences that exist between the two curricula will require enormous efforts, special skills and a lot of energy on the part of students in order to acquire the necessary knowledge. The students may not acquire the right basic knowledge to continue learning pure sciences effectively.

LEARNING MATERIALS

The modern science requires students to obtain knowledge through discovery and inquiry. They need to be exposed to varied and diversified learning materials. Most of these materials are produced in English. Many of our students are weak in their English, as such they are restricted to materials produced in Bahasa Malaysia. The learning materials in Bahasa Malaysia are limited in terms of quantity and quality. Thus the students will face a lot of difficulties, problems and short comings in the learning of pure sciences.

Most of the textbooks used in the learning of pure sciences are produced with identical and almost similar formats with the simple excuse to fulfil the requirement of the official syllabi. This puts a restriction on student exposure to a variety and diversity of learning materials. Students can buy revision and worked example books produced commercially without official evaluation of reliability and validity of their contents. These books are also produced in almost uniform format where facts are presented in structured forms with the purpose of helping students to prepare for their examinations. This leads to the assumption that such materials are effective and helpful. They can be used for study purposes, especially near the examination time.

Many students refer only to revision books and notes which are commercially produced in their endeavour to prepare for the Sijil Pelajaran Malaysia examinations. They have the assumptions

that these materials are better than the official textbooks and teachers' notes. They have not realized that the contents of these books may not be accurate and appropriate. Most of them also depend entirely on commercially produced notes without being involved in their preparation, exposure and presentation. Thus it is possible for a student who is learning pure sciences to miss the interaction with learning materials through discovery and inquiry by only referring to commercially produced books and notes.

PARENTAL CONCERNS

Most parents are concerned about their children's performance in the SPM examinations. Some parents take various actions to make sure that their children learn effectively. Many of them send their children to tuition centres to get additional help. Unfortunately, this practice creates many problems to the students without their realization and knowledge because of the following reasons:

- (1) Overlapping and differences between the teaching-learning in schools and tuition centres may occur and students may be confused. This will affect their understanding, mastery and retention of the learning materials.
- (2) Overlapping may occur and the student will find that learning is boring, time consuming and uninteresting. This may affect their attitudes towards learning.
- (3) The learning of science is restricted to limited exposure and the methods used are not normally in accordance with the practices of science. The knowledge acquired can help students to pass their examinations but they may face difficulties and problems in mastering it for future use.
- (4) The main objective of tuition centres is to train students to have the skills of answering examination questions so that they can get good marks at the expense of other important skills. Such training may produce unbalanced students in terms of skill development. They may face problems and difficulties at higher levels of learning.

CONCLUSION

I would like to take the stance that as a nation we have formulated the right strategies in the reorientation of students' inclination towards science and technology with the policies on pure science curriculum, technical and vocational schools, Kurikulum Baru Sekolah Rendah (KBSR) and Kurikulum Bersepadu Kurikulum Baru Sekolah Menengah (KBSM). Our main problems seem to be in the areas of implementation, directions and guidance where students can gain the experience of learning science in interesting, meaningful, enjoyable, effective and challenging ways. I believe we can do this by exposing our students to varied and diversified learning activities to acquire the following skills and experiences through active involvement, participation and commitment.

- (1) The students should be trained to acquire all the necessary skills so that learning activities become interesting, meaningful and enjoyable to them.
- (2) The students should be given training in team building so that they could successfully form learning groups. Team skills will help them learn in accordance with the provisions and aspirations of our new curricula, that is Kurikulum Baru Sekolah Rendah (KBSR) and Kurikulum Bersepadu Sekolah Menengah (KBSM).
- (3) Students should be trained to acquire both Bahasa Malaysia and English skills through realistic activities with opportunities to use the languages across the curriculum.

- (4) Students are made to participate actively through skill training activities to enhance their abilities to understand, read, listen, comprehend, write, converse, communicate, think and improve their memories.
- (5) Increased emphasis is placed on the development of critical thinking skills through content areas so that schools can play the role of educating students for the technological world.
- (6) At school level, the emphasis should be placed on more learning by the students through less but effective teaching.
- (7) The schools should encourage the realization of human potential involving people, places, policies and programmes. Everybody and everything can and should invite students to develop intellectually, socially, psychologically and physically.
- (8) Schools should make full use of information technology by taking advantage of recent research findings on learning and memory.

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QUESTIONS AND ANSWERS

Question: What is your basis and standard of comparison when you say our standard of education is still in the Nineteenth Century?

Answer: The techniques of teaching used are obsolete. Teachers do not follow the modern theory of teaching which should be based on the following steps:

1. Presentation by teachers.
2. Acceptance by students.
3. Reinforcement which is carried out through exercises and re-explanation.
4. Application through problem-solving and other activities.
5. Evaluation has to be carried out to determine whether students have understood what have been taught. If they have understood, they should then be able to master the contents and retain them for examination purposes.

The above method of teaching is not adopted by teachers because they are more interested in covering the syllabus rather than ensuring that the students understood what has been taught.

Question: Are these problems or the source of these educational problems from the teachers or students?

Answer: Neither. The fault lies more with the training that the teachers have received. Trainee teachers are not really equipped with real-life skills in schools. They do not know how to adjust to the school situation after completing their training. For instance, when they ask their students to read and their students ask them how and what to read, these fresh teachers are stumped.