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# A Study of the Informational Needs of Teachers Teaching the Malaysian Integrated Science Course<sup>1</sup>

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Matlamat kajian ini adalah untuk menentukan keperluan-keperluan maklumat guru-guru yang mengajar kursus Sains Paduan di Malaysia. Empat keperluan maklumat yang dikaji adalah Pendekatan Mengajar dan Kaedah/Teknik; Isi maklumat latarbelakang mengenai tajuk-tajuk dalam kursus; Persediaan - untuk eksperimen-eksperimen dan demonstrasi; dan Penilaian - pembinaan butir-butir ujian berbilang pilihan.

Keperluan maklumat tersebut mungkin timbul oleh sebab ramai guru-guru yang mengajar Sains Paduan mempunyai sedikit latarbelakang dalam sains. Tambahan pula, kursus dalam perkhidmatan yang berlangsung sebanyak tiga siri, dan tiap satunya selama dua minggu, dirancang semata-mata untuk membiasakan guru-guru dengan kerja-kerja praktik yang berhubung dengan kursus.

Kajian ini dijalankan dalam dua peringkat. Peringkat pertama terdiri dari satu siri temu-ramah yang tidak terancang dengan 20 orang guru sebagai sampel. Peringkat kedua melibatkan penggunaan soalselidik yang dibina dari maklumat yang terkumpul dalam peringkat pertama. Soalselidik ini diberi kepada 76 orang guru-guru Sains Paduan yang merupakan satu sample dari berbagai lapisan dari 14 buah sekolah di kawasan bandar/luar bandar dari empat buah negeri - Kedah, Perak Utara, Pulau Pinang dan Perlis.

Setengah daripada keputusan kajian ini adalah: maklumat dalam kategori Pengajaran, terutama pengajaran dalam darjah yang berbagai kebolehan, diletakkan tertinggi sekali, sementara Penilaian terendah sekali; dalam kategori Isi, guru-guru telah menunjukkan yang mereka memerlukan maklumat mengenai tajuk-tajuk yang tidak terdapat dalam kursus-kursus sains dalam sukatan pelajaran lama; tidak ada perbezaan yang bermakna mengenai keperluan maklumat antara guru-guru di kawasan-kawasan luar bandar dan di bandar dalam semua kategori-kategori ini kecuali dua perkara dalam kategori Persediaan; kedua-dua kumpulan guru yang telah mengikuti dan yang tidak biasa mengikuti kursus dalam perkhidmatan menunjukkan bahawa mereka memerlukan maklumat-maklumat lanjutan mengenai Pendekatan Mengajar.

## Introduction

The Malaysian Integrated Science Course was adapted from the original Scottish version in the latter part of the 1960's. It was gradually introduced into the lower secondary schools in Peninsular Malaysia over a period of 8 years. By 1976 the course was fully implemented. This process of implementation has been fairly well documented<sup>2</sup> and has attracted several studies<sup>3</sup>.

This course can be seen as the long overdue starting point for curriculum revision in science education in Malaysia. However, recent studies<sup>4</sup> have indicated that changes in curriculum which requires changes in teaching styles and methods place very heavy demands on the teachers and often these demands are not met, resulting in the failure of these new courses or programmes. Gross's *et. al* work suggests that constant and immediate support is necessary to sustain these changes. The Malaysian Integrated Science Course, with its emphasis on experimental work and discovery learning is a typical example of such a curriculum.

The Malaysian Ministry of Education has tried to overcome this problem by providing teachers who are selected with a series of three 2-weeks in-service courses. However, as these courses are structured mainly to provide them with some familiarization of/with the practical work involved in the course and as most of the teachers have little and in some cases no background

in science, these courses are hardly sufficient to meet their needs<sup>5</sup>. These teachers would require continuous and immediate support, especially with the new teaching approach and content of the programme if they are to teach more effectively and be confident enough to be innovative in their teaching.

### Purpose of the Study

The survey reported here was undertaken primarily to ascertain the informational needs of teachers involved in teaching the Malaysian Integrated Science Course. Basically the main questions which this study hopes to clarify are:

1. What are the areas in which teachers would require further information?
2. What are the more important areas of need?

Subsidiary questions also asked in this study are:

1. Do the teachers in rural schools have different informational needs from those teaching in the urban schools?
2. Do the teachers who have followed the in-service courses have different informational needs?

It is envisaged that the information gathered will be used as a basis for the development of self-instructional modules for teachers involved in teaching the Malaysian Integrated Science Course.

### Method

The survey was conducted in 1976 following a two-stage approach. In the first stage, a series of unstructured interviews was held with twenty teachers from a stratified sample of urban/rural schools in the states of Kedah, North Perak, Penang and Perlis. Teachers were asked to discuss their problems in teaching the courses and the types of information that they would like to have to assist them in their teaching. They were also asked to suggest the best ways in which the information could be conveyed to them.

The intention of this first stage was to obtain unbiased and self expressed informational needs of the teachers. It was felt that it would be necessary to include this stage in order to minimize the occurrence of *perceived needs* in the study and to provide an opportunity to explore this area of needs without any preconceived notions on the part of the researchers. Comments of teachers in these interviews were also used to highlight some of points to be discussed later.

The second stage involved the administration of a questionnaire developed from the information gathered earlier to a second sample of teachers. The items in the questionnaire are unranked statements about the informational needs as expressed by the first sample of teachers. This second sample of teachers were asked to indicate their *agreement* or *disagreement* with each item on a 4-point scale. For validation purposes, teachers were also asked to rank items in order of priority to the tenth rank. The second sample of teachers consisted of 76 Integrated Science teachers from a stratified urban/rural sample of 14 schools in the 4 states mentioned earlier.

There was a 100% return of the questionnaire sent to the schools.

### Results and General Discussion

With regards to the first question asked, which is, **What are the areas of information needs of the teachers**, the responses obtained from interviews in the first stage revealed that the informational needs of the teachers can be broadly categorised into 4 areas:

1. Teaching approach and methods/techniques (T).
2. Content – background information on topics in the course. (C)

3. Preparation – for the experiments and demonstration. (P)
4. Evaluation – the construction of multiple-choice test items. (E)

The analysis of the data collected in the second stage of the study seems to support the above finding. All of the items scored less than 2.50 on the 4-point scale. This indicated that all the teachers perceived these four areas as areas of needs. Table 1 and 2 provide the relevant data.

One of the items in the questionnaire was inserted to see whether teachers perceived the conceptualisation of the course as being an area of need on the assumption that effective teaching of the course would be dependent on how well teachers have internalized the conceptualisation of the course. The data indicated that on the whole the teachers did not perceive this is as an area of need. This is perhaps because teachers had all understood and internalized the conceptualisation of the course. Alternatively it may be possible that teachers were more practical-minded and were more interested in the basic problems of getting the materials over to the pupils, rather than be concerned with the philosophy of the course. (See item 13, Table 1).

#### Teachers Informational Needs with Regards to Teaching, Preparation and Evaluation

The ranking of these needs was based on their means score on the 4-point scale, and are set down in the Table 1 below. These ranking can be composed with the teachers' own ranking of the items.

Ranking of According to Mean Score	Type of Information Required	Mean Score	Teachers' Own Ranking/Area Rank	
1	Teaching mixed ability class (T)	1.66	1	3.2
2	Following the MISC approach (T)	1.71	2	3.72
3	Training the lab. assistants (P)	1.72	4	4.70
4	Discussing results obtained by pupils (T)	1.76	5	4.5
5	Use demonstrations in discovery teaching (T)	1.79	3	4.05
6	Improvising apparatus (P)	1.92	7	4.8
7	Ways to deal with divergent results (T)	1.96	8	5.5
8	Organising and maintaining apparatus (P)	1.97	9	5.6
9	Expanding on a topic (T)	1.98	6	4.75
10	Self-evaluation (E)	2.01	12	6.3
11	Organising the practical work (P)	2.02	11	6.0
12	Developing multiple choice questions (E)	2.03	13	6.6
13	Underlying philosophy of the course	2.12	10	5.7

TABLE 1: Ranking of Items in the Preparation (P), Teaching (T) and Evaluation (E) categories according to mean scores and teachers own Ranking.

As shown in Table 1 teachers have ranked items related to information on teaching as being among the highest and items on evaluation among the lowest. This is also reflected in the ranking by mean score. The items in the area of preparation tend to be ranked in the middle. Feedback from the graduate teachers of the Universiti Sains Malaysia<sup>6</sup> seems to support this finding, especially with respect to the item on the need for information on the teaching of mixed-ability classes.

The fact that teachers indicated this area of informational need as being the most important is significant. It suggests that the teachers themselves feel that they had very little experience and expertise to deal with such classes. With the introduction of comprehensive education in the first three years of secondary school and the accompanying automatic promotion system, this is fast becoming an area of concern, and coupled with the generally authoritarian approach of our education system, the problem of teaching mixed-ability classes will become even more acute. It could be that teachers will require more than information to be able to handle these classes.

The item on the need for information on how to follow the approach advocated by the course which was ranked second could be also seen as symptomatic of the same problem. The teaching approach of the course can be characterised by activities such as guided discovery learning, open discussions and first hand experiences. This approach emphasizes individual differences, whereas in practice teachers are more at home in teaching the class as a single unit. According to the teachers interviewed, the lack of time to cover the syllabus and the unresponsiveness of the pupils forced them to adopt a more didactic teaching approach. Some of them also felt that the in-service courses they attended had not given them sufficient information and training to follow the approach<sup>7</sup>

Some of the items on need for information on the preparation for the teaching of the course were ranked highly, especially that for the training of supportive staff. This is indicative of some of the problems of getting efficient assistance from their laboratory staff. Most teachers expressed dissatisfaction with the type of support they had. Although the Ministry of Education had run a series of courses for laboratory assistants, there are still large numbers of them untrained and inexperienced. As one teacher puts it: "I have to prepare for all my experiments, distribute and collect all apparatus, and store them, and also teach 30 periods on top of it."

The items on the need for information on evaluation ranked the lowest. It may be due to the emphasis put on the development of multiple choice items during the in-service courses which made the teachers feel either confident enough to construct their own or alternatively to use items on the course which are published locally in numerous cheap books. Although teachers did not see this as being a problem area, it could very well become an area of concern as the types of test items developed either by teachers or book writers could be influential in the way the course would be perceived by the pupils and the way they would study. A cursory look at some of the test papers developed by the teachers and those found in these books shows that most of the items are of the recall type — at various levels of difficulty. Items testing higher levels of thinking are practically non-existent. Fed on such a diet, it would not be surprising if pupils become increasingly content-oriented.

### Teachers Informational Needs with Regards to Content

Table 2 shows how the teachers ranked their needs for background material to teach the course.

From Table 2, it is clear that, with the exception of the information on the cathode ray tubes there are very small differences between the items, indicating that perhaps the teachers felt that generally the information on these items was equally necessary for them to teach this course. This is not surprising as most of them (80% of the same have MCE science or less) had not been exposed to these areas of the content. The science courses which they took belonged to the old syllabus which did not cover these areas. Most teachers interviewed in the first stage suggested that they felt very inadequate when handling these topics.

It is interesting to note that the topic Geology was ranked the highest. It could be that apart from having little exposure of the topic the teachers felt very inadequate to teach it because local examples of the materials and concepts in Geology were not readily available around their schools.

Rank	Items	Mean Score (Scale 1-4)
1	Geology	1.83
2	Electronics	1.86
3	Ionic Theory	1.90
4	Colloidal Theory	1.92
5	Crystal Structure	1.93
6	Kinetic Theory	1.96
7	pH Theory	2.0
8	Cathode Rays	2.29

\* n = 76

TABLE 2: Ranking of Items on the Background Information as Required by Teachers.

#### Influence of Locality of Schools

The data were analysed to see whether there are any differences between the needs of teachers teaching the urban and rural schools. Table 3 show the rankings of the two groups.

Items	Urban Schools n = 38		Rural Schools n = 38	
	Mean Score	Rank	Mean Score	Rank Class
Teaching mixed-ability class (T)	1.57	1	1.55	1
Following the MISC approach (T)	1.57		1.64	2
Discussing results obtained by pupils (T)	1.57		1.73	4
Use demonstration in discovery teaching (T)	1.57		1.76	5
Improvising apparatus (P)	1.59	5	1.97	6
Organising and maintaining apparatus (P)	1.61	6	2.11	12
Organising the practical work (P)	1.92	7	1.98	8
Ways to deal with divergent results (T)	1.94	8	2.05	9
Training the lab. assistants (P)	1.96	9	1.67	3
Expanding on a topic (T)	2.02	10	1.93	7
Developing multiple-choice questions (E)	2.04	11	2.08	11
Self-evaluation (E)	2.1	12	2.05	9
Underlying philosophy of the course	2.2	13	2.15	13

TABLE 3: Ranking by Urban School Teachers and Rural School Teachers.

It would appear that except for two items there is no little differences between the informational needs of the two groups of teachers. The two items which show differences are in the category of preparation. As the differences between the two item seem to contradict each other it is very difficult to interpret these differences. Perhaps urban teachers with better facilities and supportive staff found that they did not need to train the laboratory staff, and in the rural and generally smaller schools where the facilities and supportive staff were not as good, there was a need for teachers to train their laboratory staff on their own and since there was relatively less amount of equipment in these schools the problem of organising and maintaining the equipment is considerably less.

The close match between the needs of the two groups is very significant. It could be that there are no real differences between these teachers. Basing on the sample, the teachers in the rural schools in the 4 states were usually not residents of the locality. Many of the teachers lived in urban areas and travelled as far as 30 or so miles to go to work. They all had similar academic background and professional training, given the centralisation of the curriculum and training in our educational system. Another contributing factor could be that with the Ministry's policies on the posting and transfer of teachers, teachers in most schools are not necessarily drawn from the locality of the schools. This finding would suggest that there would not be any need to supply different information to the teachers.

#### Influence of In-service Courses on the Needs of Teachers

The data comparing the needs of teachers who have followed the in-service course and those who have not are shown in Table 4. The ranking reflects the teachers' own ranking of the items.

Item	In-service n = 58		No In-service n = 18	
	Mean Rank	Rank	Mean Rank	Rank
Following the MISC approach (T)	3.58	1	3.75	2
Teaching mixed ability class classes (T)	3.75	2	3.65	1
Discussing results obtained by pupils (T)	3.95	3	4.7	5
Using demonstrations in discovery teaching (T)	4.1	4	4.7	5
Expanding on a topic (T)	4.35	6	4.1	3
Improvising Apparatus (P)	4.33	5	4.7	5
Training the lab assistants (P)	4.85	7	5.05	8
Underlying philosophy of the course	5.17	8	4.15	4
Ways to deal with divergent results (T)	5.45	9	5.45	9
Organising and maintaining apparatus (P)	5.9	10	5.85	10
Organising the practical work (P)	6.0	11	6.1	12
Self evaluation (E)	6.0	12	5.85	10
Developing multiple choice questions (E)	6.6	13	6.72	13

TABLE 4: Comparison of Informational Needs of Teachers who have followed the in-service courses and those who have not.

The data indicate that there are very little differences in the ranking of most of the items of the two groups. This could suggest that the treatment of these aspects in the in-service courses are not sufficient. It should be emphasized that these in-service courses were designed primarily to familiarise the teachers with the experiments throughout the entire of the 3-year course. And as these courses are of 2 weeks duration there may not be sufficient time to go into the details of the courses.

It is not surprising that teachers who have followed the course would rank the need for information on the conceptualization of the course, the improvising of apparatus and the use of demonstrations lower than those who have not. The in-service courses did include some aspects of improvisation, and demonstrations of the different techniques which could be used in the teaching of the MISC course. However both groups are in agreement with regards to the importance of the need for further information on the teaching approach. One of the teachers remarked that the teachers would like demonstrations in real life class situations of the teaching approach advocated by the course and that perhaps a series of videotapes illustrating this would be extremely useful. This remark is useful particularly with regards to the way in which this type of information could be best conveyed to the teachers. Further work in this area would be very useful.

### Concluding Remarks

Although the survey had focussed on the informational needs of the teachers involved in the teaching of the Malaysia Integrated Science Course and their perceptions of the relative importances of these needs, it seems obvious that the teachers are having serious problems in the teaching of this course, especially with regards to the teaching approach and the handling of mixed ability classes. The production of self instructional modules on these aspects of teaching may not be sufficient to meet the teachers' needs. As suggested earlier, other forms of media may be more appropriate, even so, there seems to be sufficient evidence to indicate that a comprehensive and detail evaluation of the course will be necessary, especially to find out more about the problems of teaching this course. At the time of writing this report, it was announced that the Federal Schools Inspectorate will be carrying out an evaluation of the science programme in the lower secondary together with the other programmes in science and mathematics in the primary and lower secondary schools. While this is a step into the right direction, it might be worthwhile to consider carefully whether it would be appropriate for the Inspectorate to carry out the evaluation. This remark is not made to demean the capability of the Inspectorate. The Federal Inspectors are viewed with respect and they are perceived as figures of authority. It would be extremely difficult for Malaysian teachers to change this image of the Federal Inspectorate and there is every possibility that the information the Inspectors obtain may be different from what is being practiced. This suggests that an evaluation by a group of people who are not directly connected to the Ministry of Education may be more appropriate and will provide the information which could be used for further improvement of the Malaysian Integrated Science Course.

### Notes

<sup>1</sup> This study was carried out jointly by the author and a colleague, Encik A. Lourdusamy. Encik A. Lourdusamy is now overseas on Fellowship.

<sup>2</sup> Chang Kwai and Prahbakar, 1973.

<sup>3</sup> Lewin 1975 & Charlesworth 1976.

<sup>4</sup> Gross et. al. 1971; Schools Council, 1973.

<sup>5</sup> In a study conducted by Lewin (University of Sussex) in 1975, he found that in his sample of teacher teaching Integrated Science, 42% or 99 out of 235 teachers were not trained to teach science.

<sup>6</sup> Choo, 1979.

<sup>7</sup> See later discussion on the influence of these courses on the teachers' perceptions of their needs.

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