COPYRIGHT AND USE OF THIS THESIS

This thesis must be used in accordance with the provisions of the Copyright Act 1968.

Reproduction of material protected by copyright may be an infringement of copyright and copyright owners may be entitled to take legal action against persons who infringe their copyright.

Section 51 (2) of the Copyright Act permits an authorized officer of a university library or archives to provide a copy (by communication or otherwise) of an unpublished thesis kept in the library or archives, to a person who satisfies the authorized officer that he or she requires the reproduction for the purposes of research or study.

The Copyright Act grants the creator of a work a number of moral rights, specifically the right of attribution, the right against false attribution and the right of integrity.

You may infringe the author’s moral rights if you:
- fail to acknowledge the author of this thesis if you quote sections from the work
- attribute this thesis to another author
- subject this thesis to derogatory treatment which may prejudice the author’s reputation

For further information contact the University’s Copyright Service.

sydney.edu.au/copyright
GUIDELINES TO PLANNING
DENTAL HEALTH EDUCATION WORKSHOPS
FOR MALAYSIAN TRAINEE TEACHERS

KHAIIRIYAH bt. ABDUL MUTTALIB
B.D.S. (BRISTOL)

A thesis submitted in partial requirement for the
DIPLOMA IN PUBLIC HEALTH DENTISTRY

Department of Preventive Dentistry
Faculty of Dentistry
University of Sydney

1993
SUMMARY

Dental health education (DHE) for schoolchildren is given a high priority in Malaysian school dental programmes. Historically, DHE to target groups of schoolchildren has been the responsibility of dental personnel, especially visiting dental nurses in primary schools. Reinforcement of dental health messages by schoolteachers was not a part of the programme.

In recognition of the need for reinforcement of dental health messages by schoolteachers, there was liaison between the Ministry of Education and the Dental Division of the Ministry of Health, Malaysia. This liaison resulted, in 1990, in the incorporation of DHE workshops into the curricula of primary trainee teachers in Teachers' Training Colleges.

This thesis undertakes a literature review as an attempt to underline the role and rationale of DHE utilising teachers as dental health educators. It also makes suggestions towards a basic instructional content for DHE workshops in the context of the Malaysian government dental service.

The role and rationale of schools as the key place for reinforcement of dental messages is expanded for the benefit of dental personnel involved with such programmes as well as for the teachers involved. Educational approaches and techniques are briefly underlined, in view of the fact that many dental personnel involved with DHE are severely handicapped by lack of teaching skills. Broad outlines of topics and concepts concerning dental health and diseases are identified as basic curricula components for trainee teachers. It is suggested that planning of workshops should utilise questionnaires as an effort towards a pre-programme behavioural analysis of the target group as well as a means of post-programme feedback on the organisation, format and content of the workshops. The "Scientific Basis of Dental Health Education" (Levine 1989) is suggested as background
reading text for trainee teachers, until such time as when a local text, tailored to local needs and situations and in the appropriate language, is produced. DHE by teachers for primary schoolchildren should follow the format of the existing graded curricula guide for dental nurses. Examples are given of methodology of lesson plans as identified by Malaysian education personnel as well as attempts to incorporate DHE into various aspects of subjects in the primary curricula.

This thesis also discusses the problems of evaluation of DHE in school programmes as well as the problems of monitoring teacher activities. Background literature review has been carried out to demonstrate the equivocal nature of published evaluations of school DHE programmes. In evaluating the process of DHE by teachers, it is very clear that all efforts by the Dental Division of Malaysia cannot stand in isolation. Long lasting problems of teachers perceiving DHE as of low value have yet to be overcome, but efforts can be made by dental personnel to present dental messages, to specific community groups, which are scientifically accurate and in keeping with the times.
ACKNOWLEDGEMENT

I would like to express my deepest appreciation to Professor P.D. Barnard for his tireless advice, information, assistance and supervision in the preparation of this thesis. My thanks also go to Dr. Shanti Sivaneswaran for her warm guidance and discussions.

I would like to extend my thanks to Dr. Rohani Ramli, Assistant Dental Director II, Dental Division, Ministry of Health, Malaysia for information supplied pertaining to dental health education workshop programmes for trainee teachers, and to my colleagues in the Dental Division, Ministry of Health, Malaysia for all their help and encouragement.
DEDICATION

Praise be to Allah, Lord of the worlds.
The Beneficent, the Merciful.
Owner of the Day of Judgement.
Thee (alone) we worship; Thee (alone) we ask for help.
Show us the straight path. The path of those whom Thou hast favoured.
Not (the path) of those who earn Thine anger nor those who go astray.
(Al Fatiha 1:1-7)

This thesis is dedicated to my husband Noorizan, my children Ashraf, Nisa, Iman and Ariff and my parents for their love, support and encouragement.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summary</td>
<td>i</td>
</tr>
<tr>
<td>Acknowledgment</td>
<td>iii</td>
</tr>
<tr>
<td>Dedication</td>
<td>iv</td>
</tr>
<tr>
<td>Table of Contents</td>
<td>v</td>
</tr>
<tr>
<td>List of Tables</td>
<td>viii</td>
</tr>
<tr>
<td>List of Figures</td>
<td>ix</td>
</tr>
<tr>
<td>1. INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>2. ISSUES PERTAINING TO DENTAL SERVICES FOR PRIMARY SCHOOLCHILDREN IN MALAYSIA</td>
<td>5</td>
</tr>
<tr>
<td>2.1 THE EDUCATION SYSTEM IN MALAYSIA</td>
<td>7</td>
</tr>
<tr>
<td>2.2 DENTAL SERVICES IN MALAYSIA</td>
<td>8</td>
</tr>
<tr>
<td>2.2.1 Curative Dental Programmes</td>
<td>8</td>
</tr>
<tr>
<td>2.2.2 Preventive Dental Programmes</td>
<td>10</td>
</tr>
<tr>
<td>2.3 DENTAL ISSUES OF PRIMARY CHILDREN AGES 6 - 12 YEARS</td>
<td>13</td>
</tr>
<tr>
<td>2.3.1 Oral Health Status of Malaysian Children Below 16 Years</td>
<td>13</td>
</tr>
<tr>
<td>2.3.2 Workforce in Dental Programmes for Primary Schoolchildren</td>
<td>17</td>
</tr>
<tr>
<td>3. RATIONALE OF PRIMARY SCHOOL-BASED DENTAL HEALTH EDUCATION (DHE)</td>
<td>21</td>
</tr>
<tr>
<td>3.1 REVIEW OF SOME SCHOOL-BASED DHE PROGRAMMES</td>
<td>22</td>
</tr>
<tr>
<td>3.2 DEFINITIONS OF TERMS USED IN SCHOOL-BASED DHE PROGRAMMES</td>
<td>32</td>
</tr>
<tr>
<td>3.2.1 Health</td>
<td>32</td>
</tr>
<tr>
<td>3.2.2 Health Education/Promotion</td>
<td>33</td>
</tr>
<tr>
<td>3.2.3 Dental Health Education/Promotion</td>
<td>34</td>
</tr>
<tr>
<td>3.2.4 DHE: Connection with Prevention</td>
<td>35</td>
</tr>
<tr>
<td>3.3 EDUCATIONAL CONCEPS AND PRINCIPLES AS APPLIED TO SCHOOL-BASED DHE</td>
<td>36</td>
</tr>
<tr>
<td>3.4 TYPES OF CURRICULUM THAT CAN INCORPORATE DHE</td>
<td>39</td>
</tr>
<tr>
<td>3.5 RATIONALE OF DHE AS RESPONSIBILITY OF SCHOOL AND TEACHERS</td>
<td>41</td>
</tr>
</tbody>
</table>
4. ISSUES OF DHE WORKSHOPS FOR MALAYSIAN PRIMARY TRAINEE TEACHERS

4.1 DHE WORKSHOPS

4.1.1 Planning a DHE Workshop

4.1.2 Evaluation of Trainee Teacher DHE Workshop

4.2 USE OF QUESTIONNAIRES

4.3 BACKGROUND DENTAL HEALTH LITERATURE FOR TEACHERS

4.4 BASIC COMPONENTS OF DHE INSTRUCTIONS FOR TEACHERS

4.4.1 What to Teach about Oral Health

4.4.2 What to Teach about Preventing Dental Caries

4.4.2.1 Fluorides

4.4.2.2 Pits and fissure sealants

4.4.2.3 Oral hygiene and dental decay relationship

4.4.2.4 Reducing the frequency of sugar

4.4.3 What to Teach about Controlling and Preventing Periodontal Diseases

4.4.4 What to Teach about Preventing Oral Cancers

4.4.5 What to Teach about Safety and Oral Health

4.4.6 Oral Health and the School Services and Environment

4.4.7 School-based Self-applied Fluoride Regimens and Mechanical Plaque Removal which can be Implemented by Teachers

4.4.7.1 Toothbrushing with fluoride dentifrices

4.4.7.2 Fluoride mouthrinsing

4.4.8 Structure, Function and Malocclusion of teeth

4.5 METHODOLOGY OF LESSON PLANS AND ACTIVITIES, GRADED CURRICULUM IN DHE AND IDENTIFICATION OF CURRICULUM DETAILS

4.5.1 Methodology

4.5.2 Identification of a Graded Curricula for Ages 6-12 Years

4.5.3 Identification of Curriculum Details
5. DISCUSSION AND CONCLUSION .................................................. 86
5.1 DHE IN SCHOOLS ................................................................. 87
5.2 DENTAL PERSONNEL AS DENTAL HEALTH EDUCATORS ........ 89
5.3 IMPLEMENTATION OF TRAINEE TEACHER DHE PROGRAMME ....... 92
5.4 EVALUATION ..................................................................... 95

6. REFERENCES ........................................................................ 101

7. APPENDICES ....................................................................... 113

Appendix 1: Example of questionnaire content.
Source: Loupe, Frazier (1983) .................................................. 113
**LIST OF TABLES**

Table 1: Number and levels of educational facilities 1990.  
Source: Dental Division, Ministry of Health, Malaysia (1990)  .......... 7

Table 2: Government dental physical facilities from 1970 to 1990.  
Source: Dental Division, Ministry of Health, Malaysia (1991)  .......... 10

Table 3: Dentist:population ratio and fluoridation of water supplies by state in Peninsular Malaysia.  
Source: Dental Division, Ministry of Health, Malaysia (1991)  .......... 12

Table 4: Comparison of prevalence of dental caries of 6, 12 and 16 year-old schoolchildren from several epidemiological surveys in Malaysia.  
Source: Dental Division, Ministry of Health, Malaysia (1991)  .......... 14

Table 5: Periodontal status (CPITN) by age group.  
Source: Dental Division, Ministry of Health, Malaysia (1988)  .......... 16

Table 6: Number of primary children and pre-schoolers to number of dental nurses and caries-free and gingivitis-free status of primary schoolchildren.  
Source: Dental Division, Ministry of Health, Malaysia (1991 and 1992)  .......... 18

Table 7: Future teachers’ knowledge about fluoride, fluoridation and periodontal disease.  
Source: Glasrud, Frazier (1988)  .......... 59

Table 8: Distribution of respondents by oral health concepts taught and priority on each (Ohio Health Education Survey 1988).  
Source: Bouchard, Farquhar, Camahan, Dally (1990)  .......... 64

Table 9: An example of a DHE activity format for a 30 minute session.  
Source: Ministry of Education, Malaysia (1991b)  .......... 78

Table 10: An example of incorporating curriculum details in the subject "Man and his Environment".  
Source: Ministry of Education, Malaysia (1991b)  .......... 83
LIST OF FIGURES

Figure 1: The role of teacher’s behaviour in relation to parental behaviour.
Source: Rayner, Cohen (1971) ............................................. 43

Figure 2: A planning cycle for health education.
Source: Jacob, Plamping (1989) ........................................... 47

Figure 3: Group characteristics which affect DHE planning.
Source: Jacob, Plamping (1989) ........................................... 50

Figure 4: Future teachers’ ratings of effectiveness of methods
to prevent children’s tooth decay.
Source: Glasrud, Frazier (1988) .......................................... 55

Figure 5: Opinions about responsibilities sometimes expected of
school teachers.
Source: Glasrud, Frazier (1988) .......................................... 56

Figure 6: Opinions about services provided in an ideal school-based
dental health program.
Source: Glasrud, Frazier (1988) .......................................... 56

Figure 7: Methods for preventing oral diseases.
Source: Horowitz, Frazier (1992) ......................................... 67

Figure 8: Classroom Illustrations of knowledge and behaviour models.
Source: Cohen, Lucye (1970) .............................................. 76

Figure 9: Example of incorporating DHE into the subject
"Man and his Environment".
Source: Ministry of Education, Malaysia (1991b) ..................... 77

Figure 10: Incorporation of DHE into "Moral Education".
Source: Ministry of Education, Malaysia (1991b) ..................... 84
1 **INTRODUCTION**

The challenge in Dentistry today is to redirect efforts towards oral health promotion (WHO 1989) and one of the ways to address this is to utilise existing personnel at each level of care. As Elderton and Mjor (1992) writes "prevention supported by health promotion and education should be the foundation for oral health if it is to be successful on a large scale in both developing areas of the world and in industrialised countries". It is believed that preventive programmes in oral health integrated with general health offer the best possibilities for oral health promotion and education (Sheiham 1988).

Malaysia is a country with a relatively young population - 38.8 per cent of the population is under the age of 15 years, 57.4 per cent in the age range of 15 - 64 years and only 3.7 per cent being 65 years and above (Economic Report Malaysia 1991/1992). In this circumstance, children and preschoolers - have always topped the list of priority groups in the provision of dental care, being a very important captive group transcending racial and socio-economic barriers. However, with a population of approximately 18 million and a dentist : population ratio on average of 1 : 12000, dental care delivery in Malaysia leaves much to be desired. To complement and supplement dental health care rendered by the dental professionals in government service, dental nurses (New Zealand-types) are trained to provide dental health services to children up to the age of 17 years. The bulk of dental services to primary schoolchildren in the form of treatment and dental health education is borne by these dental nurses, under the supervision of dental officers in the government service.

Traditionally, dental health education (DHE) for primary schoolchildren is a once-a-year occurrence undertaken by dental nurses and government dental officers. DHE is an adjunct to the yearly dental screening and treatment programme under the incremental dental care programme within the government service. The exception is DHE for children in schools
with static dental clinics which may have DHE more than once a year. It is hoped that with progressive incremental care, increasing number of children will eventually be on maintenance care only - making duration of school visits shorter and enabling more visits per school per year.

The provision of dental services by a dental team is universally accepted. A dental team can have a number of different meanings: the large team that provides a national service, a smaller team that meets the demands of a province or district, or the smallest operational team which may consist of a village health worker and his or her supervisor (Allred, Hobdell 1986). According to WHO (1990), with changing needs and demands for oral health care, there is also a change in the types and mix of dental personnel required in the future. Certain preventive techniques such as oral health instruction, oral health education or supervision of toothbrushing or fluoride mouthrinses are ideally applied at a primary health care level. These activities can be carried out by non-dental personnel existing in the community such as teachers, village health volunteers or other health workers. School teachers should be given training in oral health education, practical preventive measures and also basic first aid in case of dental emergencies in school.

Enlisting and educating schoolteachers as dental health educators is not a new concept in Malaysia. Sporadic in-service training of already-serving schoolteachers have been undertaken by some enthusiastic dental officers at various levels of government dental service. However, it was not a concerted national effort. Trainee primary school teachers in Teachers’ Training Colleges therefore pose a viable captive audience for the intended dissemination of dental health education. It is intended that these future teachers will in turn undertake dental health education on primary schoolchildren.

It can be envisaged that the dental team of the future in Malaysia will not only be composed of dental auxiliaries and professionals but also ancillaries who are the non-
dental personnel. Teachers strictly fall in this category of ancillaries. In an effort to achieve the most economic, yet adequate oral health care for the population, it is up to every country to seek a practical and realistic programme comprising types and mix of oral health personnel tailored to its own needs (WHO 1990).

There is a tendency, however, to regard dental health education for teachers as merely encompassing supervision of "brush-ins" by their charges. It is important to note that educational components of every aspect of the school-based dental service include the following:-

**dental health services**, including preventive regimens, dental health screening and treatment, referrals and follow-ups,

**dental health instruction**, including both personal and community health topics, and

**environment**, including attention to all aspects of the school environment that may affect the well-being of students and school personnel alike.

DHE workshops for primary trainee teachers were thus started as a joint effort between the Ministry of Education and the Dental Division, Ministry of Health in 1990 (Ministry of Education 1991a). It is hoped that with DHE workshops being conducted for trainee teachers, oral health will be integrated into the general school curriculum. It is also hoped that preventive procedures requiring minimum dental skills will be undertaken by schoolteachers as an organised national effort.
It is the aim and objective of this thesis to explore the following topics:

1. to underline the role and rationale of dental health education in a school-setting, utilising teachers as dental health educators and,

2. to explore and make suggestions towards a basic instructional content for dental health workshops for primary trainee teachers in the context of the Malaysian government dental service.
2  ISSUES PERTAINING TO DENTAL SERVICES FOR
PRIMARY SCHOOLCHILDREN IN MALAYSIA

Malaysia can be termed a "young" country. The period after World War 2 showed a population boom when the population of the country was more than 50 per cent children under the age of 18 years. Out of a population of almost 18 million (17,763,000 by the Economic Report Malaysia 1991/1992), approximately 47 per cent is under the age of 20 years. It has a population growth rate of 2.3 per cent - and 38.8 per cent is specifically under the age of 15 years.

The Malaysian government plays a major role in the provision of medical, dental and health services through a network of hospitals, health centres and clinics. The government dental service essentially started as a school dental service and has expanded since to include dental care for the whole population. With such a large population in the younger age group, the emphasis of government dental treatment services has always been in the following order - primary schoolchildren, secondary schoolchildren, preschoolers, ante-natal mothers and the rest of the community.

After the end of World War 2, it was found that the prevailing system of dental care could not keep pace with national needs and demand for dental care. In 1948, the Annual Report of the Medical Department (Malaya) made mention of the desirability and urgency of introducing New Zealand-type dental nurses for the treatment of the growing number of children and the ratio recommended was 1 : 5 dental professional : dental nurse. The landmark year of 1949 heralded the opening of the Dental Nurses Training School in the state of Penang, with the first batch graduating in 1950. Since then the number of dental nurses have steadily increased in government service (Dental Division, Malaysia 1991). The duties and responsibilities of these dental nurses in the dental treatment of children will be expanded further in Section 2.3. This chapter will be looking into the problems of
provision of dental services to primary schoolchildren and other issues associated with the delivery of dental care and the maintenance of the oral health status of this target group.
2.1 THE EDUCATION SYSTEM IN MALAYSIA

Malaysia has a comprehensive education system ranging from 6 years of primary school education, 5 years of secondary school education, 2 years of tertiary education and further education at university level. The majority of education institutions are government-assisted although private education facilities at tertiary level are increasing. Education is free in primary and secondary government-assisted schools and more than 95 per cent of the total eligible children of ages 6 - 12 are enrolled in primary schools (Dental Division, Malaysia 1990).

Table 1 shows the existent educational facilities and their associated age groups. As shown, primary, secondary and university facilities are mainly government-assisted although there has been a steady increase in the number of private institutions catering to present demands. There are no private universities.

Table 1: Number and levels of educational facilities 1990
Source: Dental Division, Ministry of Health, Malaysia (1990).

<table>
<thead>
<tr>
<th>Type of educational facility</th>
<th>age group (years)</th>
<th>number</th>
<th>enrolment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kindergartens</td>
<td>5 - 6</td>
<td>6046</td>
<td>328,813</td>
</tr>
<tr>
<td>Primary Schools*</td>
<td>6+ - 11+</td>
<td>6828</td>
<td>2,447,206</td>
</tr>
<tr>
<td>Secondary schools*</td>
<td>12+ - 16+</td>
<td>1342</td>
<td>1,304,212</td>
</tr>
<tr>
<td>Post-secondary institutions and colleges</td>
<td>17+ - 18+</td>
<td>37</td>
<td>138,302</td>
</tr>
<tr>
<td>Universities*</td>
<td>19 and over</td>
<td>7</td>
<td>58,286</td>
</tr>
<tr>
<td>(*government-assisted)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1 serves to show the great number of children 6 to 12 who are enrolled in primary schools as compared to the other age groups in the various educational institutions.
2.2 DENTAL SERVICES IN MALAYSIA

The dental services in Malaysia are provided mainly by the government through the Ministry of Health, Ministry of Defence, Department of Aborigine Affairs and the Dental Faculty of the University of Malaya. The private practitioners also play a significant part in the dental care, with the number of dental professionals in private practice exceeding the number in the public sector. In 1992 there were 794 private practitioners to 707 in the government sector. The dentist : population ratio stands currently at an approximate ratio of 1 : 12000 dentist : population.

The overall objective of the government dental service is to improve the oral health status of the population, with special emphasis being given to priority groups (preschoolers, schoolchildren, pregnant mothers) and also to the socially and economically disadvantaged groups.

Dental care is through the provision of promotive, preventive, curative and rehabilitative dental services. To achieve the objective, greater emphasis is given to preventive programmes especially with the setting up of a central Dental Health Education Unit in 1979, the main function of which is to formulate and co-ordinate preventive dental services (Dental Division, Malaysia 1991). The government dental service is divided into the curative and the preventive dental programmes.

2.2.1 Curative Dental Programmes

Curative dental programmes in Malaysia include the following:-

1. School dental service encompassing the dental service to both the primary and secondary children. The service is of three types - the shuttle service where children are brought by van to the clinics, the mobile clinic which is a specially-
equipped vehicle which goes to the schools and in which treatment is undertaken within the school compound or the mobile dental squads which are composed of teams of dental personnel with portable equipments sent to school for the treatment of children.

2. **General dental service** where the public is charged a nominal fee for service. Service is free for pre-schoolers, primary and secondary school children, ante-natal mothers and public servants. Services include extractions, restorations, prothesis, scaling and prophylaxis, general dental examination and advice and emergency treatment.

3. **Specialist services** where clients are referred for specialised services in orthodontics, periodontics, paedodontics or oral surgery. While public servants pay a subsidised amount for treatment, all children and members of the public are eligible for treatment on a "first come, first serve" basis. Charges for payment is nominal compared to the charges in the private sector. Priority for treatment, however, depends on the severity of the individual case as judged by the specialist.

4. **Community dental service** aimed at selected groups, for example, dental projects to selected remote villages. These are usually mobile dental squads of dental nurses and professionals.

*(Dental Division, Malaysia 1991)*.

Table 2 shows the types of physical dental facilities available within the government dental service. Facilities have increased over the last 20 years. It can be seen that school dental service facilities have very much increased - school dental centres increased from 0 to 22, school dental clinics have increased almost six - fold from 115 to 635 and mobile dental squads have increased a hundred - fold from 0 to 100 over the period from 1970 to 1990.
Table 2: Government dental physical facilities from 1970 to 1990

<table>
<thead>
<tr>
<th>Types of facilities</th>
<th>Number of dental facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Hospital dental clinics</td>
<td>10</td>
</tr>
<tr>
<td>2. Main dental clinics</td>
<td>57</td>
</tr>
<tr>
<td>3. Dental clinics in Main Health Centre</td>
<td>38</td>
</tr>
<tr>
<td>4. Dental clinics in Health Subcentre</td>
<td>146</td>
</tr>
<tr>
<td>5. School Dental Centre</td>
<td>0</td>
</tr>
<tr>
<td>6. School Dental Clinics</td>
<td>115</td>
</tr>
<tr>
<td>7. Mobile dental clinics</td>
<td>12</td>
</tr>
<tr>
<td>8. Mobile dental squads</td>
<td>0</td>
</tr>
<tr>
<td>9. Other dental clinics</td>
<td>7</td>
</tr>
</tbody>
</table>

2.2.2 Preventive Dental Programmes

Preventive dental programmes come under the DHE Unit and are implemented through 3 activities - DHE, fluoridation of public water supplies and clinical dental preventive services. Preventive programmes, inclusive of monitoring of fluoride levels of water supplies, are integrated with dental treatment programmes and undertaken by the same personnel (Dental Division, Malaysia 1992). The personnel involved are dental nurses and officers, the main target being the schoolchildren, preschoolers and ante-natal mothers. The preventive dental activities include oral hygiene instructions, talks, lectures, toothbrush drills, campaigns, exhibitions and other promotional activities. Current DHE projects coordinated by the central DHE Unit include pre-school preventive dental squads, home visiting and dental care for the “special” handicapped child.

The objective of DHE in the preventive dental programmes is to instil dental consciousness and to attain behavioural changes for the improvement and maintenance of the dental health of the child, the family and the community, through their own and organised community efforts (Dental Division, Malaysia 1991). The term DHE is still used here
although the activities involved should really be encompassed under the broad term of dental health promotion as will be explained later in Chapter 3.

The second type of preventive dental programme is community water fluoridation in Malaysia. The first water fluoridation programme started in the southern state of Johor in 1957 and in 1969, a "Committee on Fluoridation of Public Water Supplies in West Malaysia" recommended 0.7 ppm fluoridation level of public water supplies as a concerted effort at caries control. This decision was made based on the great disproportion between the amount of dental treatment provided and the amount of treatment needed by all sections of the community. To date, 144 of the 418 water treatment plants are installed with fluoride feeders. Addition of fluoride chemicals to the public water supplies is conducted by personnel of the Waterworks Department and monitoring of fluoride levels is undertaken by dental personnel in conjunction with the Chemistry Department, Ministry of Health, Malaysia. Fluoridation of public water supplies serves about 87.8 per cent of the population but there are still problems associated with monitoring fluoridation levels at state and national levels (Dental Division, Malaysia 1992).

Table 3 shows the distribution of fluoride feeders in water treatment plants by states in West and East Malaysia. Included in Table 3 are the dentist : population ratios of the different states in Malaysia. These figures will be related to problems associated with dental care delivery later in Section 2.3.

Clinical dental programmes mentioned as part of the preventive dental programmes include mechanical plaque control procedures, such as toothbrushing, topical fluoride applications either self-applied or professionally-applied and the application of pit and fissure sealants.
Table 3: Dentist : population ratio and fluoridation of water supplies by state in Peninsular Malaysia.
Source: Dental Division, Ministry of Health, Malaysia (1991)

<table>
<thead>
<tr>
<th>STATES</th>
<th>DENTIST:POPULATION</th>
<th>NO. OF WATER TREATMENT PLANTS</th>
<th>NO. OF TREATMENT PLANTS WITH FLUORIDE FEEDERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>KELANTAN</td>
<td>1 : 20964</td>
<td>17</td>
<td>10</td>
</tr>
<tr>
<td>PERAK</td>
<td>1 : 18220</td>
<td>44</td>
<td>14</td>
</tr>
<tr>
<td>KEDAH</td>
<td>1 : 17972</td>
<td>37</td>
<td>5</td>
</tr>
<tr>
<td>PAHANG</td>
<td>1 : 16500</td>
<td>74</td>
<td>9</td>
</tr>
<tr>
<td>TERENGGANU</td>
<td>1 : 14667</td>
<td>21</td>
<td>11</td>
</tr>
<tr>
<td>MELAKA</td>
<td>1 : 14273</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>JOHOR</td>
<td>1 : 13905</td>
<td>49</td>
<td>23</td>
</tr>
<tr>
<td>PERLIS</td>
<td>1 : 13514</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>PULAU PINANG</td>
<td>1 : 11192</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>SELANGOR</td>
<td>1 : 10001</td>
<td>30</td>
<td>22</td>
</tr>
<tr>
<td>NEGERI SEMPILAN</td>
<td>1 : 9700</td>
<td>28</td>
<td>16</td>
</tr>
<tr>
<td>W. PERSEKUTUAN</td>
<td>1 : 3740</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Dentist : population ratio and water fluoridation in Peninsular Malaysia and East Malaysia.

<table>
<thead>
<tr>
<th>P. MALAYSIA</th>
<th>1 : 11379</th>
<th>325</th>
<th>126</th>
</tr>
</thead>
<tbody>
<tr>
<td>SARAWAK</td>
<td>1 : 28688</td>
<td>62</td>
<td>16</td>
</tr>
<tr>
<td>SABAH</td>
<td>1 : 30184</td>
<td>31</td>
<td>2</td>
</tr>
</tbody>
</table>
2.3 DENTAL ISSUES OF PRIMARY CHILDREN AGES 6 - 12 YEARS

Primary schoolchildren is one of the groups targeted as being at high risk of developing oral disease. WHO and FDI have established global goals for the year 2000 of which 5 - 6 and 12 are index ages of significance (FDI 1982, WHO 1987).

The placement of primary schoolchildren as a priority group is based on progressive dental development, with change from primary dentition to a mixed dentition and then to a permanent dentition, with all the inherent variations. In fact WHO(1987) states that if it is not possible to cover all children, efforts should concentrate on the group aged 6 - 7 because of first molar eruption. There is also the need to instil good habits at an early age, especially where toothbrushing habits and reinforcement of good dietary habits are concerned - when a young child is more interested in the doing, looking and touching activities, and ideas are retained in a practical and useful way on the behavioural level (Rayner, Cohen 1971). There is also the need for DHE because of the likelihood of increased oro-facial traumas due to school activities, especially increased activities between the ages of 9 - 12 years.

2.3.1 Oral Health Status of Malaysian Children Below 16 Years

In Malaysia, as already mentioned, primary schoolchildren are a priority group for the reasons above and also by its sheer numbers, which far exceed children in the other age groups. Reference is made here again to Table 1 in Section 2.1. With the percentage of children below 15 years of age standing at almost 40 per cent, Malaysia can hardly afford to neglect this important group of future adults. Reference is made here to Table 4 which shows a comparison of dental caries prevalence of 6, 12 and 16-year olds from several epidemiological surveys done in Malaysia.
Table 4: Comparison of prevalence of dental caries of 6, 12 and 16 year-old school children from several epidemiological surveys in Malaysia.
Source: Dental Division, Ministry of Health, Malaysia (1991)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Size of Sample</td>
<td>11070</td>
<td>15197</td>
<td>14459</td>
<td>14096</td>
</tr>
<tr>
<td>Age Group</td>
<td>6, 12, 16</td>
<td>6 - 18</td>
<td>6 - 18</td>
<td>6 - 18</td>
</tr>
<tr>
<td>Caries-free</td>
<td>16.71%</td>
<td>11.10%</td>
<td>10.36%</td>
<td>5.60%</td>
</tr>
<tr>
<td>Prevalence of dental caries</td>
<td>83.29%</td>
<td>88.90%</td>
<td>89.64%</td>
<td>94.40%</td>
</tr>
<tr>
<td>Caries prevalence deciduous dentition 6 year-old</td>
<td>88.64%</td>
<td>95.4%</td>
<td>91.69%</td>
<td>96.85%</td>
</tr>
<tr>
<td>Caries Prevalence Permanent Dentition</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6 year-old</td>
<td>12 year-old</td>
<td>16 year-old</td>
<td>all age groups</td>
</tr>
<tr>
<td></td>
<td>25.46%</td>
<td>71.33%</td>
<td>86.49%</td>
<td>52.98%</td>
</tr>
<tr>
<td></td>
<td>40.80%</td>
<td>78.40%</td>
<td>84.80%</td>
<td>73.40%</td>
</tr>
<tr>
<td></td>
<td>28.82%</td>
<td>79.57%</td>
<td>89.53%</td>
<td>70.27%</td>
</tr>
<tr>
<td></td>
<td>45.28%</td>
<td>88.93%</td>
<td>93.94%</td>
<td>82.43%</td>
</tr>
<tr>
<td>Mean dfx 6 year-old</td>
<td>d</td>
<td>3.18</td>
<td>4.2</td>
<td>3.50</td>
</tr>
<tr>
<td></td>
<td>f</td>
<td>0.24</td>
<td>0.0</td>
<td>0.65</td>
</tr>
<tr>
<td></td>
<td>x</td>
<td>2.17</td>
<td>2.1</td>
<td>1.64</td>
</tr>
<tr>
<td></td>
<td>dfx</td>
<td>6.17</td>
<td>6.3</td>
<td>5.81</td>
</tr>
<tr>
<td>Mean DMFX 6 year-old</td>
<td>D</td>
<td>0.34</td>
<td>0.80</td>
<td>0.33</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>0.0</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>0.06</td>
<td>0.00</td>
<td>0.20</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>0.02</td>
<td>0.00</td>
<td>0.02 1</td>
</tr>
<tr>
<td></td>
<td>DMFX</td>
<td>0.42</td>
<td>0.80</td>
<td>0.55</td>
</tr>
<tr>
<td>Mean DMFX 12 year-old</td>
<td>D</td>
<td>0.62</td>
<td>2.2</td>
<td>1.70</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>0.12</td>
<td>0.5</td>
<td>0.43</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>1.52</td>
<td>0.5</td>
<td>1.40</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>0.12</td>
<td>0.5</td>
<td>0.32</td>
</tr>
<tr>
<td></td>
<td>DMFX</td>
<td>2.37</td>
<td>3.7</td>
<td>3.86</td>
</tr>
<tr>
<td>Mean DMFX 16 year-old</td>
<td>D</td>
<td>0.98</td>
<td>2.3</td>
<td>2.93</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>0.33</td>
<td>1.2</td>
<td>1.65</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>2.84</td>
<td>0.6</td>
<td>1.23</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>0.21</td>
<td>0.6</td>
<td>0.51</td>
</tr>
<tr>
<td></td>
<td>DMFX</td>
<td>4.35</td>
<td>4.8</td>
<td>6.34</td>
</tr>
</tbody>
</table>
**WHO (1990)** makes reference to the fact that Malaysia is one of the countries which had a low DMFS prevalence in the 1930s and early 1940s, which rose to moderate heights in the 1960s, and then declined again due to the timely instigation of water fluoridation.

While conditions seem almost stable in West Malaysia with a mean DMFX of 2.37 in 12-year olds in 1988, mean DMFX in 12-year olds are still high in Sarawak and Sabah, being at a level of 3.86 in 1981 and 4.93 in 1985 respectively. DMFX also rises with increase in age - as seen in a comparison of mean DMFX at age 6, 12 and 16 in Table 4.

Caries prevalence is also higher in the states of Sabah and Sarawak at almost 80 per cent and 89 per cent for 12-year olds in Sarawak and Sabah respectively, and also increases with increase in age as shown by comparison of caries prevalence at age 6, 12 and 16 in Table 4. These are children who have benefited from community water fluoridation begun in the early 1970s. Yet caries prevalence in the sample remains high in both deciduous and permanent dentition - approximately 83 per cent in Peninsular Malaysia, 90 per cent in Sarawak in 1980/1981 and 94 per cent in Sabah in 1985.

Table 5 shows the periodontal status of 6, 12 and 16-year olds surveyed in 1988, set out by age group. Periodontal status seems to be at maintenance level with 70 per cent of the 6-year olds having healthy periodontal condition and the percentage of 12 and 16-year olds with healthy periodontal condition being at 94 per cent and 90 per cent respectively (Dental Division, Malaysia 1988). This survey, however, was only in Peninsular Malaysia.

In the need to maintain the oral health status of the group 6 - 12 year old, the dental service programme continues to put much emphasis on prevention activities and DHE. The Dental Division, Ministry of Health, Malaysia reiterated this stand in 1993 in a draft of workforce projection for increased number of postings for dental nurses within the government service (Dental Division, Malaysia 1993).
Table 5: Periodontal disease status (CPITN) by age group.
Source: Dental Division, Ministry of Health, Malaysia (1988).

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>CPITN 0 no periodontal disease %</th>
<th>CPITN 1 Bleeding %</th>
<th>CPITN 2 Calculus %</th>
<th>CPITN 3 Shallow pocket %</th>
<th>CPITN 4 Deep pocket %</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>70.24</td>
<td>6.16</td>
<td>0.16</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>12</td>
<td>93.46</td>
<td>4.82</td>
<td>1.66</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>16</td>
<td>90.34</td>
<td>5.32</td>
<td>4.18</td>
<td>0.04</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Malaysia has set itself oral health goals for the year 2000 based on WHO oral health goals. It is appropriate and timely to state them here, since 6-year-old and 12-year-old are important landmark years in dental health goals.

**ORAL HEALTH GOALS FOR THE YEAR 2000 - MALAYSIA**

1. That 30 per cent or double the present level of 5 - 6 year olds should be caries-free.
2. The Malaysian average will be no more than 2 DMF at 12 years of age.
3. 85 per cent of the population should retain all their teeth at the age of 18.
4. 50 per cent reduction in the incidence of gingivitis in the 6 - 18 age group.
5. 50 per cent reduction in the number of cases reaching the destructive stage of the disease in the 15 - 19 and 35 - 44 age groups.
6. 50 per cent of Malaysians own and brush their teeth with a toothbrush.
7. 50 per cent reduction in the present level of edentulouness at age 35 - 44.
8. 10 per cent reduction in the present level of edentuloussly at 65 years and above.
9. To provide a service for the needs of the dentally handicapped.
10. The preventive programmes should cover the whole population by the year 2000.

(received from Dental Division, Wilayah Persekutuan 1991).
The goals are optimistic but are realistic and achievable in the reckoning of the Dental Division, Ministry of Health, Malaysia - if the whole of the dental team, as specified in the introduction, work "together" towards dental health promotion.

2.3.2 Workforce in Dental Programmes for Primary Schoolchildren

In a move to overcome the disproportion between dental treatment needed and dental treatment met, dental nurses were introduced in 1950 to complement and supplement the dental professionals in the public sector.

Dental nurses are the only operating auxiliary in Malaysia, undergoing a 3-year course inclusive of a years’ practical training at a clinic. They are empowered, under supervision by a dentist, to undertake promotive, preventive and simple dental treatment for children under the age of 17 years. They are allowed to do simple infiltrations and teeth extractions, simple and compound amalgam restorations on deciduous and permanent dentition. A change in government policy in 1974 - 1975 allowed them to execute anterior fillings. They can only operate, under supervision, in the public sector and form the bulk of the manpower in the curative and preventive dental programmes for children in primary schools.

In the draft calling from increased posts for dental nurses (Dental Division, Malaysia 1993), it is stated that coverage of schoolchildren - at 75 per cent of primary schoolchildren - is still inadequate based on the heavy workload imposed on each dental nurse. While the ideal ratio of 1 : 1200 is stated, dental nurse : primary schoolchildren ratio still stands at 1 : 2343. Table 6 shows the existing dental nurse workforce and the existing enrolment of preschoolers and primary schoolchildren. Only data from 1991 and 1992 are shown in comparison because of a change in the recording forms of the Health Management Information System, Dental Division, Ministry of Health, Malaysia in 1991.
Table 6: Number of primary children and pre-schoolers to number of dental nurses and caries-free and gingivitis-free status of primary schoolchildren.  

<table>
<thead>
<tr>
<th>Year</th>
<th>1991</th>
<th>1992</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.of primary schools</td>
<td>6859</td>
<td>6898</td>
</tr>
<tr>
<td>No. of primary children</td>
<td>2,064,989</td>
<td>2,614,019</td>
</tr>
<tr>
<td>No.of kindergartens</td>
<td>7331</td>
<td>7421</td>
</tr>
<tr>
<td>No. of pre-schoolers</td>
<td>344,550</td>
<td>496,609</td>
</tr>
<tr>
<td>No. of dental nurses</td>
<td>1070</td>
<td>1124</td>
</tr>
<tr>
<td>No. of active dental nurses</td>
<td>997</td>
<td>1124</td>
</tr>
<tr>
<td>% of caries-free age 6+ to 11+</td>
<td>13.9</td>
<td>15.1</td>
</tr>
<tr>
<td>% of gingivitis-free age 6+ to 11+</td>
<td>81.2</td>
<td>81.6</td>
</tr>
</tbody>
</table>

Only 70 - 75 per cent coverage of the primary school children for dental screening and treatment is possible under the current availability of manpower. While it is incumbent upon every active (active referring to direct participation in school programmes) dental nurse to undertake treatment programmes, it is also mandatory for them to organise DHE and preventive activities for every primary child (preferably before clinical examination or as treatment commences). Of the school service programmes executed by dental nurses, 33.6 per cent are by mobile squads, 6.2 per cent by static school clinic services and 2.2 per cent by shuttle dental service. With the high number of primary children and a high percentage of programmes executed under mobile dental squads, dental nurses are constantly on the move with little or no time to foster rapport for reinforcement of desired dental behaviour in the children they treat.

Pre-schooler numbers are also included in Table 6 as an indication of the additional workload these numbers make on the dental nurses’ preventive programmes. The average
ratio of 1:2343 dental nurse: primary children previously mentioned, does not indicate the additional duties of undertaking preventive dental squads to the pre-schoolers in the kindergartens. This average ratio also does not hint at the problems of unequal geographical distribution of population and the problems of distance and accessibility for both providers and recipients of the dental health service. Dental nurses being constantly on the move from school to school, the programmes average one visit per year per school of 3-4 weeks duration, depending on the locality. At best DHE and preventive dental activities are twice a year in some static clinics where circumstances permit. At worst, the remote and least accessible schools are neglected specifically because of the conditions of dental nurse shortage and the increasing workload brought to bear on the dental nurses by the increasing population of primary schoolchildren.

Provision of service is mainly aimed at primary prevention - a given procedure or course of action that prevents the onset of disease (Horowitz 1979) but also at secondary prevention for children already affected. It is the responsibility of the supervising dental officer or dental nurse involved to ensure that every child examined is given DHE and undergoes a “toothbrush drill”. This blanket service is given throughout the country regardless of local conditions.

The dental programme designed for the dental nurses may best be described as incremental. This incremental dental programme is drawn up by every supervising dental officer every year, targeting primary schoolchildren within the scope of the workload and the number of dental nurses available within each district. Incremental care may be defined as:

periodic care so spaced that increments of dental disease are treated at the earliest time consistent with proper diagnosis and operating efficiency, in such a way that there is no accumulation of dental needs beyond the minimum.

(Source of quote is unknown but this definition is adopted by the Dental Division, Wilayah Persekutuan, Malaysia 1990).
There is no doubt that incremental dental care represents the ideal pattern of care where dental diseases are intercepted at the earliest possible chance. This places more urgency on the dental nurses to aim for as big a coverage of primary schoolchildren as is possible for dental screening within a school year. Caries-free and gingivitis-free percentages are included in Table 6 as an indication of the baseline percentages recorded in 1991 - these figures serve as a reflection of the caries prevalence status and the effectiveness of preventive dental activities undertaken in schools. Dental nurses have to aim at an improved percentage of caries-free and gingivitis-free primary schoolchildren in their incremental dental care from year to year.

In view of the deficiencies present within the school dental service programmes, liaison between personnel of the Ministry of Education and personnel from the Dental Division, Ministry of Health, Malaysia, recognised the need to engage schoolteachers as dental health educators to reinforce DHE within the school curriculum. As of 1990, DHE workshops as mentioned in the introduction were started for trainee teachers in Teachers’ Training Colleges. The basis of this liaison is the recognition that there is a tendency for teachers to relegate sole responsibility of dental activities to dental personnel and in the situation mentioned, that there is a need for repeated and continuous reinforcement of DHE and DHE activities by teachers throughout the school year. This liaison resulted in a circular from the Ministry of Education (1991a) giving recognition that dental disease is the main disease encountered by children in primary and secondary schools and that there is a need for teachers to incorporate DHE within the context of several subjects mentioned in the circular. Teachers are also called upon to reinforce dental health activities, specifically toothbrushing techniques and to give full co-operation to dental personnel in their yearly visits.
3 RATIONALE OF PRIMARY SCHOOL-BASED DHE

The rationale behind the inclusion of DHE activities in school curricula in many school systems around the world is that prevention is the key element in controlling dental disease and that the school system is the logical environment in which to teach preventive dental health practices (Frazier, Johnson, Jenney 1983). The crux of most school-based DHE programme is the belief that successful dental education is based on the motivation of the schoolteachers to teach preventive dentistry.

Flanders (1987) supported DHE programmes in school as reaching the largest and most important group. He cites children as being fast learners and anxious to acquire new skills and also at risk from the development of dental problems. Therefore, regardless of the equivocal nature of the evidence regarding the effectiveness of school DHE, he maintains that it is important that DHE continue to be developed.
3.1 REVIEW OF SOME SCHOOL-BASED DHE PROGRAMMES

An underlying assumption of DHE is improved knowledge which is transformed into appropriate behaviours that contribute to better oral health. Despite this assumption, it is still unclear whether an individual's knowledge or habits actually affect oral hygiene status, or whether oral hygiene is best predicted by other factors such as socioeconomic status. Few dental officers running such school programmes have evidence to justify current or future methods of oral hygiene educational activities. Most educators agree, measurement and evaluation are integral components of any instructional programme. Instruction in any subject is effective only as it leads to desired changes in students, and evaluation and assessment are needed to provide evidence of either change in oral health outcomes or changes in knowledge of dental health in primary schoolchildren, or both.

The central DHE Unit of the Dental Division in Malaysia has pushed for teachers' DHE workshops and DHE for children, based on the underlying assumption above and the belief that motivated schoolteachers will foster reinforcement and repetition of preventive dentistry procedures and DHE. However, results obtained from some evaluated school DHE programmes have been equivocal. This section will review some evaluated school-based dental health educational programmes, in an attempt to elucidate the value of DHE programs conducted in schools.

Podshadley and Shannon (1970) had questioned the value of the single lecture presentation often used to present dental health facts to elementary schoolchildren and its effectiveness, noting that any improvement in oral hygiene was temporary and too slight to be of any clinical significance. However, they did not rule out the possibility of a cumulative improvement in oral hygiene which such an annual programme might produce. Emler, Windchy, Zaino, Feldman and Scheetz (1980) wrote on the value of repetition and reinforcement in improving oral hygiene performance, reporting that there were indirect
positive results in the value that the children subsequently attach to DHE, such as children attempting to educate their parents in turn.

The Toothkeeper Programme was a school DHE package designed to prepare classroom teachers to instruct kindergarten to sixth grade schoolchildren in Texas. The programme capitalised on reinforcement by schoolteachers to help children develop personal responsibility for oral health care. Primary goals were educational - to establish positive health values and development of skills to prevent dental disease. Teachers were trained by dental hygiene consultants, a multimedia learning centre provided all necessary information, skill and teaching resources. The programme was implemented for 16 consecutive weeks and all necessary information and teaching were provided by the system. Teachers had the freedom to incorporate DHE into the existing curriculum and to tailor the programme to meet their students' needs. Evaluation was based on oral health outcomes - gingival condition was assessed using an index called the Dental Health Centre Index and assessment of the participant's oral hygiene status was made using an index called the Patient Hygiene Performance Index. However, Smith, Evans, Suomi and Friedman (1975) concluded that participation by elementary school children in the programme did not improve their gingival health or oral hygiene status. The lack of positive result in establishing positive health values and skills was attributed to the teachers receiving inadequate hours of DHE workshops and too little classroom instructions on dental health. Graves, McNeal, Haefner and Ware (1975) made a comparison of the effectiveness of a traditional DHE programme (primarily an information-oriented "show-and-tell" approach) and the Toothkeeper programme and found that even after an intensive 16-week programme conducted by the classroom teachers, only minimal reduction in debris on teeth were observed in either programme, and only a slight degree of improvement in gingival health. This was in spite of the Toothkeeper programme being a personalised curriculum approach, which rejected DHE as an 'add-on' activity.
The Alabama Smile Keeper (ASK) programme (Rose, Rogers, Kleinman, Shory, Meehan, Zumbro 1979) was also an American DHE programme designed to improve the dental health of elementary schoolchildren through the efforts of teachers teaching preventive dentistry. An assessment of the programme showed that the researchers also provided for an evaluation of both oral health outcome and change in oral health behaviours. The programme made use of three clinical examinations based on Greene and Vermillion’s Simplified Oral Hygiene Index (OHI-S) to determine if there was an improvement in oral hygiene performance. Three written aptitude tests determined if there was information gained on plaque control and if so, whether this had any correlation with oral hygiene scores. The ASK DHE course for teachers included an intensive review of the causes and prevention of oral diseases, a discussion on diet and its effect on oral health, a session on removal of plaque and resource materials for use in conjunction with the teaching. To overcome the inadequate hours cited in the Toothkeeper programme ineffectiveness, considerable time was spent to acquaint teachers with the basic skills used in plaque control and to advise them to use a humanistic approach. Other factors, such as self-image, peer group pressure and the students' well-being were principles that the ASK programme incorporated to instil the values of good oral health. ASK reported positive oral hygiene scores with there being a significant decrease in average levels of plaque from pre-instruction to post-instruction for all sixth graders. It is theorised by Rose et al. (1979) that classroom teachers having continuous access to children at an early stage of development of oral health behaviours, might prove key figures in achieving a successful school DHE programme. However, when both concepts of dental health and oral hygiene skills were studied, no significant correlation were found between knowledge levels and oral hygiene scores. Students who had acquired sufficient knowledge of concepts of dental health did not necessarily apply the information in their oral hygiene skills. Likewise, students who had good oral hygiene did not necessarily have a good grasp of dental health concepts. Although all grades showed a significant decrease in OHI-S scores from baseline, the reduction was not permanent and scores tended to increase 4 months post-
instruction.

The Natural Nashers Programme of Craft, Croucher and Dickinson (1981), was developed as part of a programme to design, test and develop motivation strategies for preventive dental behaviour in target groups, of the population at high risk to dental disease, and was intended for use with 13 - 14 year olds. It was designed to be an integrated curriculum package which made use of teachers as dental health educators and fieldworkers who were assigned to assist teachers in programme delivery, to help solve any practical or administrative problems and to help minimise variations in the programme within and between schools. Integration into the school curriculum was through the use of an initial workshop to brief teachers, explain problems, negotiate variations and to eliminate gross differences of approach. Emphasis was placed on not changing the teachers' normal role. The evaluation of Natural Nashers identified several factors which were thought to be necessary for the success of a school-based DHE programme.

* Areas of relative ignorance and knowledge were identified. Materials which stressed what audiences know will become boring and lead to apathy.

* A successful model of dissemination and liaison was identified, emphasising that DHE cannot work in isolation.

* Children were encouraged to accept responsibility for their own health choices.

* The programme also recognised situational factors for the adolescents which might act as barriers to this responsibility, such as low priority for dental health or reliance upon adults for diets. Stress was placed on good home influence and peer pressure.

* Teachers' classroom styles were found to be crucial to a positive behaviour response.

* Underlying everything was the recognition of the need for flexibility so that existing
routines of staff could be utilised, minimising disruption and encouraging DHE as a credible part of school curriculum.

Evaluation of the programme was carried out at the level of process (teachers' questionnaires, pupils' worksheets, fieldworkers' reports) and at the level of outcome (pupils' pre- and post-programme questionnaires, worksheets, plaque and gingival scores). Significant improvements in oral hygiene status, "large" gains of knowledge and "positive" changes in attitude were recorded. Craft, Croucher, Dickinson, James, Clements and Rodgers (1984) concluded that the programme led to the realisation that the principal problem lay with the administrators and the teachers and less with the pupils' response that the best chance of success for a school-based programme is through the close co-operation and support of the team.

The importance of the teachers' role in school-based programmes led Loupe and Frazier (1983) to conduct a survey among elementary teachers to assess their knowledge and teaching practices. It was disclosed that teachers were ill-informed with regard to dental health especially by not discriminating appropriately between prevention of caries and prevention of gingivitis and periodontal disease. Because of this lack of discrimination, they tended to stress great values on oral hygiene techniques for caries prevention. Based on this survey the authors concluded that education for school personnel should stress the educational components of effective measures of preventing oral disease - and that this education itself needed reinforcement. Efforts should also aim for the involvement of all school personnel and parents, specifically the importance of educating teachers about the relative benefits of preventive home care methods (for example, oral hygiene procedures and fluoride dentifrices, use of fluoride mouthrinse), of methods available at the dentist's (for example topical fluoride, pits and fissure sealants, early detection and treatment), of community programmes such as those in schools and other institutions. Loupe and Frazier (1983) concluded that there is a great need to move away from the behaviour focus limited to oral hygiene and diet practices.
On the other hand, Rubinson (1982) stated that the goals of DHE should be to change behaviours that result in dental disease and that success should not be evaluated in plaque scores or DMFS results but rather according to acquired knowledge, acquired oral hygiene skills and improved attitudes.

Melsen and Agerbaek (1980) conducted a 2-year study to determine the effect of an intensive programme of systematic information on oral health and motivation for preventive dental measures on Danish schoolchildren aged 11 - 15 years and found that not only did knowledge levels improve very slightly but that there was no change in behaviour resulting in improved oral health. These were children who have had long-term experience of participation in a school dental health care system, with a fortnightly mouth rinse, and regular contact twice yearly with dental personnel. Earlier Agerbaek, Melsen, Lind, Glavind and Kristiansen (1979) had conducted essay-writing sessions which showed that despite clearly understanding the importance of dental disease prevention and a positive attitude towards dental care, questionnaires distributed showed no significant difference in dental health knowledge post-programme. Agerbaek et al. (1979) concluded that it is possible that after long exposures to school dental care, the experiment constituted knowledge which the children already have, leading to some sort of immunization to the information. The conclusions drawn were that prior assessment of target groups are essential, isolated events of DHE of short duration, in a group already having a threshold knowledge, have no effect on oral health status and that there needed to be deeper active involvement and decision-making by both children and their families.

A study by Walsh (1985) on a group of approximately 800 teenagers aged 12 - 14 years showed an increased dental health knowledge, improved dental health attitudes and a reported increase in toothbrushing frequency. This was a short-term study. However, knowledge levels did not correlate favourably with home care practices and there was no significant difference between test and control groups. Walsh stated however, the concept
of potential health behaviour - the fact that there was no immediate significant effect on attitudes and behaviour does not negate or preclude the possibility that what is learned will be applied later in life as adults. Potential health behaviour is described not as an actual behaviour but as an awareness, in the absence of illness, of preventive behaviours beneficial to health.

The National Preventive Dentistry Demonstration Programme (NPDDP) was a study undertaken in the United States between 1977 - 1983 and involved more than 20,000 children aged between 5 to 10 years from five fluoridated and five non-fluoridated communities. The programme consisted of a series of ten DHE sessions of 50 minutes each. The teachers attended orientation workshops before the start of the programme. The results confirmed water fluoridation as the single, most effective preventive measure and other fluoride regimens such as fluoride mouthrinses and tablets programmes were found to be relatively ineffective. In general, teachers conducted classroom preventive procedures and the educational component as part of their regular duties, with a clinical procedure being provided for grades 1, 2 and 5 for the full 4-year period. Classroom procedures were discontinued for the first batch of fifth graders at the end of their sixth grade.

The findings raised serious questions about the continued usefulness of currently accepted school-based programmes of preventive dental care. The investigators concluded that the least expensive, and the least effective, was the dental health educational programme. However the results were controversial with several reviews done (Rebich 1985, Sheps 1986). Rebich (1985) hypothesised that the results had been misinterpreted and that it is expected that classroom instructions improved dental health, improved knowledge and incentive to seek professional care. Sheps (1986) and Fleiss (1986) on the other hand, concluded that the study design was flawed and made it difficult to conclude that the findings were valid, especially at a time of declining caries prevalence in the late 1970s and early 1980s as found in the United States. Several modes of treatment were always
administered together thus making it very difficult to develop reliable estimates regarding single components of the programme. For example, it is a questionable assumption that application of two or more preventive measures in combination is more effective than each individual measure. The conclusion of the American Public Health Association by Sheps (1986) was that there is a need to develop and apply better, and more pertinent outcome measures for the evaluation of the effectiveness of school-based DHE programmes and that there is a need to identify the significant characteristics of the group of children considered to be at high risk to dental diseases. However, students who participated were found to utilise dental services more often than the students who were non-participants of the programme.

All the above studies, apart from the NPDDP, had been short-term and directed towards dental health educational programmes which were not part of a school dental treatment programme. Roder and Burt (1978) conducted a study of a school dental programme in South Australia. They determined the benefits that may be derived when the dental education and treatment programmes are combined and longstanding and presented a method for evaluating the programme. However they could not define a cause-and-effect relationship between the dental health education component and hygiene scores but concluded that the results were encouraging and tentatively inferred that a history of school dental care is positively associated with a "good" oral hygiene status and an "absence" of gingivitis and that children who have had longer cycles of care under school-based programmes had better oral hygiene.

Likewise, Bennie, Tullis, Stephen and MacFadyen (1978) concluded that 11 year-olds in Sutherland County in Scotland who participated in a 5-year community-based preventive dentistry and health education programme had less caries, smaller lesions, cleaner mouths and healthier gingiva. The children were in the majority, of a lower social class group in the more disease-free subjects. The predominantly low social class group exhibited more
positive attitudes than the control children from high socio-economic strata although the factual dental knowledge was not significantly different. They concluded that the longstanding DHE programme with dental treatment made the children realise the importance of dental disease and regarded them as preventable, despite the fact that the children were from a social class where such behaviour was not widely expected.

Bentley, Cormier and Oler (1983) made a field study on 1800 rural children aged 5 - 13 and randomly assigned them for dental treatment to a school-based practice or to private practitioners in the community. Simultaneously five of the nine public schools offered an enriched programme of dental education while the remaining schools remained teaching regular health education - enriched DHE meant the educational component concurrent with preventive dental practices. All children participated in a school-based fluoride programme and their dental treatment was provided free of charge. Evidence showed that after 3 years, children assigned to the school-based practice, who also attended schools offering enriched DHE, used dental services on a more regular basis than children in the other groups. The above findings suggests that the enriched DHE encouraged students to place a higher value on their oral health and/or to lose their fear of dental treatment. In addition to its direct impact upon the children, the effect of the programme on the attitude and behaviour of teachers in the enriched DHE schools, probably encouraged an even higher level of compliance among their students. The knowledge gained from integrating oral health concepts into their regular classes may have made the teachers more supportive of their students and attentive to the details of scheduling dental visits than their colleagues in the regular education schools. One of the authors’ conclusions is that teachers and/or parents play a key role in determining whether children make effective use of available dental care. It follows that to have an effect on childrens’ utilisation, a programme of DHE has to impact on adults who are instrumental in gaining childrens’ compliance with either a school-based or a community-based delivery programme. In this Rural Dental Health Programme, an enriched dental health programme had an impact only when children were
treated in a school-based programme, at no cost to parents for the dental services provided.

The most hopeful study of school-based DHE recently is one by Hamilton and Coulby (1991). The study was based on more than 6000 schoolchildren aged 11 years in Northeast Ontario, where use was made of a self-completed questionnaire and a clinical examination to gather baseline information to test associations of caries and periodontal knowledge, self-reported oral health behaviours and source of knowledge to oral status. Although the children seemed confused over plaque and calculus and had poor knowledge of caries-preventive measures such as water fluoridation, dental sealants and choice of snack foods, it was found that high knowledge was associated with good oral health habits and low DMFT scores. The findings suggest a need to reinforce various preventive teachings and to investigate the effects of cultural status, dental experiences and residence status on oral health knowledge. Good habits associated with good knowledge possibly indicate transformation of knowledge to good habits. The schools involved had an organised school education programme and most students with good knowledge indicated the source of the information as their dentist or school, reflecting the crucial role dental experiences and school reinforcements may play in knowledge acquisition.

School-based studies are difficult to compare and contrast because of lack of uniformity of the measures and indices used - some investigators did not evaluate health outcomes while others expressed opinions of teachers and students or sometimes, of the researchers themselves (Flanders 1987). The positive results of some of these studies on childrens' utilisation of dental services and the association between good knowledge and good oral health status, help to support the continuation of DHE programmes aimed at improving knowledge. Despite the optimism of this statement, much needs to be done to improve the content of DHE instructions by schoolteachers.
3.2 DEFINITIONS OF TERMS USED IN SCHOOL-BASED DHE PROGRAMMES

As a permanent community structure, schools provide excellent settings for preventive dental programmes. The schools thus become prominent loci for reaching children with primary preventive measures (Rayner, Cohen 1971, Horowitz, Frazier 1986). Definitions of terms that are relevant to dental health education in a primary school setting will be discussed.

3.2.1 Health

The positive nature of the modern concept of health is defined by WHO in its constitution as: *Health is a state of complete physical, mental and social well-being, and not merely the absence of disease and infirmity* is well-accepted by the Ministry of Education of Malaysia in its formulation of its "School Health Programmes" (Rancangan Kesihatan Sekolah 1968). However, the Education Authority has also expanded the term *health* as the *optimum state of physical, emotional/mental, social and spiritual well-being .......... with all these factors being in dynamic equilibrium*. This definition leans towards the holistic view of health as expressed in Burt and Eklund (1992).

As such, a circular of the Ministry of Education, Malaysia, concerning its school health programmes (Rancangan Kesihatan Sekolah 1968) categorically states that *health cannot be obtained overnight unless stress is given to knowledge, attitudes and behaviour which is persistent and continuous*. This is concomitant with the definition in the Manual of Health Education (1969) which prefers to view health as a *state of dynamic harmony between the physiological, psychological, social and cultural elements which make up the human organisms in the society* - a definition which rests on the concept of adjustment and adaptation of the individual to his environment.
3.2.2 Health Education/Promotion

Health education in itself is not easily defined because the connotation is that of mere transmission of knowledge from teacher to learner of the *empty vessel* concept of Burt and Eklund (1992). Dunning (1986) defines it as *far more than a process of transmitting information from a teacher to a learner but that it is a complete process of interactions set in motion by the educator, by which he hopes to influence the attitudes and behaviour of the learner.*

*WHO* (1984) accepts health education as any combination of learning opportunities and teaching activities that is designed to facilitate voluntary adaptations of behaviour which leads to improved health. Indeed it is deemed the cornerstone of success of any preventive measure by promoting optimal professional and public acceptance and use of services (*WHO* 1987).

Education in itself results in greater access to knowledge and information and, more importantly, it develops information-seeking skills to give people the freedom to make informed choices on their own health behaviour (*Burt, Eklund* 1992).

In the past, health education was used to refer to a broad range of initiatives now covered by the term health promotion. The term health education now tends to refer to educational programmes designed to bring about voluntary changes in behaviour. The term health promotion grew out of the health education movement but can now be understood as an umbrella concept which covers health education and a number of other approaches (*Hawe, Degeling, Hall* 1990) which either alters the environment in such a way as to improve health without specific individual actions, or enables individuals to take advantage of preventive measures or services (*WHO* 1987, *Frazier* 1992). Participant involvement is essential for success and what is taught needs to be compatible with local customs and
cultures as well as scientific belief.

3.2.3 Dental Health Education/Promotion

It follows that helping people to help themselves by making the right choices, would also apply to dental health education (Dunning 1986). Dental Health Education (DHE) is an integral part of any public dental health programme and is generally accepted as a means of influencing consumer attitudes towards services being rendered (Davis 1974). This is a rather narrow view as is the provision of information to a total population in such a way that people will apply it in everyday living (Young, Striffler 1969).

The ultimate goal of all planned DHE is to obtain and maintain optimum oral health status for the maximum number of individuals through life, via the individuals' own efforts (WHO 1977).

Where teachers and trainee teachers are concerned, the midterm goals for DHE as stated in WHO (1977) would be applicable:

1. to arouse interest in oral health
2. to make people aware of the existence of oral/dental disorder in the target population groups (in this case, the elementary schoolchildren)
3. to make people aware of health promotional and disease-preventive measures available to them
4. to persuade people that oral hygiene should be valued as a personal and community asset and to help them to make decisions to improve their own oral health and that of the community
5. to make people aware of the existence of dental services and to promote the use of the services
6. to persuade people to adopt and sustain dental health practices conducive to positive oral health.
One of the earliest example of dental health promotion is by Rowntree (1959) and dental health promotional activities is described in detail by Woolley (1980). There is a great need to view the matter from the targeted groups' point of view according to Grace (1992) with dental professionals aiming to sell dental health to the community as a very desirable commodity.

3.2.4 Dental Health Education: Connection with Prevention

In a school-based setting, dental health educational activities are components of school curricula in many school systems around the world (Frazier et al. 1983). DHE activities in school aim broadly to provide the information that children need to maintain oral health and generally to prevent oral disease through the development of beneficial behaviour patterns. Preventive dental activities in a primary school system seek to prevent dental disease, through organised group activities or through specific services to the individual child. In a primary school system of children aged 6 - 12 years, DHE and prevention are words tended to be used synonymously. DHE and prevention are distinct and yet inextricably linked since there is an educational component in every preventive procedure (Burt 1983, Flanders 1987) - more so in children of these age groups where dental diseases have not occurred or are at very initial stages. DHE in schools aim at optimising self-care and minimising intervention (WHO 1987).
3.3 EDUCATIONAL CONCEPTS AND PRINCIPLES AS APPLIED TO SCHOOL-BASED DHE

Oral health education involves a variety of communication skills such as seeking information, listening, informing and demonstrating. Within the context of DHE, there are educational components associated with each available oral hygiene procedure of which teachers and students must learn the reasons and limitations for.

Instructional activities can be organised for self-application of fluorides such as brushing with fluoride dentifrices and mouthrinsing with fluoride solutions along with emphasis on the purposes of the appropriate measures. Oral hygiene instructional programmes will include teaching the rationale for reduced and less frequent sugar consumption and also includes information on available treatment procedures, products and how they can be obtained (Horowitz, Frazier 1986).

Allred and Hobdell (1986) states educational objectives as learning objectives and not teaching objectives since they define what the student, not the teacher, should be able to do. The objective(s) should be determined by the result(s) required of the student group at the end of the education session (Malvitz 1983).

The major emphasis of all school-based dental health education is primary prevention. There is no right and wrong way to educate people and the ultimate objective of all planned DHE activities is to obtain and maintain optimum dental and oral health status for all individuals throughout life (WHO 1970). These should be reminders to dental professionals and to teachers undertaking dental health education for children.
Early school-based DHE depended on a cognitive learning model which assumes the following traditional authoritarian method of:

Knowledge $\rightarrow$ attitude change $\rightarrow$ behaviour change

the KAB model as stated by Sheiham (1983).

The second approach is the behaviourial learning model which relies on changing the learner's behaviour, through prescribed activities which present the appropriate skills, behaviour and knowledge, with the hope that desired attitudes follow (Malvitz 1983, Sheiham 1983, Dunning 1986). Based on this concept there is a need for behaviourial sciences in relation to effective communication (Counsell 1970, Craft 1980).

In an ideal setting, both individual and group instruction should be present. In a one-to-one encounter, it is best to capitalise on personal experiences (Stoll 1977) but in group instructions, special educational approaches are necessary which might be beyond a dental personnel's scope, and is best left to a teacher experienced in paedagogy (Masters 1972, Friedman 1974). The dental personnel should act as a resource person supplying facts and materials (Dunning 1986).

Jean Piaget, a Swiss psychologist, postulated that children go through different developmental stages at various ages with the ability to accommodate in response to the environment. The aspect of Piaget's theory that have influenced educators is the notion that school curricula should involve students as active participants rather than mere passive listeners (Dembo 1991).

(Schou 1985, Horowitz, Frazier 1986). The more successful approaches have involved a few degrees of active involvement (Craft et al. 1981, Flanders 1987). Programmes that involved less participation with increased knowledge had less impact on attitudes, behaviours and beliefs (Walsh 1985).

Stoll (1977) talks about behaviour modification with token rewards and prizes to reinforce behaviours, discovery learning through active participation and individualised interaction. Davis (1974) mentions 'project learning' where children embark on topics of interest to them, either singly or in groups. However, the enthusiasm of the teacher is deemed as crucial to the programme (Stoll 1977, Pierce, Byrne 1979, Craft et al. 1984, Dunning 1986). At all levels, the educational material content must be correct, complete and reinforced and resource materials appropriate for the target group (WHO 1987).

Based on the behavioural concept, Cohen and Lucye (1970) stated that the educational part is not as important or effective for the lower grades as is the motivation of the parent (especially the mother) - a fact supported by North (1970) and Rayner and Cohen (1971). Although repetition and reinforcements of habits should be early, it is at the fourth, fifth and sixth grades that children have great curiosity and maximum interest about their bodies and in dental health, although the phases more related to personal appearances are not yet of concern (Dunning 1986, Malvitz 1983). Masters (1972) even advocated use of low to medium fear arousal in an entertaining fashion.

Whatever the planned educational concepts, the ultimate outcome of the educational process is very much based on the fact that learning is not an isolated event but subject to many variables. There is no substitute for plain honesty transposed into a language the children can understand.
3.4 TYPES OF CURRICULUM THAT CAN INCORPORATE DHE

The ideal type of school primary preventive dental health education curriculum programme should not impose an excess or unusual teaching burden on the teachers, should be cost-effective in terms of manpower, money and materials and should produce observable results. It is suggested that all lessons plans for the teacher need to be organised to minimise the need to search out information and in addition, the teacher could supervise a weekly mouthrinse or daily fluoride dentifrice toothbrushing (Harris 1991).

Dunning (1986) writes about three types of curriculum:-

1. **Curriculum of isolated subjects**
   the longest and extensively-used, where health is taught as a subject with a given time slot. In general, treatment as an isolated subject discourages both teacher and student from feeling that the study of health is truly vital.

2. **Broad-field curriculum**
   groups similar and like subjects into broad headings with the aim of encouraging both teachers and children to make correlations between isolated subjects as applied in real life patterns.

3. **Core curriculum**
   In essence, a group of children spends an important portion of the school day with one teacher who is responsible for their education.

The Malaysian approach to DHE is integration at low-key level, not only in the subject "Man and his Environment" but also in religious and moral studies, in line with the holistic definition of health as adopted by the Ministry of Education (Rancangan Kesihatan Sekolah 1968). Whatever the format of curriculum, DHE should be planned by teachers such that each standard or grade level would receive a greater diversity and complexity
of topics than the previous year. As such the integration of DHE in the subjects should follow the format designed for the staff nurses (*Dental Division, Malaysia 1983*), where there is a stress on instilling habit rather than information for the children ages 7 - 9 and "formal" incorporation of knowledge begins at age 10 - 12.
3.5 RATIONALE OF DHE AS RESPONSIBILITY OF SCHOOL AND TEACHERS

In principle, DHE in a school setting, under a teacher's guidance, should be an extremely important component of efforts to influence preventive dental behaviour (Haefner 1974, Kenney 1979, Frazier 1980). Other major approaches pose problems of harnessing a large captive audience whereas in a primary school setting, the readily captive audience is of an age group where primary prevention is a major part of DHE.

Schools have a tremendous capacity to be supportive of programmes involving preventive health and preventive dentistry (Kenney 1979, Dunning 1986, Davis 1974, Rayner 1974). Elementary school teachers have traditionally played a role in educating children about health (Horowitz 1979). This is the message that must be driven home to dental professionals and teachers alike.

Haefner (1974) had earlier expanded on the advantages of the school setting:-

- the school setting avoids the limitations associated with the dental office and dental campaigns,

- the school setting possesses several positive features in its own right - the asset for communication with nearly all persons within the entire school age group, in an educational context where learning is emphasised and rewarded,

- it offers the opportunity to target audience over a considerable length of time, at an early age when habit patterns are still in the process of being formed,

- the dental health educator can use both mass communication and personal communication approaches on the same audience, deriving maximum benefit from each,

- and the school classroom offers the possibility of making use of the powerful forces of group dynamics in inducing students to take appropriate dental health actions.
The credibility of the teachers as viewed by the recipients of the message can make a significance difference in acceptance of the message (Rayner, Cohen 1971, Dunning 1986), especially where the children come from a myriad of value systems shaped by social and cultural norms as in a multiracial country like Malaysia. In the study by Loupe and Frazier (1983), it was found that more than 70 per cent of teachers were prepared to teach basic dental health topics and that an equal number made use of curriculum guides and other resources.

WHO (1958) lauded school teachers as the health worker's principal collaborators. There was a need to give attention to teachers' training schools in order to obtain their collaboration, to provide them with documentation and to encourage them to stress the health aspects of the subjects they teach. There was (and still is) a need to educate them to implement and maintain the methods, and a need to educate other relevant persons in order to foster continued participation, understanding and future support of the programmes (Frazier 1979).

Apart from possessing educational skills, a teacher knows the children in the class and often serve as a parent surrogate in the absence of the parent(s) (Rayner, Cohen 1971) especially when many women are in the workforce (Silversin, Coombs 1981).

The model presented by Raynor and Cohen (1971) in Figure 1, highlights the role of the teacher's behaviour in relation to the parental behaviour. It is possible for the teacher, as a surrogate parent, to create situations in school where the children identify with the teacher, so that mutual reinforcement of the desirable behaviours may occur.
Figure 1: The role of teacher's behaviour in relation to parental behaviour.  

Teacher's behaviour → revised teaching techniques

Parental behaviour → children's behaviour

children's knowledge (through activity)

Pertinence and Salience

Values

Habits

There should be an optimum mix of ancillaries, auxiliaries and dental professionals for Malaysia to achieve the most economic, yet adequate, oral health care for its school population in the face of increasing costs of salaries, staff training and materials and equipment. Low technology/non-interventional services could be carried out by ancillary workers now and in the future (WHO 1990). It is hoped that schoolteachers will become a permanent member of the ancillaries within the dental team in Malaysia as described by Allred and Hobdell (1986).
A circular from the Ministry of Education, Malaysia (Ministry of Education, Malaysia 1991a), although belated, legitimised the request from the Dental Division, Ministry of Health, Malaysia, that DHE be integrated into the general curriculum of primary schools based on the problems of dental diseases in children of ages 6 - 12 as presented in Chapter 2. This circular gave recognition to the need for reinforcements of DHE knowledge and preventive behaviours (especially toothbrushing techniques and habit formation) by teachers in primary schools. It was then in 1990 that Senior Dental Officers were called upon to liaise with Teachers' Training Colleges in their various districts, as to the implementation of DHE workshops for trainee teachers. However, to date, the central DHE Planning Unit of the Dental Division, Ministry of Health, Malaysia is still awaiting feedback as to the format and content adopted by the various districts (Dental Division, Malaysia 1993).

This chapter will be looking into the planning of a DHE workshop and pre-programme questionnaires, with a view to making suggestions into activities and procedures that might be given emphasis. However, it is far from being a "blanket" suggestion and it is hoped that the suggestions be adapted, improvised and improved upon according to the local district requirements. As Horowitz and Frazier (1992) state this plan must not be developed by health professionals in isolation and subsequently superimposed on the school system......the plan must be a collaborative product developed with school and community leaders and directed toward the ultimate benefit of the school age children.
Masters (1972) in his work with teacher DHE workshops, considered teachers as effective dental health educators based on the roles and rationale as already stated in Chapter 3. In feedbacks from teachers themselves, Masters (1972) concluded that DHE workshops were absolutely essential for orientation of teachers to the school DHE programme and that dental personnel be always available as consultants and resource persons. For those schools in the United States with school nurses at that point in time, the teachers felt that the school nurse was of benefit as a resource person and co-ordinator of supplies and materials.

The importance of DHE workshops for teachers have been demonstrated in other school-based programmes (Weiss, Lee 1974, Rose et al. 1979, Craft et al. 1981). Craft et al. (1981) maintains that there is a need for more emphasis on what audiences "do not know and less on existing knowledge", with a suggestion by Sutherland (1979) that students should write down questions of interest to them, on which they want further clarifications. Pierce and Byrne (1979), Craft et al. (1981), Bouchard, Farquhar, Carnahan and Daily (1990) conducted pre- and post-programme dental questionnaires with the objectives of identifying oral health concepts prioritised by teachers and therefore taught in schools, and of determining the desired components of an instructional guide for teachers.

Masters (1972) recommended that workshops be held not merely for teachers but also for school administrators in an effort to brainstorm problems they foresee in the implementation of a school DHE programme. He recommended that there should be at least 3 sessions for the teachers themselves:

Session 1 --> fundamentals of programme outline and information on dental disease and effect on individual population. This session should
explain limitations of current system of care and guidelines on graded curriculum for the children,

Session 2 —> actual exercises in which teachers in small groups are instructed in the techniques of personal dental care,

Session 3 —> at least a month later - an opportunity for feedback, questions, offering critique and making recommendations, as to problems encountered and solutions to be implemented and standardised.

In the one and only feedback to date, obtained from the central DHE Planning Unit, Dental Division, Malaysia (Dental Division, Malaysia 1993), the format of the workshop is purely didactic and keeping very much to information-giving along the lines of the specific objectives of DHE workshops to trainee teachers within the Malaysian context. This will be expanded later in Section 4.1.1. However in an article by Blinkhorn, Downer, Mackie and Bleasdale (1981) it is stated many people are unaware that certain behaviours are detrimental to their health and may only be aware that they are at risk after information has been made available. The fact that information on a health problem exists is irrelevant unless it is endowed with self-Interest and the facts are seen as personally relevant. Lending credence to what Craft et al (1981) has said about giving emphasis to what audiences do not know, Jacob and Plamping (1989) have stated that effective programmes must first take into consideration the current status of the participants in terms of their awareness of the problem and interest in taking action and then target specific goals. It might well be that as dental personnel conducting DHE workshops, we bring our own knowledge, values, beliefs and skills acquired in our professional training and experiences but forget that the trainee teachers also have their own health beliefs, a certain amount of health knowledge and probably some expectations concerning the DHE workshop. Some of the dental health facts possessed by the trainee teachers might well have no scientific validity, being culturally rather than medically acceptable.
4.1.1 Planning a DHE Workshop

The planning cycle for health education, in a model by Jacob and Plamping (1989) is illustrated in Figure 2. The model demonstrates the cycle of planning applicable to DHE and also demonstrates the consideration that dental personnel must give to all factors in the planning process of a DHE workshop. The final plan of the programme should be precise enough for other dental personnel to pick up and implement and a proper programme plan would allow for logical reasoning of all the basic elements of the programme (Hawe, Degeling, Hall 1990).

Figure 2: A PLANNING CYCLE FOR HEALTH EDUCATION
Source: Jacob, Plamping (1989).
Figure 2 shows that in planning DHE sessions, it is imperative that dental personnel find out details about their target groups and study the situation analysis, in order to focus on what they hope to introduce in the DHE sessions. This endeavour will also give the current situation in terms of knowledge, beliefs, expectations, skills or experience of the members of the target group. Figure 2 also categorises material situations - the time, money, materials, facilities and people available to the dental health personnel, which might affect the process and outcome of the DHE workshops.

In consideration of the situation analysis, Jacob and Plamping (1989) have also listed details of group characteristics which affect DHE planning. This list is given in Figure 3 and should act as a check list in planning DHE workshops for Malaysian trainee teachers. It will certainly be that certain points are very important and others inapplicable in the Malaysian context of trainee teachers. The points of importance are that primary trainee teachers in Malaysia are of the age group of 18 - 25 years, of various races and ethnic origins. It is important to bear in mind that the average educational level is fifth form and those from dentally well-served areas would probably have basic knowledge from isolated DHE by dental nurses at primary school level. They are also of a group who would have benefited from areas of community water fluoridation, started in Malaysia in the early 1970s.

While consideration of situation analysis takes into account options available to the dental personnel organising the DHE workshop and leads to flexibility in the sessions, goals have to be defined very clearly. Setting goals is important for three reasons: they aid us in selecting the order of lessons and choosing teaching techniques, secondly, if the target group knows the goals set, they will know what is to be accomplished and thirdly, when goals are set and are explicit, both the provider and the members of the target group can agree on what "success" should be or look like and discuss useful feedbacks (adapted from Jacob, Plamping 1989). The goal(s) of the DHE programme for trainee teachers is specified as the ultimate desired impact(s) of the programme.
The specific objectives of the DHE educational programme for trainee teachers have already been set (Ministry of Education, Malaysia, 1991b) as below.

**The general aim:** to enable teachers to contribute effectively towards achieving the objectives of the school dental health programme.

**The specific educational objectives:**

At the end of the workshops, the trainee teachers are expected to:

1. be knowledgeable about
   i. school dental programmes
   ii. basic information about dental health including the problems associated with treatment and prevention of dental diseases
   iii. the role of school teachers in relation to dental officers and other agencies.

2. be adept at:
   i. recognising oral health status
   ii. effective oral hygiene measures (the right toothbrushing techniques).

3. be able to organise and implement scope of dental health education in the curriculum for primary schools as well as in co-curricular activities.

4. be exposed to resource materials and methodologies for the incorporation of DHE in the curriculum.

A major task of any dental personnel involved with programmes for these trainee teachers will be to encourage them to see themselves as having a major contribution to make in imparting DHE to primary school children and it might well be that enlistment of someone who can act as influential role models and opinion-makers is necessary. This is a reason
to support the holding of DHE workshops for the administrators of the colleges as well, along the lines of Masters (1972). The 3-session workshop strategy of Masters (1972) may be adopted as the minimum number of sessions, with more if need be. DHE sessions for administrators of the colleges themselves may be one of the alternatives towards this task of convincing the trainee teachers to have the right attitudes towards DHE. Problems with perceptions of responsibilities by teachers towards DHE will be expanded later under Section 4.2.

**Figure 3:** Group characteristics which affect DHE Planning.
Source: Jacob, Plamping (1989).

* The number of people in the group
* The way in which the group was formed: is it a class, an interest group, a self-help group etc? To what degree do the members recognise common interests and concerns?
* Degree of shared experience and knowledge of dental health
* Attitudes towards and perceived relevance of DHE
* Experience of education and health education methods: has it been mostly positive or negative?
* Social status and social class affect cultural norms and the use of language
* Ethnic origins also influence cultural norms and language use
* Sex
* Age
* Level of ability and receptiveness. Young children do not have fully developed intellectual capacities and have shorter attention spans than most adults. This may also be true for people with learning impairments or who are mentally confused
* Health problems or disabilities shared by group members.
4.1.2 Evaluation of Trainee Teacher DHE Workshops

Evaluation of DHE workshops should be inbuilt into the planned programme. Evaluation will help determine minor or major alterations, if any, to the components of the programme. \textit{Hawe, Degeling and Hall (1990)} terms this as \textit{process evaluation} - it should cover all aspects of delivery such as looking at sessions and session contents, attendance and what the participants think about the programme. (The evaluation with reference to the specific objectives set by the \textit{Ministry of Education, Malaysia (1991b)} define the short-term effects of DHE on the trainee teachers and not the outcome desired in the ultimate target group of primary schoolchildren).

Feedback by participants is important for the above reasons and participants’ views of content, issues and delivery will help determine factors which need/need not be changed, and/or factors which should be omitted or included. The most detailed and private feedback would be gained by distributing individual questionnaires for participants to complete. This is a good way to get anonymous feedback.

Evaluation of DHE workshops at this stage would serve more as information for future implementation of DHE workshop contents and activities and should take into consideration opinions on the following components of the DHE workshop (\textit{Hawe, Degeling, Hall 1990}):

1. Content
2. Teaching (by dental personnel involved)
3. Film and leaflets (if any) - specific programme materials
4. Group discussions
5. Venue and facilities
6. Other comments / Overall comments.

Trainee teachers should be encouraged to give positive or negative comments and make
recommendations for improvements. As Jacob and Plamping (1989) state: feedback is the skill of informing another of your observation of his or her behaviour, it is not the same as criticism. Feedback is used to help people learn new behaviours or become more effective. Helpful feedback is specific, objective and includes observations on what is done well in addition to areas needing change.
4.2 USE OF QUESTIONNAIRES

*Something old, something new, something borrowed, something blue.*

Apart from the last ingredient, this is the recipe for most questionnaires (Abramson 1990). The use of borrowed questions has the advantage that they have already been tested and found to be serviceable. However, the investigator should always consider the possible need to revalidate the questions in his own study population.

The sequence of questions needs careful attention, with the easy questions of obvious relevance to the topic being asked first and difficult questions which may cause embarrassment or resentment later. The sequence of questions should be such that the respondent will see it as natural, with smooth movement from item to item. General questions should come before ones which are specific.

If the questionnaire is a self-administered one, an introduction or explanatory note, stating the purpose and sponsorship of the study will be necessary, and clear instructions and examples should be given. A statement about confidentiality should be included but anonymity should not be guaranteed unless there is really no way of tracing which question belongs to whom. Pre-tests are indispensable and usually reveal a need for changes in the questions or their sequence or, very frequently, for shortening the questions.

Questions may be open-ended or free response or closed questions. Open-ended questions, however may be difficult to code and closed questions make for greater uniformity. To avoid the need to express all the alternative responses in words, use may be made of graphic rating scales, with a number or a score.

Evaluation done on health education can be termed quasi-experimental or some prefer to call it non-experimental. Although they are often well worth doing, the findings must be
treated with caution because it is difficult to be sure that the outcome is in fact attributable to the intervention (Abramson 1990).

Pre-programme questionnaires is one of the strategies to discover the current knowledge, attitudes, values/beliefs and behaviour to gauge what the audiences do not know (Craft et al. 1981). Questionnaires, as mentioned under DHE workshops in Section 4.1, are a way to defining instructional content and emphasis. Several studies have been done to gauge the oral health knowledge, attitudes and opinions of elementary school teachers (Boyer 1976, Loupe, Frazier 1983, Lang, Woolfolk, Faja 1989). There is only one study documenting future elementary schoolteachers' knowledge and opinions about oral health and community programmes (Glasrud, Frazier 1988). However, to define goals in the affective domain is a very difficult task since there is no measure for quantifying attitudes, values and beliefs (Jacob, Plamping 1989).

In a study by Boyer (1976), classroom teachers perceived that dental health activities, requiring teachers to be actively involved and responsible, were not considered responsibilities of teachers. They did not consider it their responsibility to demonstrate toothbrushing techniques. Teachers' attitudes therefore are an important consideration in planning any future school DHE programmes to be undertaken by teachers. Other studies show positive teacher attitudes (Loupe, Frazier 1983). In an eight-year assessment of knowledge and attitudes of schoolteachers towards oral health programmes by Loupe and Frazier (1983), 70 per cent of teachers agreed they were prepared to teach oral hygiene skills and 88 per cent considered themselves prepared to teach about the relationship of diet to oral health. The study however, showed that they were only prepared to do so, if the activities were to be single, concentrated units of the core curriculum-type as mentioned by Dunning (1986). Lang, Woolfolk and Faja (1989) suggests that further investigation is warranted and that periodic surveys be done to assess the progress of dissemination of new information about preventive agents. In the findings on the knowledge and attitudes of future elementary schoolteachers, Glasrud and Frazier(1988) found that
future teachers were poorly informed about prevention of oral diseases and cautious about accepting supervisory roles for effective primary preventive regimens in school. However, they surmised that the reluctance of the future teachers as shown by the pre-programme questionnaires reflected the lack of information and unfamiliarity of the group with the activities involved in school-based DHE programmes. The questionnaires and the results of the study by Glasrud and Frazier (1989) is shown in the Figures 4, 5, 6 and in Table 7.

**Figure 4:** Future teachers' ratings of effectiveness of methods to prevent children's tooth decay.

**Caries prevention method:**
- Make regular dental visits \( (n = 310)^* \)
- Use dental floss at least once a day \( (n = 308) \)
- Brush with a fluoride toothpaste \( (n = 311)^* \)
- Cut down the frequency of eating highly sugared foods \( (n = 312) \)
- Have fluoride applied to the teeth at a dental office \( (n = 289) \)
- Have pit and fissure sealants applied to chewing surfaces of back teeth \( (n = 190)^{**} \)
- Drink fluoridated water \( (n = 295) \)
- Use of fluoride mouthrinse \( (n = 295) \)
- Take daily fluoride tablets \( (n = 203)^{+} \)
- Brush teeth regularly without toothpaste \( (n = 282) \)

\(^*\) Not effective = 0%
\(^{**}\) For sealants, 120 responded “don't know.”
\(^{+}\) For fluoride tablets, 107 responded “don't know.”
Figure 5: Opinions about responsibilities sometimes expected of school teachers

- Instruct students about scientifically valid methods to prevent oral diseases (n = 307)
- Instruct students about public health measures such as community water fluoridation (n = 309)
- Teach students to think critically regarding commercial advertising for dental health materials and products (n = 308)
- Refer students with dental problems to the school nurse (n = 310)
- Be actively involved in community efforts to improve students' oral health (n = 305)
- Allow class time for students to get preventive dental care and treatment (n = 307)
- Supervise the use of weekly fluoride mouthrinising in class (n = 307)
- Supervise daily brushing and flossing in the classroom (n = 306)

Figure 6: Opinions about services provided in an ideal school-based dental health program

- Dental health education (n = 307)
- Brushing and flossing instruction (n = 307)
- Mouthguards for athletes (n = 306)
- Emergency treatment of dental pain (n = 305)
- Daily toothbrushing (n = 307)
- Weekly fluoride mouthrinising (n = 305)
- Topical fluoride treatments (n = 302)
- Treatment of dental injuries (n = 306)
- Regular dental prophylaxes (n = 305)
- Pit and fissure sealants (n = 302)
- Regular dental examinations with x-rays (n = 305)
- Filling cavities in teeth (n = 304)
- Orthodontic treatment (n = 304)
It is interesting to note that in Figure 4, respondents rated scientifically validated procedures such as drinking fluoridated water, applying pits and fissure sealants and using fluoride rinses and tablets as less effective in preventing dental caries than making regular dental visits, brushing and flossing and reducing the frequency of ingested sugared foods - the more "traditional" concepts of DHE. It is important to note at this juncture, that the Malaysian dental health facts for teachers and students hinge on these three "traditional" rules, indicating that a different background information guide needs to be adopted to ensure that the knowledge is current and up-to-date. Stress has to be made that good oral hygiene procedures do not ensure caries prevention.

It is also of interest to note that in Figure 5, only 26 per cent of the respondents in the study agreed that teachers should supervise weekly fluoride mouthrinsing and 25 per cent brushing and flossing - the two preventive procedures that the Malaysian dental service hopes to delegate to teachers in primary schools on a continuous basis. Most of the respondents preferred the more didactic method of teaching DHE information and knowledge.

In Figure 6, teachers, however, rated highly DHE, brushing and flossing instructions, mouthguards for athletes and emergency treatment for dental pain as very important for an ideal school-based dental health programme. These answers reflected their perception of an ideal school-based dental programme which should be provided by the community dental service. Of the ideal, the future teachers were willing to only undertake DHE but not the other instructions and activities.

In subsequent studies on the oral health knowledge, practices and sources of information of elementary schoolchildren by Woolfolk, Lang and Faja (1989) and Russell, Horowitz and Frazier (1989), it was found that the schoolchildren reflected the disappointing realities of adult awareness. Topics which were given greater levels of visibility and repetitive reinforcements in the school programmes were the topics that the children were
most conversant with. There was a general lack of information on scientifically validated topics such as fluorides and sealants, and that where teachers lack understanding of purpose or value of the procedures, the children were equally so. All the studies by Loupe and Frazier (1983), Glasrud and Frazier (1988) and Lang et al (1989) suggest that teachers may not have the information upon which to base sound decisions on behalf of the children they teach. It is heartening, however, to note that in Figure 5, more than 70 per cent agreed that they should be actively involved in community efforts to improve students’ oral health.

The purpose of laying out the study on future elementary schoolteachers by Glasrud and Frazier (1988) is:

1. to demonstrate examples of questions that may be utilised in assessing knowledge, values and attitudes of trainee teachers in a Malaysian context. A questionnaire format of this nature will be invaluable in identifying topics to be given emphasis within the context of a trainee teachers’ DHE workshop in Malaysia.

2. to demonstrate that the questions actually touch on topics and concepts that are relevant for discussion and dissemination at trainee teachers’ DHE workshops in Malaysia

3. to demonstrate that the problems of knowledge, values and attitudes of teachers and trainee teachers towards school-based oral programmes are universal problems.

Table 7 is specifically inserted as an example of questionnaire format that can be adopted for use in the Malaysian DHE workshops context. Questionnaires from the studies on practising teachers by Loupe and Frazier (1983) are compiled in Appendix 1 as a matter of interest to Malaysian dental personnel involved in designing questionnaires for teachers and trainee teachers.
Table 7: Future teachers’ knowledge about fluoride, fluoridation and periodontal disease (Minnesota 1985).

<table>
<thead>
<tr>
<th>Future teachers’ knowledge</th>
<th>Percent agree</th>
<th>Percent disagree</th>
<th>Percent don’t know</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>KNOWLEDGE ABOUT FLUORIDES</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Fluoride makes tooth enamel more resistant to decay</td>
<td>91</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2. Fluoride shows where plaque is on the teeth</td>
<td>5</td>
<td>82</td>
<td>13</td>
</tr>
<tr>
<td>3. Fluoride makes teeth whiter</td>
<td>13</td>
<td>65</td>
<td>22</td>
</tr>
<tr>
<td>4. Fluoride cleans the teeth</td>
<td>44</td>
<td>47</td>
<td>9</td>
</tr>
<tr>
<td>5. Fluoride is an essential nutrient for bones and teeth</td>
<td>40</td>
<td>34</td>
<td>26</td>
</tr>
<tr>
<td>6. Fluoride helps repair small cavities in teeth</td>
<td>12</td>
<td>77</td>
<td>11</td>
</tr>
<tr>
<td><strong>KNOWLEDGE ABOUT COMMUNITY WATER FLUORIDATION</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Fluoridation prevents cavities in adults as well as in children</td>
<td>79</td>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>8. Fluoridation is not needed because we have fluoride toothpastes and rinses</td>
<td>13</td>
<td>72</td>
<td>15</td>
</tr>
<tr>
<td>9. Fluoridation benefits everyone in the community, regardless of age, income or ability to obtain dental care</td>
<td>60</td>
<td>14</td>
<td>26</td>
</tr>
<tr>
<td>10. Water fluoridation is not as effective as people used to think</td>
<td>19</td>
<td>50</td>
<td>31</td>
</tr>
<tr>
<td>11. Water fluoridation is the most cost-effective way there is to prevent dental cavities</td>
<td>35</td>
<td>31</td>
<td>34</td>
</tr>
<tr>
<td>12. Drinking fluoridated water causes health problems in the elderly</td>
<td>5</td>
<td>29</td>
<td>68</td>
</tr>
<tr>
<td>13. Some people are allergic to fluoride in water</td>
<td>50</td>
<td>14</td>
<td>56</td>
</tr>
<tr>
<td><strong>KNOWLEDGE ABOUT PERIODONTAL DISEASE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Periodontal disease can be more progressive, leading to loss of bone that supports the teeth</td>
<td>94</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>15. After age 35, tooth loss is more attributable to tooth decay than gum disease</td>
<td>10</td>
<td>90</td>
<td>0</td>
</tr>
<tr>
<td>16. Periodontal disease is caused by a virus</td>
<td>20</td>
<td>80</td>
<td>0</td>
</tr>
<tr>
<td>17. New information shows that gum diseases can be controlled by using certain commercial mouthwashes</td>
<td>22</td>
<td>78</td>
<td>0</td>
</tr>
<tr>
<td>18. Good oral hygiene (brushing and flossing) is more important in preventing gum disease than in preventing tooth decay</td>
<td>76</td>
<td>23</td>
<td>1</td>
</tr>
<tr>
<td>19. The cause of gum disease is the presence of dental plaque</td>
<td>64</td>
<td>36</td>
<td>0</td>
</tr>
<tr>
<td>20. Vitamins and sunlight can prevent periodontal disease</td>
<td>39</td>
<td>61</td>
<td>0</td>
</tr>
<tr>
<td>21. Slight bleeding upon brushing is an early sign of periodontal disease</td>
<td>55</td>
<td>44</td>
<td>1</td>
</tr>
</tbody>
</table>
4.3 BACKGROUND DENTAL HEALTH LITERATURE FOR TEACHERS

In the study by Masters (1972), teachers requested a simplified DHE guide and as recently as 1990, Bouchard et al. (1990) indicated that among curriculum components most requested was background dental information for teachers. In the study of future elementary schoolteachers, no information was collected on the content of the reading materials on oral health. In an earlier review of information on dental health for college students, Freed and Goldstein (1976) found that articles were generally deficient in amount, thoroughness and quality and were occasionally wrong. There was much inconsistency in the textbooks. Blinkhorn and Verity (1979) found that the suitability of educative material concerning dental health is questionable, because of the tendency for such material to lapse into dental jargon which may well be totally incomprehensible to the layperson. These facts are supported by Bouchard et al. (1990).

The Dental Division of the Ministry of Health, Malaysia, has actually produced two manuals for general reference by dental nurses, teachers and dental officers alike. The first manual (Dental Division, Malaysia 1983) was originally a guide for the preparation of audio-visual aids and materials for lesson plans, for use as a graded integration into the curriculum. It was subsequently revised and distributed to schools in 1992 (Dental Division, Malaysia 1991). No distinction is made of content for use in primary and secondary schools and the assumption is that teachers will already have the background knowledge to incorporate what is most suitable for each age group and, that the knowledge held by the teachers, is correct. Apart from information disseminated during DHE workshops, there is no other comprehensive background DHE literature material available from the Ministry of Health, Malaysia.

A brief survey of several dental health facts and teaching outlines for DHE has shown that there are many varied publications from USA, Great Britain and Australia. Examples of background dental health information from the USA are Sandell (1956), publications of
the American Dental Association (1965 and 1969). These are old and dated. There are other dental health facts from Great Britain (North Western Regional Health Authority 1978, British Dental Health Foundation, no year, Levine 1989). Some are regional publications and others in collaboration with dental product manufacturers. The state of New South Wales, Australia, itself, has quite a few dental health facts publications (Health Commission of New South Wales 1974, Dental Health Education and Research Foundation 1970, Harrison, no year, Department of Health, New South Wales, no year). It is interesting to note that one publication of dental health guide for teachers from Tanzania (Normark, Jenssen, Mosha 1984) has actually adapted its material to incorporate local cultural and traditional practices, such as the making of toothbrushes from wood. This is a step towards establishing pertinence to the DHE activities undertaken in that particular country.

The purpose of mentioning some of these guides and DHE facts is to pinpoint the fact that teachers and other laypersons can so easily be misguided by information that is outdated and no longer scientifically accurate. In a review of DHE in the previous 100 years, Fox and Maddick (1980) noted that there has been three consistent messages - regular dental visits, good oral hygiene and a properly balanced diet. These are the three messages upheld by the Dental Division of the Ministry of Health, Malaysia, and there is a need to update these messages.

The characteristics in common to all the manuals mentioned above, are an emphasis on tooth morphology, functions of teeth, plaque, diet, caries and dental care with a call for student participation in mechanical plaque removal, namely toothbrushing. Some emphasise traditional methods of preventing tooth decay rather than scientifically proven methods, for example, stressing toothbrushing and flossing as the primary factors of preventing tooth decay, when use of fluorides and sealants has been shown to be more effective. The DHE facts were scientifically accurate at that specific point in time but are now outdated and no longer comprehensive (Bouchard et al. 1990). As Frazier (1980)
maintains, a major problem of education is the gap between the scientific knowledge base of the field at a specific point in time and that information as taught to the public, including schoolchildren, about oral health and the prevention of oral disease.

The dental health literature that was the simplest and most scientifically accurate to date is "The Scientific Basis of Dental Health Education" (Levine 1989). This booklet seeks to redress several earlier messages - the conflicting evidence pertaining to oral hygiene in reducing decay (Sutcliffe 1989), the ineffectiveness of fibrous foods such as apples and carrots or of rinsing with water to remove plaque and the misconception of nutrition as being necessary for the correct development of the tooth structure. However, Ashley (1989) cautions us that even though these statements are excellent summary of the consensus view of experts in the United Kingdom, points made are still open to debate and modification as the years pass.

It is appropriate at this juncture to suggest that "The Scientific Basis of Dental Health Education" (Levine 1989) be translated into the Malay Language to serve as supplemental background information for trainee teachers. Based on information derived from pre-programme questionnaires, dental personnel involved in the organisation of DHE workshops can then tailor DHE sessions to lay stress on the topics which should be given emphasis.
4.4 BASIC COMPONENTS OF DHE INSTRUCTION FOR TEACHERS

Three components are generally recognised as fundamental to any comprehensive school dental programme:

1. Services
   - Appropriate regimens to prevent dental caries and gingivitis
   - Assurance of periodic oral examinations and treatment
   - Effective referral and follow-up procedures for children in need of treatment
   - Emergency first aid for accidental dental injuries at school

2. Instruction
   - A comprehensive educational curriculum spanning all grade levels

3. Environment
   - An environment consistent with what is being taught
   - Incorporation of safety measures in the school building and in sports
   (adapted from Horowitz, Frazier 1992).

These three components constitute the framework for providing a comprehensive dental health programme at school. The basic question now is "What do we teach the teachers?", as each of the components above has its own educational component.

Bouchard et al. (1990) identified ten oral health concepts which should be taught by teachers in schools but found that a pre-tested questionnaire mailed to a stratified random sample of 424 teachers, school nurses and curriculum co-ordinators showed that reported teaching of a concept was associated with the priority school staff placed on that concept.

The emphasis of certain teaching concepts may be related to what the school personnel themselves were taught about preventing oral diseases and that they feel more knowledgeable and comfortable about relaying these familiar information to their students.

The oral health concepts of Bouchard et al. (1990) are given in Table 8.
Table 8: Distribution of respondents by oral health concepts taught and priority placed on each (Ohio Oral Health Education Survey 1988)

<table>
<thead>
<tr>
<th>ORAL HEALTH CONCEPTS</th>
<th>PERCENTAGE RESPONDENTS WHO PLACED HIGH PRIORITY ON CONCEPTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Characteristics of a healthy or unhealthy mouth</td>
<td>67 percent</td>
</tr>
<tr>
<td>2. The relationship of oral health to overall health</td>
<td>54 percent</td>
</tr>
<tr>
<td>3. The relationship of diet to oral health</td>
<td>74 percent</td>
</tr>
<tr>
<td>4. Decision-making as it relates to obtaining oral health care and purchasing oral health products</td>
<td>27 percent</td>
</tr>
<tr>
<td>5. The use of fluorides</td>
<td>59 percent</td>
</tr>
<tr>
<td>6. The uses and misuses of tobacco and alcohol and their effects on oral health</td>
<td>47 percent</td>
</tr>
<tr>
<td>7. The use of dental sealants</td>
<td>9 percent</td>
</tr>
<tr>
<td>8. Oral injury prevention and first aid</td>
<td>31 percent</td>
</tr>
<tr>
<td>9. Toothbrushing and flossing</td>
<td>89 percent</td>
</tr>
<tr>
<td>10. Role of individual and community in promoting and preventing oral disease</td>
<td>30 percent</td>
</tr>
<tr>
<td>11. Careers available in the field of dental health</td>
<td>18 percent</td>
</tr>
</tbody>
</table>

The above basic concepts can be adapted and redefined for the Malaysian trainee teachers programme. The information shows that teachers gave emphasis to toothbrushing and flossing, the relationship of diet to oral health and the characteristics of a healthy/unhealthy mouth - concepts commonly taught as tenets of DHE.

The other comprehensive method of identifying the educational components for Malaysian trainee teachers can be developed along the lines of Horowitz and Frazier (1992). They have actually tabulated the methods of preventing oral diseases, as in Figure 7, and derived flexible broad categories of educational approaches which may be used for one-to-one communication, group presentation of information and facilitation of group discussions, community organisational strategies or using mass communication channels.
The list gives a basic comparison of various methods of systemic and topical fluoride regimens and serve as a good compact guide for the general knowledge of trainee teachers. The educational approaches as derived in the article by Horowitz and Frazier (1992) are:

1. What to teach about oral health.
2. What to teach about preventing dental caries:
   i. Fluorides — systemics
      topical
      community water fluoridation
   ii. Pits and fissure sealants
   iii. Oral hygiene and dental decay relationship
   iv. Decreasing the frequency of sugar
3. What to teach about controlling and preventing periodontal diseases.
4. What to teach about preventing oral cancers.
5. What to teach about safety and oral health.

This list is not complete. In the case of trainee teachers, it would also be appropriate to stress school-based self-applied fluoride regimens and school-based mechanical plaque removal procedures.

4.4.1 What to Teach about Oral Health

This section should contain information to be used to develop a comprehensive curriculum based on the needs of the target audience. Oral health concepts and practices offered in schools should be based on the premise that oral health is an integral part of general health and that oral health contributes to general well-being and the quality of life. It is appropriate at this juncture to inform the teachers about the oral health status of the country with particular reference to the target group under their care and the situation and problems of delivery of dental care in schools. In this section, expansion could be given to
the types of dental services given in schools, the dental personnel involved and the cooperation required of teachers and school administrators.

4.4.2 What to Teach about Preventing Dental Caries

Horowitz and Frazier (1992) suggested incorporating the multifactorial nature of dental decay and broad divisions of content as already stated. It is up to the facilitator to give emphasis to any topic as and when necessary.

4.4.2.1 Fluorides

The teaching of fluorides should encompass the types of systemic fluorides, with particular emphasis on community water fluoridation and the types of topical fluoride regimens available, with the pros and cons for use in a school-based setting.

**Systemic fluorides** -
- community water fluoridation
- school water fluoridation
- fluoride tablets
- fluoride drops
- fluoride in salt
- fluoride in milk

**Topical fluorides** -
- fluoride dentifrices
- fluoride mouthrinses
- fluoride solutions - professionally-applied and self-applied
- fluoride gels - professionally-applied and self-applied
- fluoride varnishes

The effectiveness of some of the systemic and topical fluorides have been tabulated by Horowitz and Frazier (1992) as in Figure 7. The purpose of the table would be to give the teachers an overview of the regimes available and their comparative effectiveness.
<table>
<thead>
<tr>
<th>Disease and preventive methods</th>
<th>concentration or dosage</th>
<th>approx % reduction in disease</th>
<th>frequency and duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>DENTAL CARIES</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLUORIDES: Systemic and Topical benefits:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community water</td>
<td>0.7 - 1.2 ppm</td>
<td>50 - 60 %</td>
<td>ad libitum consumption for life</td>
</tr>
<tr>
<td>fluoridation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>School water</td>
<td>4.5 times optimum</td>
<td>40 %</td>
<td>ad libitum consumption for 12 years</td>
</tr>
<tr>
<td>Dietary fluoride supplements</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drops or tablets(home)</td>
<td>depends on age of child and fluoride concentration of water</td>
<td>50 - 80 %</td>
<td>Birth to at least age 14 K - 12 th grade</td>
</tr>
<tr>
<td>Tablets (school)</td>
<td></td>
<td>25 - 40 %</td>
<td></td>
</tr>
<tr>
<td>Topical benefits only:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professionally applied topical fluoride</td>
<td>2% NaF</td>
<td>30 - 40 %</td>
<td>Once or twice a year, depends on individual</td>
</tr>
<tr>
<td></td>
<td>8% SnF</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.2% APF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-applied Mouthrinses</td>
<td>0.05% NaF(daily)</td>
<td>30 - 40 %</td>
<td>at least through school years</td>
</tr>
<tr>
<td></td>
<td>0.2 % NaF(weekly)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dentifrices (toothpaste)</td>
<td>0.78% MFP</td>
<td>20 - 30 %</td>
<td>Lifetime</td>
</tr>
<tr>
<td></td>
<td>0.24% NaF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SEALANTS</td>
<td>Stop pit and fissure decay when retained</td>
<td>shortly after teeth erupt</td>
<td></td>
</tr>
<tr>
<td>CONTROL OF CARIGENIC FOOD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unavailability in school</td>
<td></td>
<td>Depends on extent of reduced frequency of intake</td>
<td></td>
</tr>
<tr>
<td>Reduced frequency of intake</td>
<td></td>
<td></td>
<td>Lifetime</td>
</tr>
<tr>
<td>ORAL HYGIENE MEASURES</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Closely supervised (school)</td>
<td>Uncertain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brushing</td>
<td></td>
<td></td>
<td>Lifetime</td>
</tr>
<tr>
<td>Flossing</td>
<td></td>
<td></td>
<td>Lifetime</td>
</tr>
<tr>
<td>Unsupervised (home)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brushing</td>
<td>Equivocal</td>
<td>Lifetime</td>
<td></td>
</tr>
<tr>
<td>Flossing</td>
<td>Equivocal</td>
<td>Lifetime</td>
<td></td>
</tr>
<tr>
<td>GINGIVITIS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oral hygiene measures:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Closely supervised (school) brushing and/or flossing</td>
<td>25 - 30 %</td>
<td>Effect decreases if unsupervised</td>
<td></td>
</tr>
<tr>
<td>Unsupervised (home) brushing and/or flossing</td>
<td>Unknown</td>
<td>Lifetime</td>
<td></td>
</tr>
<tr>
<td>ORAL CANCER</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Early detection: avoid use of tobacco products and reduce alcohol consumption</td>
<td>Unknown</td>
<td>Lifetime</td>
<td></td>
</tr>
</tbody>
</table>
4.4.2.2 Pits and fissure sealants

A simple explanation of pit and fissure sealant is given by Gordon (1989). Sealants are materials applied to occlusal surfaces to obliterate the occlusal fissures and remove the sheltered environment in which caries may thrive. It is a conservative way of tackling the problem of occlusal caries with a minimum of operative treatment usually no more than the polishing of the teeth to remove plaque and food debris. A summary as provided by Weintraub (1989) would be appropriate.

1. On the basis of the occlusal caries rate being relatively high and proximal caries rate being low, children and young adults constitute the age group most suitable for sealant programs (ages of 6.5 to 24 years).

2. A new procedure, the preventive resin restoration (PRR), is a combination of a conservative cavity preparation, small composite restoration and a sealant, and is being used for incipient or small caries lesions (Simonsen 1978).

3. It is difficult to justify sealant programmes for older age groups because of the declining prevalence of unrestored occlusal surfaces and the lower relative caries incidence of new occlusal lesions, and the higher rates of recurrent and proximal caries.

4. Effectiveness and retention decline over time although there are new and more superior materials on the market. Effectiveness depends on the age of the patient, caries rate and pattern, the number and types of teeth sealed per child and also the experience and proficiency of the dental personnel involved.

5. There is support for slightly greater benefit in fluoridated communities.

6. Reapplication of sealant is needed to maintain its preventive effect over time.

4.4.2.3 The oral hygiene and dental decay relationship

The study of the relationship between oral hygiene and caries is generally thought to be proportionate - that an increase in plaque leads to an increase in dental caries. Epidemiological corroboration of this theory is not consistent and the value of oral hygiene
practices against the initiation of dental caries has been challenged (Bibby 1966). There is no unequivocal evidence that good oral cleanliness reduces caries experience, nor is there sufficient evidence to condemn the value of good cleanliness as a caries-preventive measure. When the effects of a number of variables of caries experience were studied, the results indicated that poor standards of oral hygiene enhance the cariogenicity of sugar in the diet (Sutcliffe 1989). In a school setting, oral hygiene procedures without a fluoride dentifrice, have not been shown to prevent caries but nevertheless, should be advocated as a means of preventing periodontal disease.

4.4.2.4 Reducing the frequency of sugar

Sugars provide the nutrients required for bacteria to metabolise and produce acids that cause decay. Frequency of sugar intake has been shown to be the most important cause. Despite this knowledge, relying on students to decrease consumption and frequency of sugars as a means of caries prevention is unrealistic, in view of the pervasive availability and promotion of sugar products in present society. Accordingly, in programmes where the primary aim is to prevent caries, oral hygiene and dietary measures should only be used in conjunction with appropriate fluoride regimens and where possible, the application of dental sealants. However, teachers should still encourage routine oral hygiene measures and the restrictions of sweet products to augment other caries-preventive measures.

Mention should also be made about forms and consistency of sugar products that can slow down oral clearance of food, for example, sticky toffee is retained for a longer time on the surfaces of teeth than sweet drinks.

4.4.3 What to Teach about Controlling and Preventing Periodontal Diseases

Teachers must understand that plaque formation occurs in healthy individuals relatively independent of intake of kinds of food, degree of salivation, mastication or malocclusion (Loe 1983). Gingivitis is common among children and youth and the majority of it is
reversible through improved personal oral hygiene practices and by relatively simple professional treatment. In order to lead into techniques of mechanical plaque removal such as toothbrushing and flossing exercises in schools, teachers must know that the absence of dental plaque is consistent with gingival health and that removal or disruption of plaque can be by mechanical or chemical means. Discussion can then lead into types of toothbrushes and techniques of toothbrushing, not only for their own personal care but more importantly for the children they teach.

4.4.4 What to Teach about Oral Cancers

Teachers can be informed about tobacco and cigarette smoking being a major risk factor not only in lung cancers but also in mouth and throat cancers. Consumption of alcohol has also been linked to an increased risk of oral cancers. Clearly, a strong educational effort is needed for oral and general health. Because oral diseases are so insidious, periodic professional examination should encompass not only the teeth but also the surrounding tissues and oral mucosa.

With relevance to Malaysia, India and countries of South East Asia, mention can be made of pan or betel nut chewing as a cause of oral carcinoma especially among the Indian community in Malaysia. The Chinese community in Malaysia also suffers from a higher occurrence of oral and throat cancer and it has been speculated that this is a result of eating habits rather than the actual food intake - with the Chinese liking for very hot, steaming foods.

4.4.5 What to Teach about Safety and Oral Health

This topic encompass dental issues associated with primary schoolchildren - the progressive change from deciduous to permanent dentition, the likelihood of increase in oro-facial trauma due to school activities. Several studies on dental trauma showed high
incidence in school due to increased activities between the ages of 9 - 12 years, especially in males (Stockwell 1988, Ravn 1974, Bahgdady, Ghose, Alwash 1981, Davis, Knott 1984). This topic can thus be encompassed into lessons for general safety, such as encouraging and reinforcing the use of safety belts and safety helmets and the use of mouth guards by participants of contact sports. Students can also be instructed about the potential dangers of putting foreign objects into their mouths, especially while walking or running.

4.4.6 Oral Health and the School Services and Environment

The components of the school dental services have already been laid out. At the launching of the school health programme in Malaysia (Rancangan Kesihatan Sekolah 1968), the role and responsibility of the teachers, in making any school-based health programme a success, was defined as being equal in importance to that of the visiting health personnel. Teachers were called upon to give full co-operation and help in any health examination or health evaluation projects and to continue to reinforce health programmes which do not require specific specialised skills. Information on school dental services is necessary with the hope of continued participation and support from teachers.

Providing appropriate dental health services and related education would not have any meaning if the school environment is not consistent with what is being taught. While it is important that children be encouraged to utilise dental services and have access to caries preventive methods and necessary dental treatment, the school must co-operate in wise choices regarding meals and snacks sold in school.
4.4.7 School-based Self-applied Fluoride Regimens and Mechanical Plaque Removal which can be Implemented by Teachers

WHO (1987) recommends an intensified oral health education programme, a specific oral hygiene programme in all schools and a fluoride rinse or paste programme in all schools with an oral health programme. It also mentions the use of school teacher equivalents. It is timely to recommend here that teachers can themselves supervise self-administered preventive fluoride regimens, under the guidance and supervision of dental personnel.

4.4.7.1 Toothbrushing with fluoride dentifrices.

Substantial data show that use of fluoride dentifrices ad libitum will reduce the incidence of dental caries by about 20 - 25 per cent (Moller, Holst, Sorensen 1968, Howat, Holloway, Davis 1978, Andlaw, Palmer, King, Kneebone 1983). There are studies that show the additive effect in fluoridated areas (Lind, Von der Fehr, Joost Larsen, Moller 1976, Von der Fehr, Moller 1978). Fluoride dentifrices has been a major contributor to the caries prevalence decline globally (WHO 1990) and several types are on the market. A few salient points should be emphasised for personal care of families and children (adapted from Ripa 1991).

1. The window of vulnerability to dental fluorosis is between birth to 6 years of age and it is recommended that children below 6 should use a low-potency fluoride dentifrice of 550 ppm.
2. All children below 6 should be supervised in their toothbrushing. Dentifrices should be applied by a parent or supervising adult as a pea-size on a child's toothbrush.
3. Parents should brush pre-school children's teeth until they can do it properly themselves.
4. Children below 6 should be encouraged to rinse out thoroughly after every toothbrushing.

It must be emphasised to teachers that toothbrushing without a fluoride dentifrice has
questionable value in the prevention of dental caries although it has value as a plaque-removal procedure in the prevention of gingivitis and periodontal disease.

4.4.7.2 Fluoride mouthrinses

Ample research has shown dental caries reduction of 20 - 35 per cent by rinsing daily with a 0.05 per cent solution of sodium fluoride or weekly/fortnightly with a 0.2 per cent solution of sodium fluoride (DePaola, Soparkar, Foley, Bookstein, Bokhos 1977, Birkeland, Torell 1978, Ripa 1981, Driscoll, Swango, Horowitz, Kingman 1982).

Mouthrinses is one of the most widely-used caries-preventive public health methods in the USA, second only to community water fluoridation. The number of American schoolchildren participating in the programme has been reported to be as high as 12 million (Miller, Brunelle 1983). There are also over-the-counter products sold such as Fluorigard by Colgate-Palmolive. 2 regimens have been adopted as standard for school-based programmes:

0.05 per cent sodium fluoride rinse / 0.04 per cent APF rinse for daily use
0.2 per cent sodium fluoride rinse for weekly/fortnightly use.

In fluoride-deficient communities, fluoride mouthrinses should reduce caries by as much as 30 per cent. Whether school-based programmes should/should not be undertaken in fluoride-deficient communities must be determined by the individual programme, based upon the caries activity of the participants and the cost involved to reduce the disease level by about 30 per cent (Doherty, Martle 1987). In optimally fluoridated communities where caries activity is low, low absolute caries reduction cannot justify school-based fluoride mouthrinses. The decision to use fluoride mouthrinses for either an individual or community must be based upon knowledge of the caries risk of the targeted individual or group (Ripa 1992). This activity should be mentioned to these future teachers. Local conditions will determine whether it is undertaken or not in a particular area.
4.4.8 Structure, Function and Malocclusion of Teeth

Structure and function of teeth are topics that trainee teachers are usually conversant with. Information such as these are to be found in most DHE guides. However, the various types of malocclusion may be expanded upon, including information on orthodontic treatment for deserving cases. The effects of tooth loss, for example, over-eruption, tilting and drift of adjacent teeth, should be included in this section.
4.5 METHODOLOGY OF LESSON PLANS AND ACTIVITIES, GRADED CURRICULUM IN DHE AND IDENTIFICATION OF CURRICULUM DETAILS

There are areas of planning DHE components for children that must not be developed in isolation by health professionals. Collaboration with education personnel, who possess paedagogical skills, will insure diverse input into defining problems perceived as relevant to the school population and helps ensure broad commitment to the school problem by the school personnel (Horowitz, Frazier 1992).

The teachers’ guide, Dental FUNdamentals, of Bouchard et al. (1990) was actually developed by a consultant specialising in curriculum design. This guide includes the curriculum components, instructional strategies and materials requested by surveyed school personnel, with lessons written for kindergarten to sixth grade children.

While conditions in the Malaysian Dental Division are not as sophisticated as those in the more advanced USA, steps have been taken to identify subject matter for incorporation of DHE on a formal level for schoolchildren aged 10 - 12 years (Ministry of Education 1991b). This is in line with the call for formal incorporation of health education for these age groups in the various subjects such as "Man and his Environment", Islamic Studies, Moral Studies and the learning of languages.

4.5.1 Methodology

Cohen and Lucye (1970) introduced an example of a "Classroom illustrations of knowledge and behaviour model" as methodology for undertaking dental health education in the classroom. This is shown in Figure 8.
Table: Classroom illustrations of knowledge and behaviour models.

<table>
<thead>
<tr>
<th>DON'T</th>
<th>DO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional Knowledge Model</td>
<td>Alternative Behaviour Model</td>
</tr>
<tr>
<td>Lecture by dentist on decay process</td>
<td>Group discussion on what methods they should use to prevent decay in own teeth</td>
</tr>
<tr>
<td>Dental hygienist illustrating tooth brushing on plastic model</td>
<td>Student and teacher together removing plaque daily in classroom brushing of own teeth</td>
</tr>
<tr>
<td>Teacher telling child to go to dentist</td>
<td>Group discussion on dental facilities available to them and arranging use for own needs</td>
</tr>
<tr>
<td>Presentation of scientific facts on water fluoridation</td>
<td>Role-playing the fluoride controversy - proponents, opponents etc.</td>
</tr>
</tbody>
</table>

In the context of methodology of lesson plan for DHE as proposed for Malaysian schoolteachers, objectives are defined in the domains of the educational theory, along the lines of *Jacob and Plamping (1989)*. An example is given by the *Ministry of Education (1991b)* in Figure 9.
Figure 9: Example of incorporating DHE into the subject "Man and his Environment".

1. **Subject:** Man and his Environment

2. **Topic:** Dental Disease

3. **Target group:** Standard 4 (10 years-old)

4. **Objectives:** At the end of this lesson, students will be able to:
   - **Cognitive:** name 2 types of dental diseases
   - **Psychomotor:** recognise the existence of plaque on tooth via demonstration
   - **Affective:** realise the importance of oral health

5. **Resource materials:**
   - disclosing solution
   - mirror
   - model of teeth
   - dental chart of teeth
   - pictures/slides depicting oral diseases (not specified)
   - cassette recorder (if sing-along session)
   - toothbrushes + fluoride toothpaste + mug

6. **Existential experience:** students would already have learnt about their responsibility of ensuring their own oral health (in previous standards/grade levels).

The dental health education activity for the above lesson plan would then ensue as shown in Table 9.
Table 9: An example of a DHE activity format for a 30 minute session.

<table>
<thead>
<tr>
<th>STEPS</th>
<th>TIME</th>
<th>LESSON ACTIVITY</th>
<th>LESSON CONTENT</th>
<th>RESOURCE MATERIALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>8 min</td>
<td>switch on song</td>
<td>the types of dental diseases</td>
<td>cassette tape and recorder</td>
</tr>
<tr>
<td></td>
<td>3 min</td>
<td>1. question and answers about song e.g. who has experienced a toothache?</td>
<td></td>
<td>poster charts pictures of teeth</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. show photos of dental disease states (caries, periodontal disease, malocclusion)</td>
<td>the types of dental diseases</td>
<td></td>
</tr>
<tr>
<td>Step 2</td>
<td>12 min</td>
<td>teacher demonstrates plaque to students. 2 or 3 students will use disclosing solution in this exercise</td>
<td>the source of dental disease</td>
<td>disclosing solution/tablets toothpaste and toothbrush water, mug,mirror</td>
</tr>
<tr>
<td></td>
<td></td>
<td>question and answers 1. ways to ensure cleanliness of teeth 2. diet 3. dental examination</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 3</td>
<td>5 min</td>
<td>reinforcement, to equate flash cards with pictures of dental disease state</td>
<td>toothache</td>
<td>flash cards</td>
</tr>
<tr>
<td>Step 4</td>
<td>2 min</td>
<td>teacher summarises lesson plan according to concept</td>
<td>social mental health physical</td>
<td></td>
</tr>
</tbody>
</table>

Incorporation of lesson activities lends credence to the behavioural learning model as stated in Chapter 3. This methodology relies on trying to change the learner's behaviour.
through prescribed activities that present the appropriate skills, behaviour and knowledge, with the hope the desired attitude change will occur. Programmes now focus on having students’ participation in learning brushing and flossing skills as opposed to the teacher demonstrating or merely lecturing. Consequently, the show and tell approach evolved into programmes of show and do (Jong 1981).

From the behaviourial learning model point of view, the once-a-year add-on DHE lectures and activities are doomed to be unsuccessful. Teachers must utilise various strategies to induce children to take part in appropriate dental health actions. Didactic “traditional knowledge model” as stated above by Cohen and Lucye (1970) are no longer applicable. Based on teachers playing a key role in integrating DHE into the curriculum, the development of appropriate teacher behaviours in the classroom is crucial (Craft et al. 1981) and a teacher’s enthusiasm and co-operative classroom style can help achieve a positive behaviourial outcome. In the lower primary children of ages 7 to 9 where there is no formal lesson plan, there is scope for incidental learning of DHE with a stress towards habit formation, correct toothbrushing techniques and identifying snacks harmful to teeth. In this case, the teacher’s classroom style and enthusiasm cannot be underestimated.

4.5.2 Identification of a Graded Curricula for Ages 6 - 12

The goal of identifying a graded curricula for children is to gain his present interest and make it sufficiently ingrained that it will retain high salience for the child (Kasey 1966). This can only be achieved by a programme of DHE which is interesting and dynamic and geared to the learning ability exemplified by the child at each grade level. DHE, like education in any other subject, depends upon the child’s ability to learn and his stage of development. Kasey (1966) made some suggested examples of age-appropriate dental subject materials for kindergarten (K) - sixth grade children.
K - 1st grade:

*teach keeping the mouth clean, brushing the teeth and washing out or rinsing the mouth. If possible, reach the parents to encourage toothbrushing at home and to stress importance of "baby teeth". Discuss the role of the dentist.*

Grades 2 - 4:

*teach the importance of preservation of the teeth though proper care and the importance of visits to the dentist and keeping teeth clean. Teach simple facts about diet - especially candy and the need for rinsing mouth after eating.*

Grades 5 - 6:

*teach the importance of good dental health to overall physical health. Introduce tooth structure and the importance of proper toothbrushing techniques. Give more detailed information on the seriousness of dental diseases, on the importance of dental care and good oral hygiene and diet.*

The graded curricula as specified by the Dental Division, Malaysia (1983) was formulated as DHE guidelines for dental nurses. Teachers should follow the existent graded curricula so that the format by the dental nurses and teachers are parallel for each grade level.

The graded curricula guidelines from the Dental Division, Malaysia (1983) is entitled "Guidelines for DHE" and is divided into 4 groups at two-yearly intervals of age:

I. Preschoolers (Age 5 - 6)

Basic functions of teeth
Basic ways of maintaining oral hygiene
Identify safe foods for teeth
When to brush your teeth
II. Standards 1 - 2  (Age 7 - 8)

What is plaque?
Ways of maintaining oral health and hygiene
Why we brush our teeth
How we should brush our teeth
When we should brush our teeth
Building "strong" teeth equated to building a strong house
Importance of having a dental examination

III. Standards 3 - 4  (Age 9 - 10)

Reinforcements of the why, how and when of toothbrushing
Identifying tooth structure
The functions of different teeth - incisors, canines, premolars, molars
Deciduous teeth and their functions
Permanent teeth and their functions
Stress on a well-balanced diet
Avoid sweet foods
Reinforcement of importance of having a dental examination

IV. Standards 5 - 6  (Age 11 - 12)

Reinforcement of techniques of toothbrushing
Reinforcement of tooth structure knowledge
What is dental caries?
The role of plaque in dental caries
What is periodontal disease?
The role of plaque in causation of periodontal disease
The role of fluorides
Information on toothpaste
Reinforcement of decreasing sweet foods
Importance of set meal times
Reinforcement on the importance of dental visits

The guidelines are very broad and there is a stress on the doing message between the ages of 5 - 8 with the emphasis on habit formation of toothbrushing, recognising a clean mouth and identifying safe snacks. The importance of having a dental examination at age
7 - 8 is stressed as incremental school dental programmes start at these ages. For some children, this dental examination might well prove their first time.

At ages 9 - 10, knowledge of structure and functions of teeth are incorporated. There is a stress on information on deciduous and permanent dentition. This is to coincide with the oral health status of children in this age group as they progress from deciduous to a mixed dentition. At ages 11 - 12, there is progressive introduction of more dental knowledge as well as reinforcements of previous knowledge.

The scope of the topics being broad, it is a matter of conjecture at the moment as to what is incorporated into the lessons. Many uninformed ideas may be propagated. For example, stressing the frequency of toothbrushing as of more importance than its efficiency in plaque removal. Teachers might prove proponents of one specific method when research has shown that there is little difference in the ability to remove plaque of the different toothbrushing techniques (Sangnes, Zachrisson, Gjermo 1972, Schmid, Balmelli, Saxer 1976, Robinson 1976). The scrub method emerges as the simplest method available and is no less effective than any other because it requires minimal manual dexterity and patient concentration at these younger ages. The call to "avoid sweet foods" is unrealistic (Sheiham 1983) in this day and age, especially if schools allow sale of sweet snacks. Stress on a well-balanced diet might give children the impression that a well-balanced meal will contribute more to preventing dental diseases than decreasing the frequency of sugar and between-meal snacks. Teachers must be knowledgeable about fluorides and fluoride dentifrices to be able to teach children the role of fluorides. Without an overview of the multifactorial nature of dental caries, there is always a tendency to stress maintenance of oral hygiene as the most effective caries-preventive measure.

These examples serve to emphasise and highlight misconceptions that may be propagated by teachers who are ignorant/partially ignorant to the scientific accuracy of the knowledge they want to impart.
4.5.3 Identification of Curriculum Details

The need for identification of curriculum details is to ensure smooth incorporation of DHE into particular subjects or particular topics of subjects. The objective of identifying curriculum details is also to ensure that there is minimal disruption to the flow of teaching and that DHE is not treated as an isolated event. In the British Natural Nashers programme (Craft et al 1981), biology was identified as the subject of choice for the teaching of DHE.

An attempt to identify curriculum details has already been made between dental and education personnel in Malaysia (Ministry of Education 1991b). An excerpt of the example is shown here in Table 10 as a guide to further identification and expansion of topic details.

Table 10: An example of incorporating curriculum details in the subject "Man and his Environment" (Standard 4)

<table>
<thead>
<tr>
<th>CURRICULUM DETAILS</th>
<th>INCORPORATION OF DHE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ensuring cleanliness to maintain health</td>
<td>The importance of cleanliness of body and teeth</td>
</tr>
<tr>
<td></td>
<td>Ways to maintain dental health</td>
</tr>
<tr>
<td>Living things need nutrition and food</td>
<td>Food that builds and strengthen teeth</td>
</tr>
<tr>
<td></td>
<td>Food that is bad for teeth</td>
</tr>
<tr>
<td>Humans require food, air, water, clothes and shelter</td>
<td>The importance of fluoride in water for dental health</td>
</tr>
<tr>
<td>Responsibility of an individual towards himself</td>
<td>The responsibility of an individual in maintaining dental health</td>
</tr>
<tr>
<td></td>
<td>Dental diseases</td>
</tr>
<tr>
<td>Responsibility of an individual towards family and society</td>
<td>Responsibility of an individual towards maintaining dental health of his family</td>
</tr>
</tbody>
</table>
Another way to incorporate DHE into subjects would be to furnish teachers with the specific age-appropriate titles for them to incorporate in the best way they see fit. An example of incorporation of DHE in the subject "Moral Education" is shown in Figure 10:

Figure 10: Incorporation of DHE into "Moral Education".

Standard 1
Ensuring oral hygiene: use of suitable toothbrush of correct size and shape
  the correct techniques of toothbrushing
  "show and do" sessions
  toothbrushes cannot be shared

Standard 2
Care of toothbrushes: keep toothbrushes clean and dry
  toothbrushes must be changed periodically
  reinforcement of previous topics

Standard 3
Incorporation of other topics
  brush teeth on waking up in the morning
  brush teeth at night before sleep
  rinse mouth after food
  use of toothpaste
  the importance of good dental health
  the importance of frequent dental visits and examination

Standard 4
Foods to ensure dental health
  the importance of well-balanced meals
  foods that are bad for teeth

Standard 5
Tooth structure: types of teeth, their functions, number and structure
Standard 6
The importance of dental health
    for oneself
    for the family
    for society
Dental facilities in existence
Dental visits to facilities
Simulating role play

Three topics seem to be missing in the general list - and these are:
1. the importance of cutting down the frequency of snacking
2. the types of malocclusion and their consequences.
3. the consequences of permanent tooth extraction.

Topic 1 could be incorporated in Standard 3 or Standard 4 and Topics 2 and 3 would probably be relevant in Standard 5 onwards. These are merely examples and it is up to the individual dental personnel or dental team to liaise with the education colleagues as to the best ways of approach.
5 DISCUSSION AND CONCLUSION

The general aim of dental health education (DHE) is to promote the life-long maintenance of a dentition which is comfortable, functional, socially acceptable and to promote general health through awareness and understanding of the need of good dental health (Sheihem 1983). The major objective is dissemination of information about dental health and diseases, to help individuals learn the skills necessary to adopt and maintain healthful practices. This emphasis will require an understanding of the personal, environmental and societal influences affecting behaviour.

DHE for children is given a high priority in the Malaysian government dental service. Historically, the government dental service began as a school dental service to serve the growing population of children after World War 2. Children below 18 years had reached more than 50 per cent of the population after the war. The percentage of those below 15 years of age, at approximately 38 per cent of the population, is still high. As a result, schools emerged as the logical and practical setting to implement large scale DHE programmes, alongside yearly dental screening and treatment. With limited resources of manpower, there has to be consideration of target groups and ways of disseminating and reinforcing dental health messages in the most economic and efficient way. Teachers are identified as the most logical and economic dental ancillary, especially for primary schoolchildren between the ages of 6 - 12 years - not only because of the sheer preponderance of teachers above the number of dental personnel but also because of their educational training and the number of hours spent by teachers with the children. Trainee teachers at primary school level are therefore, a viable, captive group for dissemination of DHE messages, as opposed to sporadic DHE sessions for in-service teachers. It is hoped that these dental messages will subsequently be disseminated to the primary schoolchildren.
5.1 DHE IN SCHOOLS

Schools function as one of society's major facilities for socialising and teaching children. Either explicitly or implicitly, they impart information and encourage behaviours that society views as appropriate and important preparation for responsible community living and membership. Schools, therefore, provide legitimate settings for the efficient application of preventive health services - the rationale adopted is that prevention is the key to controlling dental disease and that caries and periodontal disease are largely preventable through personal behaviour. Schools have a key role to play in providing an educational environment that is consistent with what students are taught about health and should prepare students to make knowledgeable decisions, not only as individuals but also as future parents, opinion leaders and community decision makers (Horowitz, Frazier 1992). A basic premise for DHE in schools is that school-based dental health programmes must be consistent with current scientific knowledge about the relative effectiveness of available methods for the prevention and control of dental diseases. A second premise is that everyone, especially children, has a right to the most up-to-date knowledge and information.

There is much variation in the way DHE is conducted in schools. Curriculum development in educational terms refers to the systematic selection of goals, content, teaching methods and materials, and evaluation process for a given topic of study. It is essentially a committee function, ideally taking into account inputs from parents, community representatives, students as well as faculty and administration. Primary school curriculum is identified as being more flexible than secondary school curriculum with less pressure of examinations. This flexibility of the primary school curriculum lends itself to integration of dental health education in various subjects taught from the ages of 6 - 12. Primary school-based DHE also provides an opportunity to reach the largest number of children during the early stages of development when habit patterns can more easily be modified or changed,
especially in the youngest groups.

Even though there is evidence in the literature of philosophically sound curricula that include imaginative teaching strategies, the benefits beyond short-term knowledge and attitude change continue to go largely undetected. Roder and Burt (1978), in their evaluation of a school DHE programme, found that children with long histories of dental care in schools had cleaner teeth and less gingivitis. The authors felt that the results were encouraging and that it was important to develop and to refine models to assess the effects of DHE in schools.

The role of the dental professional has shifted from that of provider and presenter of the dental health lectures as part of the school curriculum to that of initiator, encourager and supporter of programmes that can be used by teachers in schools to reach the widest number of schoolchildren (Towner 1984). DHE for students hinges very much upon the enthusiasm of teachers delivering the message (Craft et al. 1984, Dunning 1986). Some teachers tend to neglect DHE because of lack of priority and some teachers feel more comfortable with the physical aspects of forms, functions and structure of dentition rather than social influences of health values, importance of self-care and personal choices. Public health dentists involved in DHE workshops for trainee teachers need to be aware of the task facing them.
5.2 DENTAL PERSONNEL AS DENTAL HEALTH EDUCATORS

It can be safely said that early school-based DHE in Malaysia was based on the cognitive theory, consisting of dental nurses and professionals giving lectures which were not part of the school curriculum. Administratively, one-time visits present little difficulty and are often welcomed by the teachers and school administrators, but reinforcement is not usually a part of the activity. Teachers did not perceive themselves as being responsible for, or a part of, the DHE activities. In dentistry, the major obstacle appears to be the perception that the consequences of dental diseases are not serious. In most cases, dental diseases are not regarded as life-threatening and held in low value by teachers.

It is one of life’s ironies that many people in important educational positions have no training in how to teach - and this applies to public health dentists concerned with dental health promotion. To undertake DHE requires planning and educational skills. The mistake that is often made, is to believe that provision of information will lead to behaviour and attitude change. Information is necessary, and a prerequisite to behaviour change, but information alone is not sufficient condition to effect behaviour change. Dental professionals involved in DHE activities, need knowledge of the behavioural sciences, and an understanding of the need to tailor all dental health promotional efforts to the target groups or individuals. Knowledge of educational techniques is something that should be sought, either through attending professional training or else by obtaining help from educators who have the skills. Another important point is that, due to their training, some dental personnel may err towards curative rather than preventive approaches in their DHE undertakings.

Jacob and Piamping (1989) provide a model for teaching:

1. set goals
2. give information
3. influence attitudes, values and beliefs
4. provide for practice
5. give feedback

The reasons for setting goals or objectives have already been expanded in Chapter 4. But the advice here is that goals must be realistic. Most dental health educators feel that to settle for anything less than what is thought to be right or correct is unacceptable, without due regard to the fact that what is expected might not be completely attainable for the client/group.

According to Jacob and Plamping (1989), the dental health educator, as a communicator, has two forms of power:

1. **expert power** that comes with the qualification and,
2. **referent power** which is suggested to be more effective, and which stems from the ability of the educator to accept the clients as they are.

For example, when clients perceive the professional as likeable and admirable, it is more likely that offering options increases the client's feeling of involvement in their own health care and their sense of having retained choice and control. Referent power means accepting the validity of the client's views which will enable the professional to offer an alternative. It is assistance in recognising situational factors which influence their health behaviours. Another example of referent power is collaborating with clients on setting realistic goals. A third example is negotiating goals for change in dental health behaviour.

The need to develop referent power is not stressed in most health worker's training. Some professionals have poor communication skills which affect the quality of the relationship established with the client. Clients are usually unable to judge the skill and quality of the provider's work but they can judge the quality of the relationship. In terms of preventive health care, altruism (working for the interest of others) is a daunting prospect but constitutes one of the dental professional's responsibilities.
In undertaking DHE for trainee teachers, dental personnel should approach topics from all angles of the subject, to demonstrate to the group that validity is given to all views and all sides. The group should then be invited in the discussion. This is an acknowledgement of the importance of their views and perceptions.

It is also suggested that public health dentists make local oral health surveys of their particular area - this would prove essential in not only programme planning but also to educate key decision-makers in the area and influence teachers on the course they should take in their school curriculum (Siegal, Martin, Kuthy 1988). Data could also be used for programme planning, including resource procurement and educating the dental profession and the public.
5.3 IMPLEMENTATION OF TRAINEE TEACHER DHE PROGRAMME

During the operation of the NPDDP, discussed in Chapter 3, it was found that teachers preferred a 'cookbook' approach with lesson plans and teaching guides being planned and suggested for them. Many teachers felt they lacked the competence to select materials or to develop lesson plans. They soon became bored with the activities they were meant to supervise and presented arguments about the traditional role of the educational system. Similarly it was found that teachers of younger children from grades 1 to 4 and their charges were more receptive to the programme than older children who became more self-directed and difficult to manage. Teachers of higher grades also showed more dissent in undertaking dental health activities. This is probably a reflection of increasing syllabus complexity and pressure towards academic performance.

In view of this, the stress of any programme for teachers should be:

1. to present a content that can be smoothly incorporated into lesson plans of various subjects
2. to present a design of DHE programme that does not significantly distort the teachers' role and time and
3. to provide suggestions for use of resource materials.

The Natural Nashers Programme (Craft et al. 1981) showed that the principal problem lay more with administrators' and teachers' reactions than with students' reactions. The basic lesson learnt was that the dissemination strategy had its best chance of success when the dental team acted as facilitators and gave freedom to teachers to decide their own use of the programme while ensuring a high and close level of support.

There are a few points that should be kept in focus.

* Trainee teachers fall into the "young adults" group - a group that might present
characteristics peculiar to itself. *Craft and Croucher (1980)* in a study on young adults, aged 16 - 20, found them apathetic towards dental treatment and less likely to visit the dentists due to increasing social responsibilities of work and family.

* They had less knowledge of the consequences of frequency of sweet snacks and had poor knowledge of early signs of dental diseases due to a lack of DHE in school. Behavioural diagnosis of this group is emphasised before undertaking DHE sessions.

* There is a need to check the dental IQ, that is, an emphasis on behavioural diagnosis of the group to check on variables which may have positive or negative effects on the messages.

* Topics should be kept simple with an avoidance of dental jargon.

* Stress should be given to frequency rather than to quantity of sugar, knowledge of early signs of dental diseases especially where periodontal disease is concerned, and the efficacy of the various preventive fluoride regimes.

* There is a need to check the teachers' "educational objectives" in undertaking DHE, for example, they may be stressing reading and writing rather than the accuracy of the dental messages.

* When dealing with sugar intake and diet modification - ALWAYS SUGGEST ALTERNATIVES - introduce an element of choice in the regimens mentioned.

* It is preferable that all messages should be in line with general health messages (*Sheiham 1988, Horowitz, Frazier 1992*). For example, stressing the need to regulate sugar intake in line with health messages concerning obesity, cardiac problems and maturity-onset diabetes.

* There is a need to acquaint teachers, through practical demonstration, with faulty methods of toothbrushing (or other ways of physical removal of plaque) which leads to enamel defects of abrasion and attrition (*WHO 1984*).

* There is a need to reinforce the importance of monitoring behaviour changes in children instead of just gain in knowledge.
There is a need to provide teachers with knowledge of the types of dental service provided to schools, with a stress on the co-operation and teamwork required to make school dental health programmes a success.
5.4 EVALUATION

The goal in evaluating school-based oral health programmes is to determine if improvements in the oral health of students can be attributed to general or specific aspects of the programme. In the case of DHE for trainee teachers, the objectives are as elaborated in Chapter 4. Evaluation methods may range from those that use sophisticated research designs to those that employ simple but valid observations.

Evaluation should be addressed at the beginning of the planning cycle because this activity provides the basis for decisions in the future. Programme evaluation should not be an after thought. It is necessary to judge the success in achieving stated goals and objectives and identify weaknesses and new directions, if necessary. In the case of school dental programmes, there must be proper recording of oral health status (for example, the recording of DMFX in school programmes, caries-free and gingivitis-free percentages, from year to year) so that changes may be documented. Poorly conceived and conducted evaluations tend to produce questionable results, which will not lend themselves to comparison. These may be misinterpreted or misused to lead to an overestimation of the worth of a programme.

Evaluation of short-term objectives may differ from those of long-term objectives. For example, short-term evaluation may range from monitoring students' knowledge and acceptance of preventive procedures to the extent of compliance to the DHE programme on the part of the teachers. Long-term evaluation should focus on the reduction of caries and gingivitis prevalence in the group of schoolchildren, compared to data previously recorded.

If the efficacy of a programme is documented, then evaluation should focus on how well the measure is applied rather than validation of the procedure. This might mean monitoring
how teachers incorporate DHE in their daily lessons - their lesson plans and methodologies. Because childrens' oral hygiene levels and gingival health depend more on day-to-day measures, then an apparent improvement in oral health status would be called an impact evaluation. Simple evaluation of efforts such as amount of time spent, quantity of materials used cannot be equated with those parameters focusing on the effects on oral health. The results of the evaluation should be shared with the relevant groups in the community.

In the context of school DHE, there are actually three levels of evaluation:

1. the first is at the level of process of educating teachers, between the dental personnel and the trainee teachers,

2. the second is at the level of process of educating the children, between the teachers and the students,

3. the third is the outcome evaluation of oral health status of the children, between the dental personnel and the students.

Monitoring of teachers' DHE activities at the second level, will actually prove difficult because they fall under a different jurisdiction. The Dental Division of Malaysia will be totally reliant on school administration for such evaluation, for example, the regularity of teachers incorporating DHE into various subjects.

How are students to demonstrate achievements after DHE by teachers in schools?

These are just a few possible ways of evaluation:

* by gain in knowledge of selected health information
* by demonstrating mastery in certain physical skills
* by developing coping skills (decision-making appropriate for their age and development stages) such as compliance and utilization of health services
* by means of problem-solving skills, for example, a short description of dealing with potential problem and how they apply their knowledge. Problem solving is also an additional source of learning
by demonstrating knowledge of disease signs and habits, or behaviours conducive to dental diseases

* Behaviour change is one of the objectives of school DHE but establishing a cause-and-effect relationship chain is very difficult. Health behaviour is so complex that it is likely an interplay of variables, not single forces, that shapes health outcomes. The number of variables in play in school and home environment is infinite. This, taken with the short-term nature of most opportunities for evaluation of school DHE, makes it virtually impossible to tie classroom activities to health behaviours that an individual may adopt in the course of a lifetime. An educational experience is only one of the many factors that might make up the total picture of any person's health behaviour. Reports of effectiveness of school DHE have been equivocal but it cannot be discounted as one of the sources affecting change in behaviour, alongside other variables such as home influences at earlier stages and peer pressure at later stages of life.

To establish immediate behaviour change as the criterion for success of DHE programmes would be technically impossible and if taken to the extreme, such a policy might lead to unfair decisions about accountability - a policy where dental personnel and teachers might be held accountable for students understanding or not understanding oral health concepts.

Where gain in knowledge is concerned, Green, Kreuter, Deeds and Partridge (1980) state that there is evidence that knowledge and health is more than a philosophic association. One cannot imply that any positive relationship is entirely due to knowledge, yet it is unlikely that there is no association. A balanced perspective suggests that knowledge more than likely makes some of the difference. Knowledge increases decision-making ability and other skills required for effective living in a complex world. This is the special contribution school DHE can make to an improved quality of life.
Long-range educational efforts appear to be more successful than are the short-term efforts. If this is true, schools may provide the most effective, long-term dental health education, as they offer the opportunity for communication with schoolchildren for many years.

Evaluators of health education in schools therefore face a dilemma. On the one hand they must hypothesize that DHE in the school affects health practices, for how else can they justify the time and resources spent on it? On the other hand, it has not yet been possible to evaluate changes in behaviour - the most desirable, logical and convincing confirmation of the behaviour hypothesis.

This thesis has attempted to underline the role and rationale of DHE in schools and to give an outline of coverage of topics and concepts to be considered for dental health messages to trainee teachers. In doing so, it has highlighted problems that are peculiar to Malaysia as well as problems that are universal, such as the reluctance of teachers to undertake DHE, and the lack of educational skills of dental personnel involved in dental health promotion. Problems of evaluation of school DHE are also discussed and a review of some examples of evaluated school DHE programmes serves to demonstrate the equivocal nature of DHE on schoolchildren.

The dental health concepts and topics identified as basic components of DHE instructions for trainee teachers, can be varied, according to local situations. Because of the lack of a comprehensive dental background reading material for trainee teachers, the "Scientific Basis of Dental Health Education" (Levine 1989) is recommended as text for reading, until such a time as when a Malaysian DHE text can be produced, tailored to local needs and in the appropriate language.

Steps to planning a DHE workshop for trainee teachers have been outlined, the most
important of which is the suggestion for use of questionnaires as a means of undertaking a pre-programme behavioural diagnosis of the target group, and as a means of post-programme feedback on organisation and content of workshops.

In focusing on methodology of lesson plans, graded curriculum and identification of curriculum details, it is very clear that DHE cannot exist in isolation without the collaboration of many different departments and agencies. The dental professional is cautioned that a variety of reasons may contribute to failure to incorporate DHE in the school curriculum, such as:

* competing demands for school time by many special interest groups
* pressures to emphasise the basics rather than to implement programmes that address areas perceived as being of low value
* resentment by school personnel of the trend to use schools as social laboratories
* lack of reinforcements of oral health aspects by parents and peers and
* conflicting messages in other aspects of school life.

On the other hand, dental personnel may have been responsible for results having been equivocal because:

* the message has not always been correct thus the need to ensure scientifically accurate information which are applicable to self care
* DHE has for the most part been given by personnel untrained in educational techniques with many basic teaching errors
* preventive activities, by the fact that they prevent disease which are thus not seen, do not provide incentives needed to sustain greater long-term efforts
* DHE is often measured by oral health outcomes and status - this concentration on outcomes has perhaps led to the neglect of PROCESS of education
in present society, recommendations for appropriate dental health behaviours are countered by so many alternatives messages - for example, mass media advertisement of sugar products

Green et al. (1980).

To date, there seems to be no satisfactory way to evaluate DHE. As Frazier (1992) states, much of the research so far has been limited to cross-sectional surveys or small-sample experiments and still brings up the need for research to assess the scientific validity of available print and audio-visual aids materials used as information sources. The equivocal nature of reviewed school DHE programmes is a fact that can be extremely demoralising for dental personnel involved in such activities. However, ending with the words of Jacob and Plamping (1989):

It is common to hear people say that health education doesn’t work. We feel that the best answer to this is neither does treatment, so let’s consider which may have the greatest impact on health in various contexts.
6 REFERENCES

AGERBAEK N, MELSEN B, LIND OP, GLAVIND L, KRISTIANSEN B (1979)
Effect of regular small group instruction per se on oral health status of Danish
schoolchildren.

ALLRED H, HOBDELL MH (1986)
The planning and development of educational programmes for personnel in oral health.

AMERICAN DENTAL ASSOCIATION (1956)
Dental health facts for teachers.
Chicago: American Dental Association.

ANDLAW RJ, PALMER JD, KING J, KNEEBONE SB (1983)
Caries preventive effects of toothpastes containing monofluorophosphate and
trimetaphosphate: a 3 - year clinical trial.

AMERICAN DENTAL ASSOCIATION (1969)
Dental health teaching outlines 1969.
Chicago: Bruce Publishing Co.

ASHLEY FP (1989)
Role of dental health education in preventive dentistry.

BAGHDADY VS, GHOSE LJ, ALWASH R (1981)
Traumatised anterior teeth as related to the cause and place.

BENNIE AM, TULLIS JI, STEPHE RN KW, MacFAD YEN EE (1978)
Five years of community preventive dentistry and health education in the county of
Sutherland, Scotland.

BENTLEY JM, CORMIER P, OLER J (1983)
The Rural Dental Health Program: the effect of a school-based dental health education
program on children's utilization of dental services.

BIBBY BG (1966)
Do we tell the truth about preventing caries?

BIRKELAND JM, TORELL P (1978)
Caries-preventive fluoride mouthrinses.
BLINKHORN AS, VERITY JM (1979)
Assessment of the readability of dental health education literature.

BLINKHORN AS, DOWNER AC, MACKIE IC, BLEASDALE R (1981)
Evaluation of a practice-based preventive programme for adolescents.

BOHANNAN HM, DISNEY JA, GRAVES RC, ANDERSON PE, KLEIN SP (1985)
Operation of the National Preventive Dentistry Demonstration Program.

BOUCHARD JM, FARQUHAR CL, CARNAHAN BW, DAILY SL (1990)
Oral health instructional needs of Ohio elementary educators.
J Sch Health 1990; 60: 511 - 3.

BOYER EM (1976)
Classroom teachers' perceived role in dental health education.

BRITISH DENTAL HEALTH FOUNDATION (no year)
London: British Dental Health Foundation.

BURT BA, EKLUND SA (1992)
Promotion of oral health.
In: Dentistry, dental practice and the community. Chap 19.

BURT BA (1983)
The prevention connection: linking dental health education and prevention.

CHAMBERS DW (1973)
Susceptibility to preventive dental treatment.

COHEN LK, LUCYE H (1970)
A position on school dental health education.

COUNSELL LA (1970)
The implications of the behavioral sciences for dental health education.

CRAFT M (1980)
The need for behavioral science in the dental curriculum.
London: Royal Society of Health.

CRAFT M, CROUCHER R (1980)
The 16 to 20 study.
Preventive dental health in adolescents: short and long term pupil response to trials of an integrated curriculum package.

Natural Nashers: a programme of dental health education for adolescents in schools.

DAVIS HC (1974)
An approach to dental health education for schoolchildren.
Bristol: Wright. p 274 - 83.

DAVIS GT, KNOTT SC (1984)
Dental trauma in Australia.

DEMBO MH (1991)
Applying educational psychology in the classroom. 4th edn.

DENTAL DIVISION, MALAYSIA (1983)
Panduan ceramah pendidikan kesihatan pergigian.
Bahagian Pergigian.
Ministry of Health, Malaysia.

DENTAL DIVISION, MALAYSIA (1988)
Dental epidemiological survey of schoolchildren in Peninsular Malaysia 1988.
Ministry of Health, Malaysia.

DENTAL DIVISION, MALAYSIA (1990)
Dental epidemiological survey of adults in Malaysia.
Ministry of Health, Malaysia.

DENTAL DIVISION, MALAYSIA (1992)
Sistem maklumat pengurusan kesihatan. Sub-sistem pergigian.
Unit sistem maklumat dan dokumentasi.
Kementerian Kesihatan Malaysia.

DENTAL DIVISION, MALAYSIA (1993)
Communications.
Penolong Pengarah Pergigian II dan Pegawai Pergigian.
Ministry of Health, Malaysia.

DENTAL DIVISION, WILAYAH PERSEKUTUAN, MALAYSIA (1991)
Material from Dental Director, W/P.
Ministry of Health, Malaysia.

DENTAL HEALTH EDUCATION AND RESEARCH FOUNDATION (1970)
University of Sydney, New South Wales.
DENTAL SERVICES DIVISION (1991),
Ministry of Health, Malaysia.

DePAOLA PF, SOPARKAR P, FOLEY S, BOOKSTEIN F, BOKHOS Y (1977)
Effect of high concentration ammonium and sodium fluoride rinses on dental caries in schoolchildren.

DEPARTMENT OF HEALTH, NEW SOUTH WALES (no year)
Dental health education teaching manual.
Sydney: Dental Services, NSW Department of Health.

DOHERTY NJG, MARTIE CW (1987)
Analysis of the costs of school-based mouthrinising programs.

DRISCOLL WS, SWANGO PA, HOROWITZ AM, KINGMAN A (1982)
Daily and weekly fluoride mouthrinising in a fluoridated community.

DUNNING JM (1986)
Dental health education.

ECONOMIC REPORT MALAYSIA (1991/1992)
Ministry of Finance, Malaysia; 20: 236.

ELDERTON RJ, MJOR IA (1992)
Changing role in cariology and operative dentistry.

The value of repetition and reinforcement in improving oral hygiene performance.
J Periodontol 1980; 51: 228 - 34.

FEDERATION DENTAIRE INTERNATIONALE (1982)
Global goals for oral health in the year 2000.

FLANDERS RA (1987)
Effectiveness of dental health educational programs in school. Special contribution.

FLEISS JL (1986)
A dissenting opinion on the National Preventive Dentistry Demonstration Program.

FOX B, MADDICK I (1986)
A hundred years of dental health education.

FRAZIER PJ, JOHNSON BG, JENNEY J (1983)
Health educational aspects of preventive dental programs for school-age children in 34 countries - final results of an FDI international survey.
Int Dent J 1983; 33: 152 - 68.
FRAZIER PJ (1979)
Overcoming obstacles to progress in school dental programs.

FRAZIER PJ (1980)
School-based instructions for improving oral hygiene: closing the knowledge gap.

FRAZIER PJ (1992)
Research on oral health education and promotion and social epidemiology.

FREED JR, GOLDSMITH MS (1976)
Dental health: what is being taught to college students.

FRIEDLANDER LA (1974)
Impact of teacher-student dental health education.
J Sch Health 1974; 44: 140 - 3.

GLASERU DH, FRAZIER PJ (1988)
Future elementary school teachers' knowledge and opinion about oral health and
community programs.

GORDON PH (1989)
Fissure sealants.

GRACE M (1992)
Who is in control?

GRAVES RC, McNEAL DR, HAEFNER DP, WARE BG (1975)
A comparison of the effectiveness of the "Toothkeeper" and a traditional dental health
education program.

GREEN LW, KREUTER MW, DEEDS SG, PARTRIDGE KB (1980)
Health education planning. A diagnostic approach.
Palo Alto: Mayfield Publishing.

HAEFNER DP (1974)
School dental health programs.

HAMILTON ME, COULBY WM (1991)
Oral health knowledge and habits of senior elementary school students.

HARRIS NO (1991)
School-based dental health programs.
In: Harris NO, Christen AG. Primary preventive dentistry. Chap 19.
HARRISON L (no year)
Dental care for kids - leader's manual (a resource for Arab-speaking families).
Southern Sydney Area Health Service. Southern Sydney Health Promotion Unit.

HAWE P, DEGELING D, HALL J (1990)
Evaluating health promotion. A health worker's guide.
Sydney: MacLennan and Petty.

HEALTH EDUCATION COUNCIL (1971)
Consolidated report of the conference on dental health education.

HEALTH COMMISSION OF NEW SOUTH WALES (1974)
Health education. Dental health.
Teacher's guides on health education in NSW schools.

HOROWITZ AM (1979)
A comparison of available strategies to affect children's dental health: primary preventive procedures for use in school-based dental programs.

HOROWITZ AM (1983)
Effective oral health education and promotion to prevent dental caries.

HOROWITZ AM, FRAZIER PJ (1986)
Promotion of preventive measures.
In: Granath L, McHugh WD. Systemised prevention of oral disease: theory and practice.

HOROWITZ AM, FRAZIER PJ (1992)
Effective oral health programs in school settings.

HOWAT AP, HOLLOWAY PJ, DAVIS TGH (1978)
Caries prevention by daily supervised use of MFP gel dentifrice: report of a 3-year clinical trial.

JACOB MC, PLAMPING D (1989)
Health education in the community.
Bristol: Wright.

JONG A (1981)
Dental health education.
In: Jong A. Dental public health and community dentistry. Chap 8.
St Louis: Mosby.

KASEY EH (1966)
Curriculum planning in dental health: problems, processes and prospects.
in: Woodstock workshop on dental health education.
New England Council on dental health and care.
KENNEY JB (1979)
The role and responsibility of schools in affecting dental health status - a potential yet unrealised.

Oral health knowledge and attitudes of elementary school teachers in Michigan.

LEVINE RS (1989)
The scientific basis of dental health education. A policy statement.

LIND OP, VON der FEHR FR, JOOST LARSEN M, MOLLER IJ (1976)
Anti-caries effect of a 2% sodium monofluorophosphate dentifrice in a Danish fluoride area.

LOE H (1983)
Principles of aetiology and pathogenesis governing the treatment of periodontal disease.

LOUPE J, FRAZIER PJ (1983)
Knowledge and attitudes of schoolteachers toward oral health programs and preventive dentistry.

MALVITZ DM (1983)
Education for oral health.
In: Striffler DF, Young WO, Burt BA. Dentistry, dental practice and the community. 3rd edn.
Chap 15.

MANUAL OF HEALTH EDUCATION (1969)
Chap 1. Division of Health Education.
Department of Public Health, New South Wales.

MASTERS DM (1972)
The classroom teacher: effective dental health educator.

MELENSEN B, AGERBAEK N (1980)
Effects of an instructional motivation program on oral health in Danish adolescents after 1 and 2 years.

MILLER AJ, BRUNELLE JA (1983)
A summary of the NIDR community caries preventive demonstration program.

MINISTRY OF EDUCATION, MALAYSIA (1991a)
Bahagian Sekolah,

MINISTRY OF EDUCATION, MALAYSIA (1991b)
Bahagian Sekolah,
Objektif/d.d.69.
MOLLER IJ, HOLST JJ, SORENSEN E (1968)
Caries reducing effect of a sodium monofluorophosphate dentifrice.

MURRAY JJ (1986)
Topical fluorides.

Tanzania: DANIDA/ Central Dental Unit, Ministry of Health.

NORTH WEST REGIONAL HEALTH AUTHORITY (no year)
Dental Health Authority. A guide for improving the dental health of school children aged 5-11 years.
Manchester: Gateway House.

NORTH AF (1970)
Dental health education for the preschool and primary grades.

PIERCE PB, BYRNE TJ (1979)
Effect of teacher in-service workshop on student dental health.

PODSHADLEY AG, SHANNON J (1970)
Oral hygiene performance of elementary schoolchildren following dental health education.

PODSHADLEY AG, SCHWEIKLE ES (1970)
The effectiveness of two educational programs in changing the performance of oral hygiene by elementary schoolchildren.

RANCANGAN KESIHATAN SEKOLAH (1968)
Bahagian Sekolah,
Ministry of Education, Malaysia.

RAVN JJ (1974)
Dental Injuries in Copenhagen schoolchildren school years 1967 - 1972.

RAYNER JF (1974)
Critique of Haefner's Paper.

RAYNER JF, COHEN LK (1971)
School dental health education.

REBICH T (1985)
School-based preventive dental care: a different view.
RIPA LW (1981)  
Fluoride rinsing: what dentists should know.  

RIPA LW (1991)  
A critique of topical fluoride methods (dentifrices, monthrinses, operator- and self-applied gels) in an era of decreased caries and increased fluorosis prevalence.  

RIPA LW (1992)  
Rinses for the control of dental caries.  

ROBINSON E (1976)  
A comparative evaluation of the scrub and bass methods of toothbrushing with flossing as an adjunct.  

RODER DM, BURT BA (1978)  
Evaluation of dental health education in a school dental care program.  

ROSE C, ROGERS EW, KLEINMAN PR, SHORY NL, MEEHAN JT, ZUMBRO PE (1979)  
As assessment of the Alabama Smile Keeper school dental health program.  

ROWNTREE FSD (1959)  
Dental health education. An experiment at Braintree.  

RUBINSON L (1982)  
Evaluating school dental health education programs.  

RUSSELL BA, HOROWITZ AM, FRAZIER PJ (1989)  
School-based preventive regimens and oral health knowledge and practices of sixth graders.  

SANDELL P (1956)  
Teaching dental health to elementary school children.  
Bureau of dental health education.  
Chicago: American Dental Association.

SANGNES G, ZACHRISSON B, GJERMO P (1972)  
Effectiveness of vertical and normal brushing techniques in plaque removal.  

SCHMID MO, BALMELLI OP, SAXER UP (1976)  
Plaque removing effect of toothbrush, dental floss and a toothpick.  

SCHOU L (1985)  
Active-involvement principle in dental health education.  
SHEIHAM A (1983)
Promoting periodontal health - effective programmes of education and promotion.

SHEIHAM A (1988)
Integrating dental care with general health care.

SHEPS CG (1986)

SIEGAL MD, MARTIN B, KUTHY KA (1988)
Usefulness of a local oral health survey in program development.

SILVERSIN JB, COOMBS JA (1981)
Institutions and oral health behaviours.

SIMONSEN RJ (1978)
Preventive resin restorations.

SMITH LW, EVANS RI, SUOMI JD, FRIEDMAN LA (1975)
Teachers as models in programs for school dental health: an evaluation of the "Toothkeeper".

STOCKWELL AJ (1988)
Incidence of dental trauma in Western Australian School Dental Service.

STOLL FA (1977)
Educational concepts applied to dental health education.
In: Dental Health Education. 5th edn. Chap 13.

SUTCLIFFE P (1989)
Oral cleanliness and dental caries.

SUTHERLAND MS (1979)
Relevant curriculum planning in health education. A methodology.

TAN HH, RUTTER E, VERHEY H (1981)
Effect of repeated dental health care education on gingival health, knowledge, attitudes, behaviour and perception.
TOWNER EML (1984)
The "Gleam Team" programme: development and evaluation of a dental health education package for infant schools.

VON der FEHR FR, MOLLER IJ (1978)
Caries-preventive fluoride dentifrices.

WALSH MM (1985)
Effects of school-based dental health education on knowledge, attitudes and behaviour of adolescents in San Francisco.

WEINTRAUB JA (1989)
The effectiveness of pit and fissure sealants.

WEISS RJ, LEE EM (1974)
THETA: Team health education teaching assistants.

WHO (1958)
Expert committee on training of health personnel in health education of the public.
Geneva: Tech Rep Ser no. 156.

WHO (1977)
Manila: Regional Office for Western Pacific.

WHO (1984)
Prevention methods and programmes for oral diseases.
Geneva: Tech Rep Ser no. 713.

WHO (1987)
Prevention of oral diseases.

WHO (1989)
Health through oral health. Guidelines for planning and monitoring for oral health care. Prepared by Joint Working Group of WHO and FDI.
London: Quintessence.

WHO (1990)

WONG HD (1973)
Dental health education in a public dental health programme.

Oral health knowledge and sources of information among elementary schoolchildren.
WOOLLEY JM (1980)
Changing oral hygiene attitudes and habits.

YOUNG WD, STRIFFLER DF (1969)
The dentist, his practice, and the community. 2nd edn.
Philadelphia: WB Saunders.
Appendix 1: Example of questionnaire content. 
Source: Loupe, Frazier (1983)

Below are examples of questionnaire contents that may be adapted for use in questionnaire 
for Malaysian primary trainee and in-service teachers.

A. Information on percentage of teachers who use certain resources in oral 
   health teaching:
   
   1. Curriculum guides and other sources.
   2. Dental staff nurse visiting your classroom.
   3. Dentist visiting your classroom.
   4. Field trips to dental health education units.

B. Information on teacher's acceptance of responsibilities in school oral health 
   programmes (on Likert scale of 1 = strongly agree to 5 = strongly disagree)
   
   1. Have personal pride in oral hygiene to set an example for children to follow.
   2. Help pupils recognise and appreciate the value of good teeth and their 
      effect on appearance, digestion and speech.
   3. Help the child develop awareness of the causes of tooth decay.
   4. Instruct children in eating habits that minimise tooth decay.
   5. Motivate each child to establish good oral hygiene and interest in personal 
      oral health.
   6. Help child develop friendly attitude towards dentists.
   7. Refer students with dental problems to staff nurse.
8. Teach students to think critically about advertised materials pertaining to dental health.

9. Demonstrate proper toothbrushing to the class.

10. Administer or recommend appropriate action in case of accident or dental mishap.

11. Distribute and record students' dental health card.

12. Be certain that all students visit dentist once-a-year (or are seen by the dental staff nurse).

13. Try to coordinate distribution of dental health cards with the dentists' schedule.

14. Visit parents, when necessary, to follow up on child's dental health progress.

C. Information on percentage of teachers who feel prepared to teach various oral health topics.

1. Relating good dental health to proper diet.

2. Develop a sense of pride in good oral health.

3. Appreciating the services that a dentist can provide.

4. Understanding the processes and reasons for tooth decay.

5. Increasing proficiency in oral hygiene skills (brushing and flossing).

D. Information on teachers' ranking of reasons for maintaining their own oral hygiene (use of Likert scale of 1 = strongly agree to 5 = strongly disagree).

1. To prevent personal tooth decay.

2. To prevent gum disease.

3. To enhance your own personal appearance.
4. To give your mouth a clean, fresh feeling.
5. To set an example for students to follow.

E. Information on teachers' ratings of the effectiveness of various actions in preventing tooth decay (1 = very effective to 5 = very ineffective).

1. Use of dental floss at least once per day.
2. Brush twice a day with fluoridated toothpaste.
3. Rinse mouth with water, after meals, if unable to brush.
4. Parent help child to brush teeth until sufficient dexterity to perform on own is gained.
5. Parent takes child to dentist by age 2 1/2 years.
6. Drink community fluoridated water.
7. Use fruits, popcorn, nuts as snack substitutes.
8. Mother should drink lots of milk and take Vitamin D while pregnant.
9. Chew sugarless gum to remove food stuffs when unable to brush.
10. Use a toothpick after eating if unable to brush.
11. Use mouthwashes regularly.

F. Information on teachers' ratings of the effectiveness of various actions in preventing tooth decay (1 = very effective to 5 = very ineffective).

1. Have fluoride professionally applied to the teeth.
2. Use sodium fluoride mouthrinse in school once a week.
3. Have acrylic pit and fissure sealants applied to teeth.