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TRAINING PROGRAMME FOR DENTAL ASSISTANTS

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1. INTRODUCTION

The dental surgeon has always had some help in his office, originally from a man who acted as a crier and who would hold the patient down while extractions were performed. Then developed the receptionist and housekeeper, often the dentist's wife who opened the surgery door in a white coat, sent out bills and tidied the surgery and waiting room (Manning, 1971; United States Office of Education and United States Public Health Service 1965, p.2).

Today the dental assistant is not just a casual "office girl", mainly involved in running errands. She is an acknowledged full-time member of the dental health team with clearly defined responsibilities. Her employment has been described by the 1959 World Health Organisation Expert Committee on Auxiliary Dental Personnel (World Health Organisation, Technical Report Series 163, 1959, p.8) as "essential in any dental service, public or private". Her contribution towards the delivery of more dental services has been well recognised. In 1972 the British Dental Association stated that "the main factor enabling the profession to meet the growing demand for National Health Service treatment has been a reorganisation of practice methods and particularly the more efficient use of surgery assistants" (British Dental Association, 1972).
1.1 DEFINITIONS

Every dentist has his own definition of the term "dental assistant". One may see her as the part-time high school student he employs to answer the telephone and keep the office tidy. Another may see her primarily as a chairside helper, providing an extra pair of hands in the practice of four-handed dentistry. Yet another may see the assistant as essentially a secretary.

The World Health Organisation (W.H.O.) Expert Committee on Auxiliary Dental Personnel (World Health Organisation, Technical Report Series 163, p.6) defined the dental auxiliary as a subsidiary dental personnel with less than full professional qualification involved to a greater or lesser extent in the practice of dentistry in its widest form. The auxiliary relieves the dentist of all duties involved in the operation of his practice except those that are restricted by law to a licenced dentist and those which involve major questions of office policy. Dental auxiliaries can be divided into two broad categories - operating and non-operating.

A non-operating dental auxiliary is one who assists the operator (dentist or others as authorised by law) in his clinical work but does not carry out any independent procedures in the oral cavity. In this category falls the dental assistant and the dental technician.

A dental assistant is a non-operating auxiliary who works within the clinical area in which dental care is provided. She does not independently provide any part of this care but assists the dentist to do so (Allred, 1977, p.7). The dental assistant may also be known as "dental surgery assistant", "dental nurse", or simply "assistant".
The United States Navy even refers to its assistants as "dental technicians" (Allred, 1977, p.7). In the Malaysian Health and Armed Services, the term "dental surgery assistant" is used.

For the purpose of this thesis, formalised training programmes will be defined as those courses conducted at special training institutions involving "face-to-face" contact between the students and the teachers/instructors.

On-the-job-training will refer to that training, mostly through experience, received at no other place than that of employment. If on-the-job training forms part of a formalised training curriculum, then it will categorically be included under formal training.

1.2 ROLES AND FUNCTIONS OF DENTAL ASSISTANTS

The dental profession assigns a wide variety of duties and functions to the assistant in the performance of her auxiliary duties. Surveys by Leatherman for the International Dental Federation (Leatherman, 1969) and Allred for World Health Organisation Regional Office for Europe (Allred, 1977) reported that extra oral duties of dental assistants vary from secretarial and reception to exclusive chairside assisting. About one third of the countries responding to the study conducted by Allred in 1977 (Allred, 1977, p.23) indicated that their assistants also carried out educative roles in prevention, sometimes for individuals, at other times for groups (see Fig.1). In his survey, Leatherman (Leatherman, 1969) reported that dental assistants in Bulgaria, Israel and Romania are also used to give dental health education.
Fig. 1. Work specification of dental assistants in European countries responding to Allred's study in 1977.

|------------|-----------|------------|------------|------------|--------|-----------|----------|-------------|----------------|-----------------|-----------|-----------|------------------|---------|---------------|----------|---------------------|--------|----------|
Key to items of work

1. Housekeeping duties
2. Patient appointment and reception
3. Administrative commitments
4. Organisation, preparation, and running of the clinical area
5. Sterilisation of instruments
6. Mixing dental materials
7. X-ray film developing
8. Assisting the operator at the chairside
9. Assisting the operator in a close support role (e.g., 4-handed)
10. Simple technical procedures (e.g., model casting)
11. Individual patient education in oral hygiene and prevention
12. Group education in oral hygiene and prevention in schools or elsewhere
13. Supervision of self-application of preventive measures
14. Application of caries-preventing agents to teeth
15. Taking impressions for study models
16. Supragingival scaling and polishing
17. Subgingival scaling
18. Recording patients' histories
19. Partial denture examination
20. Complete dental examination
21. Taking intra-oral radiographs
22. Treatment planning
23. Application of curative agents to gingiva
24. Minor gingival surgery
25. Removal of gingival packs
26. Placement of gingival packs
27. Removal of sutures
28. Topical application of local anaesthetic agents
29. Infiltration injection anaesthesia
31. Inserting and finishing dental restorations
32. Simple cavity preparation
33. Extraction of deciduous teeth
34. Extraction of permanent teeth
35. Direct treatment of dental pulp
36. Root canal treatment (endodontics)
37. Selected technical procedures in the dental laboratory
38. All dental laboratory procedures
39. Preparatory work for removable denture
40. Preparatory work for any type of crown or bridge work
41. Insertion of removable denture
42. Insertion of crown or bridge work
43-47. Additional items.

In Ireland, Malta and Poland, dental assistants do not provide close support to the operators whilst those in Greece, Finland, U.S.S.R., United Kingdom and Ireland are used to record patients' histories. The commonest intraoral functions are often restricted to the taking of radiographs (Allred, 1977, p.23 & Leatherman, 1969). In Australia, dental chairside service is concerned with assistance to the dentist at the chairside, dental health education, basic dental x-rays, application of rubber dam, pre and post operative instructions, irrigation of the mouth and removal of sutures as well as office management (Australian Dental Association, Dental Auxiliaries Committee, 1977). In Malaysia, dental surgery assistants are involved in chairside assisting, dental health education, basic dental x-rays, general surgery duties (for example, sterilization of instruments, pouring and trimming plaster/stone models) and office management.

The essential function of the assistant at the chairside is to provide the operator with an extra pair of hands. She keeps the field of work clear, clean and dry by retracting the patient's checks, depressing the tongue and keeping toilet of the area (British Dental Association, Ancillary Personnel Committee, 1976; Sciaiky, 1969; Pownall, 1966). In addition, assisting at the chairside also involves the passing of instruments to the operator, mixing of temporary and permanent restorative materials and in some instances, the changing of burs. This assistant is also involved in the preparation of patients prior to treatment. When the operation is completed, the assistant gathers the used instruments and prepares the chair for the next appointment.

A dental assistant on general supportive duties feeds the assistant at the chairside with those items that are not readily
available in the immediate vicinity of the chair, that is, she forms the third pair of hands in the practice of six-handed dentistry. She prepares restorative and impression materials (when these are not available at the chairside) and then hands them over to the chairside assistant. She processes and mounts radiographs as well as pours and trims models (Pownall, 1966; American Dental Association, Council on Dental Education, 1965; Arnold, 1973a, 1973b). Her other duties may include the cleaning, sterilizing and storage of instruments and the preparation of trays for the next appointment(s). She also attends to all those duties that take her out of the surgery, such as the fetching of items not normally kept by the chairside or those that are used occasionally. In a two-chair set-up, she prepares the next patient and when the dentist has moved to the second chair, clears and prepares the first one for the next patient.

When taking the role of an administrative assistant the dental assistant, apart from receiving patients, is sometimes charged with the responsibility of keeping the appointment book, operating the recall system, typing, patient charging and the proper filing of all records and correspondence. She answers the telephone and where necessary, "shields" her dentist from untoward distractions (Arnold, 1973a, 1973b; American Dental Association, Council on Dental Education, 1965; Pownall, 1966).
1.3 NEED FOR DENTAL ASSISTANTS

1.3.1 The Problem

1.3.1.1 Manpower shortage (dentists) - Few would deny that the fundamental problem facing dental services today is the sheer volume of dental diseases. Yet this is only one half of the problem - the other being the shortage of dentists.

As early as 1958, Smith (Smith, 1958) had pointed that not enough new dentists were being produced in the United States to reduce the country's imbalance between the need for and the availability of dental services. Other studies projecting manpower (dentist) needs done in the 1960s also indicated that the profession would be unable to meet future demands for dental services (American Dental Association, Bureau of Economic Research and Statistics, 1968; American Dental Association, Task Force on National Health Programs, 1971, p.39).

Being a relative term, this "shortage" of dentist is not unique to the United States but is present in most countries of the world (Allred, 1972; Allred, 1977, p.2; Garza, 1973; McIntosh, 1961), becoming more evident at different periods of time depending on the nation's stage of economical, social and educational developments.

1.3.1.2 Cost of training dentists - Increasing the number of dentists seemed a reasonable solution. However, one of the problems of setting up new schools is the high cost involved. In most instances, developing countries cannot possibly afford the budget even though the prevalence and incidence of dental diseases are on
the rise in these countries. Furthermore, the current global economic slump and treasury cut-backs, existing schools are being "forced" to reduce their student intakes.

1.3.1.3 Increasing demand - All over the world demand for dental services exceeds by far the output capacity of the dental profession (Allred, 1977, p.2; Pownall, 1966; British Dental Association, 1968; McIntosh, 1961; Romano, 1966). This can be attributed to several factors, some of which are discussed below.

As a result of rising levels of education, in particular dental health education, the public becomes more appreciative of the value of dental health and its intimate relation to total health. This brings about changes in attitude towards preservation of teeth rather than their replacement by dentures. The public is thus motivated to seek dental care (Campbell and Blandford, 1974; Lotzkar et al., 1971; Bruce and Cox, 1970).

Improvements in socioeconomic status not only brings a steadily larger percentage of the population into dental offices but also increasing individual demands for dental service. The type of dental service demanded has also changed. Multiple extractions followed by prostheses are gradually being replaced by more preventive measures and more complex, extensive and prolonged treatments of a cosmetic nature. Furthermore the removal of economic barriers through government and/or private schemes (insurance, prepayment plans, credit facilities, union contracts) had made dental services more accessible to the poor. Government's recognition of public needs, either as
a right of the people or as an essential factor in work productivity has further increased pressure upon the profession to provide more services.

1.3.1.4 Need versus demand - Thus far we have only discussed demands for dental care. Leaders in Public Health Dentistry such as Dr Barmes (Barmes, 1969) had pointed that "need" is a more realistic measure of the requirements for dental services. Providing only for demands leaves any service behind all the time and vulnerable to sudden changes, and has never proved to be a success in terms of the dental health of the average individual (Barmes, 1969). It is evident that when these needs of the population are taken into account, the problem of delivering dental care is seen to become even worse (Tattersall, 1964; Sciaky, 1969).

1.3.2 A Solution

Even though the productivity of dentists is dependent upon many variables (such as his working speed, the equipments he uses and his surgery design) only the contributions of dental assistants will be discussed.

As early as 1944 Dr Henry Klein (Klein, 1944) had shown that by using one and then two assistants the dentist could increase his treatment capacity by 33% and 66% respectively (compared to the dentist working alone). Other studies such as that by Waterman (Waterman, 1952), Davis (Davis, McKenzie and Hester, 1963) and Kilpatrick (Kilpatrick, 1971) also reported significant increases
in efficency, decreased work load and shorter operating times with
effective use of dental assistants. Apart from these studies, survey
results had also shown increased number of patients seen without
extension of working hours (American Dental Association, Bureau of
Economic Research and Statistics, 1966; Moen and Fitzgerald, 1950;
American Dental Association, Bureau of Economic Research and Statistics,
1974).

The use of dental assistants to increase productivity can be
affected in two ways:

(a) close support four-handed dentistry
(b) relief of other extraoral duties.

1.3.2.1 Four-handed dentistry - This forms one of the basis of
the dental team concept which attempts to provide more dental services
for the community at reasonable costs (Campbell and Blandford, 1974;
Cooper, 1974; Pesillo, 1976; Arnold, 1973a, 1973b; Craig, 1970; Arnold,
1969; Brown, 1967). The functions of the dental assistant in four-
handed dentistry include:

(a) effective instrument delivery and retrieval - this is clearly
demonstrated in operations which involve repeated exchanges of
instruments such as during amalgam condensation. It should be
remembered that each time the dentist moves for an instrument valuable
time is wasted resulting in decreased production. Further valuable
time can be saved if the assistant is able to anticipate the needs of
the dentist during treatment (for example, handling him cotton rolls
for tooth isolation soon as cavity preparation is completed without
waiting to be asked) (Paul, 1972a, 1972b, 1972c).
(b) efficient use of triple syringe and evacuator - this allows the operation to be completed in less time since this "washed field technique" (Kilpatrick, 1974, p.412-414 and p.436; Thompson, 1955; Schon, 1971) not only provides better view but also eliminates rinsing which is a time-consuming factor.

(c) delivery of restorative and impression materials - coordinated delivery of these materials ensures that no time is lost by the dentist in preparing and loading these materials.

In meeting the profession's objective of delivering more dentistry, efficient utilization of dental assistants shows great promise of ensuring effective and efficient utilization of dentist's time and skill without sacrifice of his quality of work.

1.3.2.2 Relief of other extraoral duties - To enhance further increase in productivity it is essential that the dentist and his close-support assistant are not removed from their chairs. The use of ambulatory assistants ensures that the operating team is not unduly disturbed in their tasks.

Ambulatory assistants help improve efficiency by setting up instrument trays (when this system is used), refurbishing the operatory with clean, sterilized instruments and feeding her counterpart at the chairside with materials or instruments that are not readily accessible. She processes and mounts radiographs, triturates amalgam, mixes impression materials and makes necessary addition(s) to the prepared standardised trays (for example, special forceps during oral surgery). She takes impressions from the dentist and pours them in the
laboratory. Hence we see that the dentist's work schedule is not unduly disturbed. He is spared of chores that do not require his highly specialised skills and knowledge.

In a two-chair surgery, the ambulant assistant prepares the next patient and clears the preceding chair, ready for the next appointment. Assistants who had been assigned office duties answer the telephone and where necessary, shield the dentist from unwarranted disturbances.

It is apparent that dental assistants have provided dentistry with an avenue for increasing its productivity. However this avenue cannot be fully realised without efficient assisting which in turn emphasises the need for efficient training.

1.4 OBJECTIVES OF THESIS

In view of the numerous and varying duties assigned to dental assistants and in view of the fact that effective performance of these duties is essential to the dentist's productivity, it is important that dental assistants are properly and efficiently trained if their potentials (in helping increase dentist's productivity) are to be maximally utilised.

The objectives of this thesis are:

1. to look at some of the factors to be considered in the preparation of a dental assistant training programme, and
2. to highlight the importance of recognising these factors if success is to be ensured both in terms of fulfilling its purpose of being established and in achieving its objectives.

In order to achieve the above objectives, we will first look at some of the factors that influence need for a dental assistant training programme and how these factors relate to the decision to have such a programme and to the success of the programme. A number of examples of dental assistant training programmes are then presented to provide some background on how these programmes have been conducted. From these examples it would be apparent that adaptations or modifications are necessary to ensure that the programmes are suited to their respective local demands and conditions.

Sections 3 and 4 discuss some of the considerations to be made in the preparation of a dental assistant training programme. Section 3 deals with identification of programme objectives and training requirements and constraints whilst Section 4 looks at factors to be considered in the preparation of training curriculum.

The discussion part of this thesis deals with some of the processes and steps to be undertaken so that as many influencing factors as possible are considered which is important if a training programme such as that for dental assistants is to be successful. Some of the methods of obtaining information, sources and types of information that should be gathered are also presented in this section.
2. FORMALISED TRAINING PROGRAMMES

2.1 NEED FOR FORMALISED PROGRAMMES

The need for formalised training is dependent upon numerous factors, some of which are discussed below.

2.1.1 Dentist's Interests

This can be related to several factors, some of which are:

(a) Productivity of his practice - Is there a need at all for increasing productivity? Even though there is a world wide need for increasing productivity to meet increasing demands, local demands may be different, it may warrant the postponement of an assistant training programme to cater for other urgent needs. Even when there is a need to increase productivity, a decision has to be made as to what approach to take. A survey is necessary to determine the extent and urgency of the problem and to define priority groups. May be the school dental therapist or assistants with expanded functions would be more desirable or may be, a more efficient form of training for dental assistants is all that is required.

(b) Efficiency of his practice - As far as this is concerned, the dentist may not be too keen on having a formal programme. He can easily "produce" an assistant who is as effective and efficient as any graduate of a formal programme. However, the ability of the dentist to effectively train an assistant is dependent to a large extent on whether he has the time for it or not. In most instances
he is too busy (may not necessarily be due to his practice alone) to spend ample time with his newly acquired trainee. The quite common practice of delegating teaching duties to a senior assistant is not always the best way—she may have undesirable tricks and short cuts which are better eliminated than perpetuated and where theoretical teaching is concerned, this may be a case of "a blind leading another blind".

(c) Teaching aspects - Even if the dentist has adequate time, he may not be a good teacher. Teaching is a scientific art, not merely telling and showing how things are done. Telling and showing may be a good way of getting things done, it is certainly the quickest way for the dentist to make his newly acquired trainee useful. However, an assistant who had been trained in this manner will be less able to adapt what had been "taught" to varying situation as they lack knowledge of basic principles and background—she had not been "conditioned to think". Furthermore, the dental surgery hardly constitutes a proper environment for training both from the dentist's and student's points of views. Interruptions can occur at any time. How much materials can the dentist afford to lose for teaching purposes? When is the trainee ready for practical assisting (with patients)? Can the dentist afford any hazard with patients? (this affects his image as seen by the community he wants to serve). Experiences in the U.S.A. indicated that practicing dentists had realised that on-the-job training of assistants is time-consuming, costly, frustrating and impedes productivity (Cranford, 1968; Hollinshead, 1961, p.208).
(d) *Other considerations* - The dentist in private practice may not want his assistants to be formally trained in a special institution for the simple reason that they (assistants) may press for higher wages to keep at par with other similarly qualified technical aids. Even though this may seem selfish it is nevertheless a real enough situation as it may affect, among other things, the acceptance and employment of graduates. On the other hand, it may seem ridiculous to have a population of dentists each involved in his own training programme when their time and efforts could be more useful elsewhere. Taken in a broader perspective with three or four communities (or more depending upon community size), this loss of time may reach a substantial enough proportion that a centralised training programme will be more economical.

The influences of "dentist's interest" on the need for formalised programme depend on his need to be productive, what is "efficiency" to him and his awareness of the benefits of having a well-trained, efficient assistant (he may be just as happy to have, say, a 60% efficient assistant as he is unaware of what a more efficient assisting can do). His priority for self-interest benefits or service to community will also influence his decision for or against formal programmes.
2.1.2 Dental Assistant's Interest

Standardisation of qualifications would ensure greater mobility not only in the immediate community but also in the state or even nationwide. This is desirable not only from the assistant's point of view but also where the dentist is concerned. A dental assistant who has had the benefit of a formal course of training can adapt herself to the varying needs and skills of individual dental surgeon in differing environments whereas an assistant who has received her training from one person only, in the form of an apprenticeship, is less likely to be able to do this. Standardised qualification would also be useful when we consider resettlement programmes for servicemen. On termination of their military service these soldier assistants would be better able to find employment in the civilian sector.

Formalising the training of assistants (which is usually accompanied with the award of certificates) is desirable as it would give the assistants a certain amount of status in line with her other medical and dental counterparts (or other technical aids for that matter). This may or may not stimulate dedication and loyalty to their new found career. If it does, dentistry as a profession would certainly benefit. Looking from a group interest point of view, formalised training is desirable in that it provides the assistants with a better justification in their demands for better working conditions (which includes higher pay).
2.1.3 Dentistry as a Profession

As far as fulfilment of its obligations to the community is concerned, the profession is responsible for providing the best dental care possible. In this aspect formalised training is desirable as it ensures greater control of the standard of knowledge and quality of training. This is important not only for the dentist but also for public protection. In the face of increasing demands for dental services on-the-job training will be unable to provide for the high degree of competency so essential if the profession is to continue providing greater dental care without sacrifice of quality. Of lesser importance, the image of dentistry as a highly skilled and specialised profession is enhanced when its auxiliaries are all formally qualified. As has been said earlier, formalising the training of assistants would tend to promote loyalty and dedication to the profession which is one of the ways of reducing wastage rate. Dental assisting is presented as a rewarding career, not just a "temporary vocation" while waiting for better job opportunities.

2.1.4 Community Interests

Does the community want more dentistry? Does the inability of local dentists to meet community demands constitute a serious enough problem to warrant expenditure of public money? These are important considerations since they affect the willingness and extent of support (especially financial) that a community will give to our training programme. Cost of dental care is yet another factor since a community that is already paying too much for dentistry would not
be in the least interested in having to support a further dental project: unless, of course, there is a promise of reducing cost of service (fees) through better efficiency and productivity (greater productivity would mean increased nett income. Dentist may then be able to afford reducing his fees). A formal training programme is also desirable form the point of view of public protection because quality control can be better regulated. If the community wants more dentistry, how much is it willing to spend? Certainly increasing the dentist's productivity through efficient assisting is one of the cheapest ways of meeting increasing demands. An analysis of the community's dental needs is however necessary to ensure proper expenditure of public money. A programme for dental hygienists or expanded function dental auxiliary or intensification of its school dental service may be more appropriate and desirable than our programme for dental assistants.

2.1.5 Educational Considerations

Formalised training offers many of the advantages of an educational institution. Teaching is done by qualified staff or at least those with teaching inclinations both of whom are sensitive to the psychology of learning. Their main concern is to impart knowledge rather than just producing an extra set of hands. Teaching materials will be better prepared and more systematically presented. Instruction will be more complete (i.e. more theoretical background) with allowance for further education and career mobility. Furthermore, continuous evaluation of the curriculum will ensure that education of these assistants is kept abreast with current concepts
and techniques. The environment will also be more conducive to learning without the hustle and bustle of a practice trying to cope with its patient appointments. The presence of other students promotes healthy competition and stimulates the desire to learn. The presence and use of teaching/learning aids will make the learning process more meaningful and enjoyable.

Only some of the factors relating to the need for formalised training programme for dental assistants were discussed. It is evident that each of these factors has its own weight and influence not only upon the decision to establish such a programme but also on the support that will be given which eventually determines the success of the proposed venture. Where clash of interest is inevitable, community welfare should take precedence over other considerations. When there is no real need for such a programme having it anyway for the sake of image and status is hardly justifiable.

When it has been established that there is a need for increasing productivity and when it has been agreed that this would be accomplished through more efficient assisting, formal programme should be considered favourably because of its greater assurance (compared to on-the-job training) of, among other things, more efficient training and better public protection.
2.2 EXAMPLES OF TRAINING PROGRAMMES

Only some of these will be described so as to form a general background of the various programmes in operation today. We will first look at programme outlines in some of the countries and then at some of the specific programmes conducted by various institutions. Unless otherwise stated, information in the first part of this section is derived from W.H.O.'s World Directory of Schools for Dental Auxiliaries (W.H.O., Geneva, 1977).

Australia. (Barnard, 1980, p.33–35; Australian Department of Health, 1975, p.26–28). A summary of institutions offering courses for dental assistants (also known as chairside assistants or dental nurses in some states), course duration and number of formal training hours is presented in Table 1. In addition correspondence courses conducted by the Dental Assistants Association Australia (D.A.A.A.) are available in all states to cater for non-metropolitan students. Other courses available include post certificate course in Radiography (New South Wales, Queensland and South Australia conducted by D.A.A.A.) and full-time certificate courses (six months to 2 years duration) which are available in the states of Victoria, South Australia and Western Australia (at dental hospitals except for Mt Lawley Technical College in Perth, Western Australia).

Subjects in the curricula include professional ethics, dental jurisprudence, chairside assisting, office management, applied psychology, anatomy and physiology, instrument, appliance and equipment, microbiology and sterilization procedures, drugs, anaesthesia, dental
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<td></td>
<td>Royal Newcastle Hospital</td>
<td>1 year practical course + correspondence (Dental Assistant Association).</td>
<td></td>
</tr>
<tr>
<td>Victoria</td>
<td>Dental Nurses Training Committee</td>
<td>1 year part-time + 3 years inservice training for accreditation</td>
<td>1 year part-time is of 80 hours of weekly lectures and tutorials for 8 months + 1 demonstration day.</td>
</tr>
<tr>
<td></td>
<td>Royal Dental Hospital Melbourne</td>
<td>2 years full-time (practical and theory). Year 1 - 248 hours (4 weeks) preliminary training then 25 × ¼ days for study + 1 week study block. Year 2 - 172 hours (9 × ¼ days for study + 1 week study block).</td>
<td></td>
</tr>
<tr>
<td>Queensland</td>
<td>Department of Technical Education</td>
<td>1 year part-time</td>
<td>65 hours = 62 evening lectures and tutorials. - 3 hours practical demonstration for Brisbane Metropolitan course</td>
</tr>
<tr>
<td>South Australia</td>
<td>Dental Assistant Training Committee</td>
<td>1 year part-time</td>
<td>111 hours of weekly evening classes.</td>
</tr>
<tr>
<td></td>
<td>Dental Hospital</td>
<td>10 months part-time for employed assistants only.</td>
<td></td>
</tr>
<tr>
<td>Western Australia</td>
<td>Dental Assistant Association (W.A.)</td>
<td>1 year part-time</td>
<td>130 hours over 12 months.</td>
</tr>
<tr>
<td></td>
<td>Mt Langley Technical College</td>
<td>1 year full-time</td>
<td>1080 hours (36 weeks). Clinical time is spent assisting in private practice or dental therapy clinics.</td>
</tr>
<tr>
<td></td>
<td>Perth Dental Hospital</td>
<td>2 years full-time</td>
<td>600 hours of lectures and practical, Year 1 - 12 weeks (520 hours + practical), Year 2 - 3 weeks (80 hours + practical).</td>
</tr>
<tr>
<td>Tasmania</td>
<td>Dental Assistant Training Committee with Australian Dental Assoc. (Tas).</td>
<td>1 year part-time</td>
<td>28 hours</td>
</tr>
<tr>
<td>Australian Capital Territory</td>
<td>Technical College</td>
<td>1 year part-time</td>
<td>120 hours</td>
</tr>
<tr>
<td>Armed Services</td>
<td>Dental Training School R.M.A.S. Cerberus</td>
<td>17 weeks full-time</td>
<td></td>
</tr>
<tr>
<td></td>
<td>R.A.A.F. Base Wagga</td>
<td>10 weeks course</td>
<td></td>
</tr>
<tr>
<td></td>
<td>School of Army Health Training</td>
<td>5 weeks + on-job training</td>
<td></td>
</tr>
</tbody>
</table>

Source: Australian Department of Health "Handbook on health manpower part 1, 1975" and Barnard, P.D. "Facts and figures, 1980".)
materials and techniques, oral examination and surgery, first aid and emergencies, diet and nutrition, dental radiography, dental health education and the various specialities of dentistry (such as oral surgery, orthodontics and prosthodontics).

Canada. Generally courses are approximately 900 instruction hours, of which 40% are devoted to theory, 40% to practice and 20% to inservice training. These courses are held at post-high school colleges and institutes of technology and are of one academic year duration. Subjects in the curriculum include dental office procedures, dental science, dental laboratory procedures, dental operative procedures, dental materials, dental radiography and clinical practice. Facilities for further training are available at some institutions.

Denmark. The two year curriculum consists of a one year formal course and a year in general practice or in a school dental service. 60% - 70% of the 1050 instruction hours are spent on lectures while the remaining 30% - 40% are devoted to seminars, demonstrations, laboratory work, etc. The curriculum includes anatomy, physiology, pharmacology, bacteriology and sterilization procedures, general pathology, first aid, dental pathology and prophylaxis, dental cariology, endodontics, periodontology, prosthetics, oral surgery, orthodontics, radiology and clinical photography, rationalised practice management and community dentistry.
German Democratic Republic. Training programmes are of three years duration. 31% of the 4847 instruction hours are devoted to theoretical studies whilst the remaining 69% is for practical work. Subjects in the curriculum include Marxism–Leninism, German, Russian, culture and aesthetics, physical education, health protection, health economics, medical microbiology, teaching methods, psychology, sociology, general pathology, nutrition, data processing, health statistics, preventive medicine, dental materials, general and dental pharmacology, disinfection and sterilisation procedures, instrumentation, dental techniques and radiology.

Norway. A fairly intensive course of 1220 instruction hours over ten months consists of 30% theoretical studies, 40% practical which includes laboratory work and 30% of inservice training. Preference is given to applicants with practical experience. Subjects taught include basic dental subjects, practice administration and social subjects. Refresher courses (up to 1973) are available only at two schools (out of nine).

Singapore. The course (up to 1973) is conducted at a hospital dental clinic and consists of 97% practical and 3% (out of 2020 hours over two years) theoretical studies. Subjects studied include anatomy and physiology, dental materials, dental drugs, the role of dental assistants in various dental operations and general clerical work.
United Kingdom. Courses offered are either one year full-time study followed by one year of work or two years part-time, evening/day release classes for employed assistants. Subjects taught include English, office procedures, record keeping, stores, first aid, anatomy, physiology of the mouth, structure of teeth, drugs, bacteriology, sterilisation procedures, oral hygiene, anaesthesia, instruments and radiography. Short refresher courses and one-day seminars are arranged for qualified surgery assistants. Opportunities are given to the better qualified (academically) assistants to enrol for a nine-month course to qualify as dental hygienists.

United States of America. Training programmes range from seven months to two years in duration and are mostly conducted at post-high school institutions. Because of the great number of programmes (and hence great variations) being conducted it is difficult to state separately the total number of hours spent on theory, practice and inservice training. The educational programmes include courses in general education, biological sciences, office procedures and a period of clinical experience either at the premises (when facilities are available) or at selected surgeries or affiliated institutions.

Great variation exists in duration of courses ranging from ten months to three years. Percentages devoted to theoretical and practical instructions also vary from 3% theory and 97% practical in Singapore to 65% theory and 35% practical in Denmark. Information is lacking on whether instruction is provided exclusively at parent institutions or that other facilities (such as affiliated hospitals or clinics or private practices) are also utilised. There is no
information (other than subjects taught) relating to actual curriculum - we do not know if it is divided into terms (and if the curriculum is, what is taught in each term) and whether theoretical instruction is integrated with practical teaching or that practical experience is gained only after a certain amount of theoretical background had been given. What is exactly meant by theoretical (whether it is solely lectures or includes seminars, tutorials, visits, assignments) and practical (whether it is solely laboratory work or includes practical assisting, observations, on-job or inservice training) instructions are not known. Methods of supervision (who supervises? personal or group supervision?) is not known especially when affiliated institutions are used. There is also no information regarding methods of student assessment and student placements upon graduation (who finds jobs for them, who employs them).

In view of the above examples of "inadequacies" in summarised information a look at some specific programmes is necessary to develop a further insight into how dental assistants training programmes have been conducted. These programmes are selected because of the variations in their curriculum formats (such as inservice hospital training, full-time vocational training, part-time technical situation and joint university-community health centre projects) that were deemed necessary to accommodate local resources and requirements.

*Eastman Dental Hospital London* (Blake, 1966)

*Prerequisites:* There is no rigid academic requirements for entry as it is believed that academic attainment is not as important as practical ability combined with a shrewdly sympathetic personality and a
keenness and willingness to undertake the work. Trainees between
the ages of 16-20 years are accepted.

Training programme: The course is conducted over 12 months which is
divided into $2 \times 6$ monthly sessions. On entering the hospital, trainees
receive an intensive 12-day course from the tutor-in-charge on funda-
mental aspects of hospital routine and etiquette. This is then followed
by a short course in bacteriology and sterilisation. Following this
introductory period trainees are given posts in the various hospital
departments on a rotation basis covering periods of 1-2 months
duration. They assist with work on patients under the instruction of
a senior nurse whose duties include the instruction of trainee
assistants in the special subject of the particular department.
Trainees work in most departments twice, once as juniors and once more
when they have had more general experience towards the end of the
training. During all this time that the trainees are circulating
around the hospital, lectures are also given by senior staff members
of the appropriate departments. Lecture topics of the first six
months of the course include introductory hospital routine,
bacteriology and sterilisation, human anatomy and physiology, dental
anatomy and physiology and charting (history and note taking). In
the second six months lectures are on dental caries, conservative
dentistry (materials, instruments and chairside processes),
inflammation (abscesses, healing of wounds, socket healing),
periodontal disease and treatment, local and general anaesthesia,
surgical dentistry, drugs, prosthetics, orthodontics. The National
Health Service and record keeping on the N.H.S. and dental radiology
(elementary theory, radiation danger, dental x-ray procedures and
film processing).
**Student assessment:** Two-hour written examinations and eight-minute vivas are conducted at the end of each term. Students are not allowed to proceed into the second part of the programme unless satisfactory grades are obtained in the first term.

**Others:** While under training trainees receive some payment. On successful completion of the course, trainees are awarded the hospital certificate.

*School of Dental Medicine Harvard University - Dimock Health Vocational Centre, Boston* (Kazis and Blau, 1973).

The programme was essentially designed to provide training and thus employment opportunities for members of an economically deprived community as well as increasing the supply of trained dental assistants to local dentists.

**Prerequisites and recruitment of students:** High School diplomas are not required. There is no real specification on age requirements, applicants up to the age of 30-39 years have been accepted. Prospective students are interviewed to determine their work history, family obligations, motivation, skills and educational level. For those who lack the necessary educational basis, there is a pre-vocational training course which provides the skills necessary to enter and complete the vocational courses. Through Dimock Community Health Centre, dental assistant trainees are recruited from among the disadvantaged residents of the inner city area. Recruitment is by word of mouth, local community agencies, hospitals, city and state agencies and the Massachusetts Division of Employment Security.
Training programme: The training programme is divided into three phases — six weeks of basic training and laboratory exercises conducted at the community health vocational centre, 11 weeks of practical assisting at the faculty, and five weeks of externship at affiliated institutions of Harvard, e.g. Children's Hospital Medical Centre (dental section), oral surgery clinic of the Massachusetts General Hospital.

The first six weeks of the course is divided into two sections. The first part is used by the staff of the vocational centre to instruct on general topics such as filing, public speaking, public relations, telephone techniques, personal hygiene and a review of mathematics, English composition and grammar. The second section is organised and taught by faculty staff of Harvard University and consists of introductory basic sciences, general dentistry (terminologies, dental materials, dental radiography, community health) and practical techniques (charting, instruments and set-ups, chairside positioning and office procedures). Practical laboratory sessions are held in mixing materials and the handling and sterilisation of instruments.

The next eleven weeks are spent in the general office of the dental school. Students are assigned to junior students in the principle clinical year and the graduate students in endodontics, periodontics, restorative dentistry and public health dentistry. Instructions in four-handed chairside procedures are also given. In addition seminars in periodontics, endodontics and general clinical procedures are held. Students also participate in the dental assistants' sessions of the Massachusetts Dental Society.
The final five weeks are spend in externships at affiliated institutions of Harvard University such as the dental clinic of the Children's Hospital Medical Centre, the oral surgery clinic at Massachusetts General Hospital, the Veterans' Administration installations and community health centres.

Student assessment: No mention was made in the article with regards to theoretical assessment. Evaluation of student work in the clinic is based on feedbacks from dental students and faculty members.

Others: Assistance is given for student employment upon graduation. Graduates have found employment in community health centres and private dental offices. A few have been accepted for advanced training (e.g. expanded function programmes) which also is run by the university.

Dental Auxiliaries Centre, Sydney Technical College (D.P.H. visit report 1982)

Part-time courses conducted by this centre are for employed assistants only. Classes are held in the evenings 5½ hours per week for 36 weeks over a period of one year (two semesters). Four different classes are conducted concurrently each year. Three of these classes are run from 2.00 pm to 8.00 pm while the fourth is run from 5.45 pm to 8.30 pm for two nights.
Teaching staff: This consists of both full-time and part-time dentists and dental assistants. All permanent staff had undergone teaching courses before they are appointed.

Training programme: Emphasis is placed more on the teaching of principles and techniques rather than actual assisting with patients (students are already in employment). Theoretical instruction is mainly in the form of lectures, tutorials and class discussions. Textbooks are prescribed. In addition printed notes are also given. Teaching/learning aids such as cine films, slides, overhead projectors and videocassettes are used. A dental chair with basic chairside facilities (non-operational - for demonstrations only) is also installed in the lecture room.

Practical instruction consists chiefly of demonstrations and practical exercises in the centre's operatory and laboratory areas. Students are instructed on techniques in four-handed sit-down dentistry, radiography, sterilisation and other surgery procedures (such as mixing of cements, impression materials, silicates and processing and mounting of x-ray films). Laboratory technique in pouring and preparing plaster/stone models is also in the curriculum. Practical work with patients is limited and this is mainly in the taking of radiographs. Students are encouraged to bring in close friends and relatives.

A summary of curriculum content is as follows:

Basic sciences - general anatomy, physiology, microbiology, general pathology, pharmacology.
Dental assisting - sterilisation principles and techniques, identification of instruments and their uses, instrument and tray systems, principles and techniques of four-handed dentistry, dental materials, usual patient complaints.

General Dentistry (procedures in dentistry and reasons for them) - history taking, examination, treatment planning, principles and instrumentations in preventive dentistry, prosthetics, pedodontics, oral surgery, orthodontics, periodontics, endodontics and dentistry for the elderly and handicapped.

Office duties - record filing, recall systems, principles of book-keeping, financial transactions, stock control and ordering, reception and appointments, general correspondence. Typing is not offered as part of the course.

Laboratory procedures - dental radiography, model preparation.

Other related subjects - ethics, dental jurisprudence, first aid and emergencies, psychological principles and applied psychology, diet and nutrition.

**Student assessment:** The centre conducts its own examination. However, students wishing to undertake the National Certificate of the Dental Assistants Association of Australia examination are given three weeks time off for preparation purposes. The internal examination is conducted six times a year in six weekly blocks. Short answer questions are used. Assessments are also held for the practical aspects of the curriculum. Each stage or task is checked and marked in the
students' assessment cards (e.g. a tick against kalzinol mixing when the instructor is satisfied with cement prepared). Assessments are also made on neatness, tidiness and mannerisms. Test reports are not sent to employers as contract is between the institution and individual student. A certificate is awarded on successful completion of the course.

Others: This centre is a branch of the School of Biological Sciences, Department of Tertiary and Further Education which in turn is a branch of the state Department of Education. Students are required to pay a certain amount of fees. (In some cases students are sponsored by their employers.). Further courses available from the centre are the Dental Radiography Certificate Course (part-time evening two hours weekly for 36 weeks) and the Dental Health Education Course (evening classes two hours per week for 18 weeks).

Dr Martin Luther King Community Centre, New York (Dedeaux, 1971)

This centre is located in the Bronx area and as such, one of its aims of conducting a dental assistants training programme is to develop basic assisting skills for employment purposes as well as increasing the number of dental assistants available to the community. Teaching is task orientated, only essential knowledge and skill required to perform tasks are taught. Knowledge related to the task but not totally essential such as history, physics of radiography, is covered only if there is sufficient time.
Student selection: All female residents in the area between the ages of 18-55 years are eligible to apply for admission to the programme. Preference is, however, given to heads of households. Selection is based on interviews (group and individual) and an IQ test.

Training programme: Successful applicants are required to attend an eight-week full-time "core curriculum" orientation programme in which lectures on health careers, basic health skills, community resources and academic preparation are given. Those students who have shown interests in dental assisting then enter the centre's Dental Assistant Training Programme. This programme is conducted over a period of six months which is divided into 2 x 3 monthly periods.

The first three months are spent on classwork. Subjects taught include basic sciences, chairside assisting arts and functions, laboratory procedures, business education skills and applied assisting sciences.

The next three months are spent on on-the-job training which is provided at the health centre itself and in clinics and operating rooms of affiliated hospitals. Trainees observe assistants working with dentists as well as participate in actual assisting with patients (mix cements and impression materials, develop x-rays, pour and trim models, file records, make appointments and other routine duties expected of dental assistants).
Teaching staff: This is made up of members of the health centre and staff of affiliated clinics and hospitals as well as visiting lecturers.

Employment: This is not guaranteed by the centre. However, the centre does seek employment for trainees. The article reported that there was no difficulty in finding employment. Trainees were sought by other clinics, private offices and hospitals.

Others: This programme is financed by the United States Federal Government (Office of Economic Opportunity). Trainees are granted a stipend while they are in training status.

Mabel Dean Bacon Vocational High School, New York (Zipser, 1966)

The "Dental Office Assisting" programme is supported by the High School Division of the Board of Education, City of New York. It is a preparatory course designed to give a broad overall view of the career and field of dental assisting. It is incorporated into the regular high school schedules. Students majoring in dental assisting spend half their time on regular academic classes and the other half on vocational or dental assisting subjects.

Student selection: This programme is offered to potentially qualified pupils (referred by school guidance counsellors) from all five boroughs of Greater New York. All prospective applicants are screened and tested before admission to determine their "degree of potential success". This screening and testing involves reading comprehension, mathematical reasoning, organisation of work habits, speed, accuracy, dexterity, physical fitness and personality.
Training Programme: A total of 1800 hours (spread over three years) are spent on teaching the arts and functions of chairside assisting (involving preparation, maintenance and care of equipment, preparation and assisting procedures during patient treatments), techniques and procedures of laboratory assisting (preparation of impression materials, casts and models, radiographic processing) and secretarial and business procedures (typewriting, record keeping, filing, dental appointments, and general office management). In addition social sciences, liberal arts, speech improvements, voice, poise and diction training are included in the vocational areas of the programme. Other teaching activities include problem solving discussions, field trips to local and national dental events (when geographically feasible), and individual projects. Practical training is achieved in the school's Dental Assisting Department which had been designed to accommodate typical dental surgery facilities. Students are not sent to private dental offices to ensure their objectivity and "unspoiled quality" to which future employers can mould to meet their respective office needs. Pupils are, however, sent to approved dental centres, hospitals and health department clinics (as recommended by the State Education Commission) in their senior year for supplementary clinical observation and instruction. In these instances close liaison, supervision and follow-up are maintained on a daily basis by the programme coordinator with each dental centre staff.

Student assessment: No mention was made as regards theoretical and practical assessments. Pupils are, however, inspected daily for their standards of grooming (e.g. optimal personal health and hygiene, cleanliness of uniform, appropriate length of uncoloured finger-nails, no jewelry or excessive make-up and no gum chewing).
Student placement: The school maintains an employment service for its qualified graduates. Attempts are made to screen all employment requests before referring the applicant so that the limitations as well as special abilities and personalities of each will be aptly suited to the particular needs of the individual practitioner. This "processing" has been quite successful in that over 90% of the graduates have remained with their original dentist employers to the satisfaction of both parties.

Others: This programme has proved a success in that the Dental Society of the State of New York had since approved accreditation of high school programmes not only in dental assisting but also in dental laboratory processing (footnote end of article by Zipser, 1966).

2.3 SUMMARY

"Need" for formalised training programme for dental assistants is dependent upon several social and personal factors. Careful consideration of these factors is necessary to ensure support and success of a dental assistants training programme. Assessment of need should be based on local conditions and requirements rather than on some perceived ideas and intuitions. Only when there is real need (based on documentable evidence rather than some guess work) will establishment of such a programme be justified both scientifically and morally.
Several examples of training programmes have been presented to provide some background on the conduct of training programmes as well as illustrate some of the variations in training formats. Even though the range of variations selected is rather limited, these examples have nevertheless helped highlight the need for adaptation or modification to local expectations and conditions.
3. PLANNING THE TRAINING PROGRAMME

It has been said in the last chapter that efficient training is an important prerequisite for efficient assisting and to ensure efficient training a formalised training programme should be established. However, efficient training cannot be ensured or guaranteed unless there is proper planning.

This section deals with some of the factors to be considered in the planning of a training programme for dental assistants. These factors are:

(a) objectives of training programme
(b) length of training programme
(c) training facilities
(d) teaching staff
(e) student selection and
(f) evaluation of the training programme.

In section 4, focus will then be placed on planning of the curriculum at the classroom level (training/instructional objectives, design and content, student assessment).

3.1 OBJECTIVES OF TRAINING PROGRAMME

Defining objectives at the outset of planning is mandatory since it will help guide the rest of the planning process. Knowing what is to be achieved will enable formulation of ways and means of achieving it in the most effective and efficient manner possible.
Objectives will also provide a means for evaluating effectiveness of the programme enabling reviews and adjustments to be made as deemed necessary by the unpredictable and changing environment.

Before any objectives are defined it is of utmost importance that a study be conducted to provide relevant information upon which realistic objectives can be based. This study may include a survey of dentist opinion and/or consultation with local and state dental societies and those federal and state agencies which employ trained assistants. Employment agencies may also be useful for gaining additional information.

3.1.1 Influencing Factors and Their Implications

A number of factors will need consideration in the formulation of training objectives. Some of these are:

(a) Financial consideration. - recognition of financial constraints is essential so that only financially feasible objectives are formulated. Limited budgets would necessitate modifications or adjustments if economically workable programmes are to be formulated and successfully executed.

Aiming to produce graduates "highly skilled and knowledgeable in all aspects of dental assisting" may not be possible unless arrangements are made to use affiliated hospitals, dental clinics or even private dental offices for practical teaching and experience. This is in view of the fact that being a practically-orientated occupation, the training of dental assistants would necessarily have
a high practical component to which purchase of expensive equipment and machinery (dental chairs, x-ray machines, etc.) is required. There may just be not enough funds to support the establishment of such facilities. Perhaps a part-time theoretical supplementary course for employed assistants is all that can be afforded when there is a severe financial constraint.

(b) Urgency of need. - In the presence of acute urgency of need for trained assistants, more quickly achieved objectives would be more desirable. Instead of producing graduates fully cognizant of the science and arts of dental assisting, training may be limited to only the arts of assisting with the science component being confined to essential knowledge directly related to the task only (e.g. Dr Martin Luther King Community Centre - see 2.2).

(c) Type of dental assistants required - A survey of roles and functions of dental assistants would provide some background as to what areas of dental assisting should assistants be more competent than others. If demand is more for chairside assisting skills, then objectives would have to be formulated such that more hours are spent on chairside assisting techniques and procedures. Perhaps development of highly competent chairside assistants is not all that desirable as compared to assistants with greater skills and knowledge in office procedures. In cases where assistants are expected to perform some dental health education work, objective of the training programme should be designed such that its curriculum includes the teaching of dental health education principles and techniques. Perhaps even public speaking, psychology and poster preparation techniques should
be incorporated in the curriculum. In the Armed Services where basic
paramedical knowledge is essential, objectives should be set such
that these requirements are catered for (unless candidates already
had them).

An analysis of projected requirements of dental assistants
would also be useful so that objectives that cover these requirements
are formulated. This is to ensure that provisions (such as space
and equipments) are made in the planning process for these coming
needs.

(d) Nature of community to be Served - Objectives will also be
different in a programme that aims to serve, say, for example, an
economically deprived community with high unemployment rate as opposed
to an affluent upper middle to upper class society. In the first
instance a major objective would be to provide basic skills required
for improving employment opportunities whereas in the latter case, a
more extensive course may be necessary in view of a possible higher
involvement in cosmetic dentistry work, for example, crown and bridge
work.

(e) Mobility and recognition - Provision for employment mobility
is another factor that influences the formulation of programme
objectives. Where this is to be ensured, accreditation guidelines
would have to be consulted so that its requirements are met.

Where provision for career mobility and advancement are to be
provided for, consultation with institutions conducting such courses
would be necessary in addition to meeting accreditation requirements.
The above are only examples of some of the factors that influence the choice of objectives and their priorities. It might further be added that none of these factors act in isolation to warrant a straight "action-reaction" type of decisions. Every influence needs careful thought and thorough consideration so that a workable equilibrium is achieved. In all cases, however, quality should not be compromised to the extend that public protection is sacrificed.

3.1.2 Some Recommended Objectives

These are presented to provide some insight into what dental assistant training programmes should aim to achieve.

Both the American (American Dental Association, Council on Dental Education, 1974) and Australian (Australian Dental Association, Dental Auxiliaries Committee, 1977) Dental Associations recommended that the education of dental assistants should include the content and learning experiences required to prepare the student to function effectively as an integral member of the dental health team. Graduates should be able to perform chairside assisting duties and related office and laboratory procedures under the direction and supervision of the dentist.

The United States Public Health Service in collaboration with the United States Office of Education (U.S. Office of Education and U.S.P.H.S., 1965) advocated that dental assistants training programmes should have four basic objectives:
(1) To provide the student with a knowledge of dental theory adequate for understanding the significance and implications of those procedures to be performed.

(2) To provide the student with working skills in chairside, clinical and dental laboratory procedures.

(3) To provide the student with knowledge, understanding and skills in recordkeeping, office maintenance, communications and other business procedures.

(4) To impress upon the student the importance of professional ethics and conduct of good public relations.

The above recommendations would prove useful in providing guidelines when objectives of training programmes are formulated. Depending on local demands and conditions, variations from these recommendations are necessary. These variations may relate to:

(1) extent of the objectives - to what is considered as 'adequate' knowledge and skill necessary for effective assisting.

(2) priority of the objectives - knowledge and skills in record keeping and office procedures may be more important than skills in laboratory procedures and techniques.

(3) addition of other objectives - for example, in the Armed Services where paramedical knowledge and skills are required.
3.2 LENGTH OF TRAINING PROGRAMMES

The W.H.O. expert committee on dental auxiliaries in 1959 (W.H.O. T.R.S. 163, 1959, p.9) recommended that the education of dental assistants should be one year in length. The Australian Dental Association (Australian Dental Association, Dental Auxiliaries Committee, 1977) advocated that part-time courses for employed assistants be of one academic year in duration whilst the American Dental Association in 1974 (American Dental Association, Council on Dental Education, 1974) recommended that the minimum length of a dental assistant curriculum must be one academic year.

However, an inspection of Section 2.2 (examples of training programmes) indicates that there are great variations in the length of dental assistants training courses ranging from 22 weeks to three years.

It is apparent that duration of training per se is not an important point of consideration, rather it is the length of time required to achieve objectives. A programme that aims to teach basic assisting skills need not be as long or longer than that which aims to provide a comprehensive study in dental assisting. In general, the length of training programmes should be proportional to the degree of competency and level of knowledge required of graduating assistants.

An assistant training programme must extend a long enough period to allow presentation of materials to students in a meaningful way. There must be ample time to absorb fundamentals before going into more advanced topics. A dental assistants' course which gives students information and skills many of which may be potentially
dangerous, must have sufficient time for the development of acceptable standards of competency as well as proper sense of values and ethics. Otherwise it may be doing more harm than good.

On the other end of the scale a training programme for dental assistants should not be unnecessarily longer than is required to achieve its objectives. It should not present a formidable obstacle to the entering student, for example, a potential candidate may feel that by the time she finishes an assistants training programme she could have completed another training course and would be working and earning just as much. An assistants training programme should compete favourably with other vocations for the interest and attention of prospective students.

From a financial point of view, a dental assistants course should also not be unduly prolonged as it would then incur unnecessary costs.

3.3 TRAINING FACILITIES

3.3.1 Physical Facilities and Equipment

As a major proportion of an assistant's career will be spent in the dental surgery, either as a chairside assistant or performing other supportive functions (e.g. processing x-ray films, sterilising instruments, pouring models), it is highly essential to ensure that upon graduation students are conversant with at least the basic skills of dental assisting. To achieve this, it is imperative that requirements for physical facilities and equipment are satisfied.
The components of a dental assisting training facility, the purposes for which they are used and their basic equipment are presented below:

3.3.1.1 Dental operating

This is where chairside assisting techniques, identification of dental instruments, preparation of materials used in dental treatment and sterilisation procedures are taught.

Each operatory should contain a dental unit and chair, an oral evacuator, an instrument cabinet, a complete set of instruments, operating stools for the dentist and the assistant and a common sterilising area which should be equipped with commonly-used types of sterilisers (by methods of action rather than brand name, e.g. heat, pressure, chemical).

An emergency kit fully equipped for management of dental office emergencies should be made available in the operating area for instruction and use especially when patient care is provided at the premises.

3.3.1.2 X-ray facility

This should include commonly-used type of x-ray machine(s) (depending upon how much radiography to be taught), a dental chair, a lead-lined apron and a sink. The x-ray room should be large enough for use in demonstrations and supervised practice of techniques. Provision for maximum protection form x-radiation
should be incorporated in the design of this section of the clinical area, e.g. lead-lined wall and glass viewing window.

A darkroom would be necessary for use in the instruction of x-ray processing techniques, maintenance of the processing tank and preparation and changing of solutions. This room should be equipped with a work counter, a processing tank with circulating water, a sink with hot and cold water, drying racks and a storage cabinet. The room should be "light-tight" and equipped with a safelight lamp. It should have enough free floor space to permit groups of five or six students to observe demonstrations.

3.3.1.3 Laboratory

This should be provided to facilitate instruction in the manipulation of dental materials (acrylic, plaster, stone) and other laboratory procedures associated with dental assisting.

Laboratory benches, enough to accommodate a full class, are the basic equipment. The benches should be of sufficient height for comfort and positioned to give each student a clear view of demonstrations. Electric and gas outlets and bench lights should be provided at each bench position. Model trimmers should be located close to a sink (for supply of water coolant) and plaster traps placed in the latter for protection against stoppage caused by plaster accumulation.
3.3.1.4 Classroom

The classroom should be located within the dental assisting facility and be equipped with typical classroom utilities, e.g. chairs, tables, blackboard. There should also be adequate power outlets for use of audiovisual equipment.

The extent to which physical facilities and equipment are required or that can be provided for would depend on such factors as objectives of training, financial constraints and availability of space.

A complete laboratory facility may not be necessary when a programme does not aim to provide extensive teachings in laboratory techniques - may be a small workroom will be sufficient. A programme that aims to provide only basic knowledge in chairside assisting techniques may not require an extensive clinical facility. May be one or two dental chair units is all that is required for demonstration purposes.

In addition to the facilities already discussed (operatory, x-ray, laboratory, classroom), a simulated office with filing cabinets, typewriters and other office utilities may be provided for to enhance teachings in office management and procedures. A reception area may also be required when patients are seen in the premises. A special room may be set aside for teachings and practice of poster preparation techniques when this subject forms part of the student's training in dental health education.
A training programme that is run on a low budget may not afford to provide as extensive a training facility as one that has a larger financial support. In instances where practical experience is to be incorporated in such a programme, affiliated institutions (dental hospitals, dental schools, private dental offices) may have to be utilised to provide the required experience. The type of facility that can be provided for would also be affected by the amount of money available - a darkroom may not be possible in which case a portable x-ray processor may be all that can be acquired.

Availability of space is another factor that determines the extent to which facilities can be accommodated. Having too many equipments and reducing free floor space is not always a wise decision as this tends to reduce the effectiveness of teaching processes.

3.3.2 Audiovisual Teaching Aids

The use of audiovisual aids as instructional media has increased greatly in the past decade or so. Despite common criticism of their use as being "impersonal and dehumanising and that staff-student contact will be lost" (Garrick, 1978) more and more of these media are finding their ways into teaching curricula. This popularity is attributed to several unique characteristics (Garrick, 1978) of these media, some of which are listed below:

(1) media allow easy and repeated reproduction of an event or procedure.
(2) media can provide visual access to a process or technique which would be otherwise unobservable and, in addition, can provide this access to large numbers of students simultaneously.

(3) media can promote the illusion of reality, where reality is desirable, but not possible to obtain.

(4) media also allow for students to proceed at their own pace and provide opportunities for active student involvement, for example, with review questions and in remedial exercises.

(5) media can facilitate the understanding of abstract concepts which may be difficult to communicate verbally.

3.3.2.1 Use of audiovisual aids in dental assistant training programme

Although use of these aids is highly desirable from an educational point of view (considering advantages as above) the decision to invest in such media should be based upon careful consideration of whether there is a real need for them - will they affect more efficient learning? If they do, will their effectiveness be of enough significance to warrant purchase? A major factor that determines "need" is the objectives of the programme. It would be helpful to remember that these aids are mainly useful in enhancing the communication of information for the development of concepts and ideas. Their use in teaching practical skills is fairly limited and as such they are of limited value in a training programme which is mainly concerned with the teaching of basic
skills in dental assisting. On the other hand a dental assistant programme that aims to provide comprehensive study in dental assisting may find such devices (audiovisual aids) necessary to attain its objectives.

In considering purchase of these media it would also be desirable or even advisable that experiences of other similar institutions be sought to determine the usefulness of these aids — whether they have indeed been effective; whether it is really worthwhile to have them.

When it has been decided that investment in audiovisual teaching aids is warranted, the next step is to decide on which types and model that will be acquired.

As a general consideration, decision on choice should be based upon functional capabilities rather than the degree of sophistication. Simple equipments are not only more economical to purchase and maintain but also have less risk of breakdown especially when students are to be allowed access to them. For example, if it is intended to make cassette recorders available to students for the purpose of listening to recorded instruction, it will be sufficient to provide "playback only" recorders which are cheaper and simpler than recorders with a "record" mode.

Another consideration is the type of media which are used by other institutions which have similar needs and tasks and with which sharing of instructional materials are contemplated. Unless prior consultation is done, incompatibility of media systems produced by various manufacturers may result.
A further important factor in the choice of media is the efficiency of available servicing. Before choosing among different brands of equipment information about maintenance contracts should be sought with distributors. It is safer to choose equipment from distributors who have developed a good reputation of reliable service.

The availability of "software" materials (instructional materials) is another factor which influences the choice of audio-visual equipment. Purchasing software produced in other institutions may prove costly and it may be difficult to find materials which will satisfy the particular needs of the purchaser. Alternatively, the institution which invests in hardware should be prepared to provide both technical and educational support for the production and maintenance of teaching materials. The production of audio-visual materials, or the review and appraisal of existing materials, is a necessary prerequisite to the effective use of any media.

3.3.2.2 Some advantages and disadvantages of some audiovisual aids

In considering the choice of audiovisual teaching aids it is essential that the advantages and disadvantages of these machines be fully recognised so that their potentials can be utilised and their limitations understood. Following are some of the advantages and disadvantages of commonly-used audiovisual aids which may be useful in a dental assistant training programme. There are presented not as a comprehensive check list but just as a guideline.
(a) The overhead projector - This has been cited as the most useful and versatile of all training aids (Lamb, 1967, p.15; Romiszowski, 1968, p.61). It is comparatively inexpensive and requires minimal maintenance. It can be of special convenience in supplementing the conventional board or even replacing it (Mills, 1977, p.203). Some of its advantages are:

(1) Since the illustrations are projected backwards onto a screen, the teacher is able to remain facing the class. He is able to observe class reactions at all times, maintaining continuous contact with the students throughout the session (Lamb, 1967, p.16; Romiszowski, 1968, p.62).

(2) It can make working in a small group less formal, encouraging student participation.

(3) The projector does not require total blackout, it can be used in the normal lighting of a classroom or lecture theatre. This makes the writing of notes easier as well as facilitating the teacher to refer to his instruction material.

(4) By using a roll of acetate film, the teacher can draw a series of diagrams, note down important points, without the need to erase any of them (this is quite impossible with the board as space is limited). When necessary, a review can be easily accomplished by rewinding the roll to the appropriate section.

(5) By using the "overlap technique", diagrams can be built up as the lecture proceeds. By using extra acetate films, the operator can draw or write over prepared transparencies without spoiling the original (Lamb, 1967, p.18).
(6) Transparencies can be cheaply and easily made, enlarged or reduced where necessary from a master original (Romiszowski, 1968, p.63). Compared to charts these transparencies are less bulky and easily handled and stored.

(b) *Slides and slide projectors* - These are useful adjuncts in units of instructions where motion is not important. Major advantages of these still projections are:

(1) Slides are cheap and easy to make. This encourages their use as there are minimal financial and time hindrances in their preparations. Furthermore painstaking preparations of diagrams or charts are avoided and being less bulky, they are easily handled and stored.

(2) As slides are individually mounted, the teacher has much more control over which visuals he wants to show and the order he wants to show them (in comparison to cine film and video tape programmes).

(3) The teacher has more scope to use his own ideas, to use slides that are particularly useful to class needs.

(4) These still projections allow the teacher to explain each slide thoroughly, concentrating on details or points which are usually missed by students when they view motion pictures. The teacher is able to set the rate at which information is translated to the class.

(5) Slides are more durable to wear and tear than film strips or video tapes since the film surface does not come into contact with parts of the projector mechanism or dirty cassette heads.
(6) When synchronised with a tape recorder, these slides can be used for self-paced learning (Mills, 1977, p.200). After the initial expense of the equipment, programmes can be produced at lower costs (Di Biaggio et al., 1970). Once programmes have been prepared they can be used by students for "catching up" and reinforcement purposes.

(c) **Cine film** - Some advantages are:

(1) It can bring a variety of exciting situations of the outside world into the class. The presence of motion adds a touch of reality.

(2) It can survey a broad field of study in a short time. It can bring together in proper juxtaposition, scenes and sequences that would require much time and effort if the class is to follow the route taken by the camera, for example, a "tour" of the various departments of a dental hospital.

(3) It can be used to reveal and explain movements vital to the proper understanding of many subjects through the use of slow motion and time-lapsed photography. Through "close-ups" or magnification techniques the attention of the class can be focussed on a small area of interest.

(4) All the tricks of emphasis known to film makers, notably animation, can be used to make vivid impressions on the class (Mills, 1977, p.179-180).

It should be noted that the above advantages can also be achieved through videotape programmes (discussed next section) to a greater or lesser extent. Some major shortcomings of the cine film are:
(1) There is no or limited opportunity for active class participation during the showing of a film. Unless pointed out to them, students tend to miss some of the finer points of the film. Misinterpretation of information is another setback.

(2) The teacher is unable to control the rate at which the class can learn. Commercially-produced films tend to be crammed with too much information and there is a serious danger of saturation and poor assimilation in factual films.

(3) It is very difficult to find films that can satisfy specific needs or requirements of classroom activities. Own preparation of programmes can be a costly and tedious affair.

(4) A film can impart only experiences through the eyes and ears and is therefore of limited value in teaching manual skills (Mills, 1977, p.180).

(d) *Video system* (consisting of the video tape player/recorder, videotape cassette and television) - Further advantages of the video system (apart from sharing the advantages of the cine system i.e. film reel and projector) include:

(1) The video tape player/recorder allows easier and quicker access to specific segments of a programme. This is attributed to its unique pushbutton operation with quick forward and reverse features as well as digital indicators (Lieberman, 1972).

(2) Instructional programmes can be made quickly and relatively inexpensively. Teachers can be involved in preparation of programmes, allowing better control of content materials.
(3) The video system is more adaptable for self-learning purposes, for example, a tape segment can be arranged to include verbal and visual descriptions, pertinent examples, stress on important points, and questions with an optional opportunity to permit the learner to think and provide answers. The sequence would be completed with correct answers, repeated restatement of important facts, or correction of incorrect responses.

(4) Compactness of the tape cassette allows easy handling and storage.

When contemplating on using the video system, consultation with institutions with whom instructional programmes are to be shared must be made to avoid purchase of incompatible equipment (e.g. type of cassette).

Consideration on using audiovisual aids in the training of dental assistants should be based upon evidence of need as it relates to programme objectives. Consultation with other similar institutions would also prove useful not only in determining need but also in acquiring such information as to what type of equipment would be useful and which can be done without. Advantages and disadvantages of proposed equipment should be fully investigated before actual purchase is undertaken.
3.3.3 Library Facility

A library is essential since its presence makes materials readily accessible. This enables staff to keep abreast with current developments in their areas of study. Interested students will find the library useful to supplement their knowledge.

However, despite such general advantages of having a library, one should not rush into setting up such a facility when planning the training of dental assistants. There are several factors which need to be considered.

Is there a real need for a library? This depends to a large extent on the objectives of a particular programme. If the objective is to provide as much education to students as possible, then such a facility may be warranted. But then again, a "resource centre" with several collections of selected items (books or articles) may be all that is required. On the other hand there may not be any necessity at all for a library or even a resource centre when training is only aimed at producing assistants capable of technical functions as required by the profession.

"Need" would also depend on the availability of other library facilities. Where another institution (such as a dental school) that can provide the necessary service is nearby, perhaps it would be unwise to waste valuable resources on a similar venture. This, however, may cause inconvenience to students but then again it depends on whether students are to be provided with the services of a library or not.
Will the presence of a library be beneficial at all? It would be useful to remember that even university students tend to be confused by the library. Considering that dental assisting students are of lesser mental capability, a library may not be such a good idea after all. Whether this is a significant factor or not will certainly depend on the moral conviction of a particular training centre as it aims to fulfil its obligations as an educational centre.

A library would also be "wasted" unless there is sufficient interest amongst staff to use it. This may be due to their general attitude or in the case where a major proportion of staff is on part-time basis, they may just not have the time for it (for example, a dentist may be busy at his practice when not called upon at the training centre).

What are the implications of having a library? Setting up a library is not simply a matter of acquiring books and other reference materials. Time would have to be spent in selecting what items to be purchased - what materials will be suitable for staff and if students are to be given access to the library, which articles or books would be most appropriate to minimise confusion. Furthermore, is there available space to accommodate it? Is there enough funds, first to set it up and then to maintain it? Having a small room may be fine in the initial stages but as the years go by, such accommodation may prove inadequate. Another room may have to be acquired or even a relocation may be necessary which would mean added expenses.
The work of the library does not consist solely in supplying books and other items requested by name. There are many "behind the scene" activities that needed to be done (e.g. ordering, catalogueing) to ensure the efficient running of the library. A librarian may be necessary which would then direct us back to whether such a person is available and if not, will it be feasible to hire one. May be someone can be assigned to look after the library but whether this is in the best interest of the library or not remains to be seen.

The decision to establish a library would require careful investigation even though on the surface it may have seemed such a good idea. Any decision should be based upon need and recognition of both the good and bad points of having such a facility. Consultation with other similar institutions would be useful in gaining information such as service utilisation by students, staff opinion and student attitude. Every endeavour should be undertaken to ensure that there is sound justification for having such a facility. Perhaps a library as such may not be necessary after all - one or two shelves in the staff or student common room or both may be adequate and just as useful.
3.4 TEACHING STAFF IN A DENTAL ASSISTANT TRAINING PROGRAMME

The success of a training programme cannot be achieved through proper planning alone. Students do not learn from objectives or curricula, students learn from teachers and teachers play an important role to the success of a training programme.

3.4.1 Composition of Teaching Staff

(a) Dentist - A dentist would have the necessary background and awareness of the needs of his profession, for example, what the acceptable level of competency is, what the requirements of dental assisting are.

The dentist on full-time staff would be mostly involved in the giving of lectures. Depending on the specific functions to be taught in the curriculum, he may be called upon for supervision or be actually involved in the teaching process (for example, practical sessions in chairside assisting procedures). Dentists may also be employed on part-time basis in which instance they will be mostly involved in the giving of lectures.

(b) Senior dental assistants - The employment of assistants for teaching purposes is desirable as students usually find it easier to relate to someone who they can identify with (Shepro, 1964). On top of this, being assistants themselves, they are more sensitive to the problems and needs of students.
Dental assistants on staff will be mostly utilised as clinical tutors. Assistants may also be called upon on part-time basis to assist in clinical supervision.

(c) Dental technician - He may or may not be necessary depending upon the nature and extent of laboratory skills to be taught.

(d) Non-dental teaching staff - This may be required where the curriculum involves allied non-dental subjects such as bookkeeping, secretarial skills and psychology. Depending on the extent of each subject, this criteria of teaching staff may not necessarily be on either full or part-time basis - they may be called upon as guest lecturers or teachers.

3.4.2 Number of Teaching Staff

Generally the number of staff (both part-time and permanent) to be utilised would depend on the nature of the curriculum, the number of students and the amount of money available.

The ratio of staff to student in dental assisting aspects of the curriculum should provide for appropriate instruction and evaluation. During practical sessions the number of staff should be adequate to provide for close supervision, allowing for more personalised instruction. This would mean that a practically orientated course will require the service of more teachers than the one with high theoretical component. When off-campus facilities are used for providing clinical practice and experience,
the number of staff should be adequate to permit an instructor to visit each facility on a regular basis to observe and evaluate student progress (American Dental Association, Council on Dental Education, 1974). The number of teachers required would also depend on the nature and extent of specialised subjects to be taught, for example, a dental technician may not be required when it is considered that the dentist or senior dental assistant is competent enough to teach laboratory techniques commensurate with programme objectives.

The amount of money available would also influence the number and type of teaching staff. As employing dentists is more expensive than dental assistants, their (dentists) use should be kept to a minimum without jeopardising course objectives. In most instances however, one or two dentists may be required on the permanent staff to act as course coordinator(s). When other dentists are required, they can be employed on part-time basis, being paid on hourly rates, for example.

3.4.3 Desirable Qualities

Dental assisting staff members (part-time and permanent) should have background in and current knowledge of dental assisting and specific subjects they are teaching.

Teachers who are involved in clinical instruction should have knowledge of current concepts of dental assistant utilisation and clinical instruction and evaluation. Dental assistants on staff should have recognised competence in assisting procedures and practical experience as an assistant.
It is also desirable that staff to be appointed (both part-time and permanent) have some teaching background or at least recognised teaching inclinations. There is a great difference between a series of talk on dentistry and a planned and effective instructional session.

Wherever possible, the dentist on permanent staff (who is also usually the course coordinator) should be a formally qualified teacher. This is to ensure that more effective teaching activities are incorporated in the conduct of the training programme.

Other personal qualities such as dedication, honesty, responsibility and understanding should also be considered in the selection of teaching staff.

3.5 **STUDENT SELECTION**

Several factors are associated with the selection of students for a dental assistant training programme. This section deals with some of these factors - number of students, age, academic qualifications, personal qualities and methods of selection.

3.5.1 **Number of Students (per intake)**

The number of students that can be accepted is dependent upon such constraining factors as:
(a) **Training facility** - The ability of a training programme to carry out its tasks effectively will depend on the capacity and availability of its teaching facility - limited space and equipment will impose restrictions on the number of students that can be trained effectively.

(b) **Staff** - The number of available teaching staff will also affect to a certain extent the number of students that can be accepted.

(c) **Budget** - Inadequate money to support the running of a programme may necessitate reduction in the number of students per intake.

(d) **Need for trained assistants** - Generally more students will have to be trained when there is a greater need. The actual number will depend on training capability of a particular programme.

3.5.2 **Age of Students**

Specifying age requirements may be necessary when it is intended to limit the number of eligible candidates.

The minimum age of eligibility is usually associated with the number of school years required to provide students with the minimal educational background that is considered necessary for them to comprehend the intended teaching materials.

Both the American Dental Association (American Dental Association, Council on Dental Education, 1974) and the United States Public Health Service and United States Office of Education (United
States Office of Education and United States Public Health Service, 1965) recommended that potential candidates should have finished or completed high school at the diploma or equivalent standard. The Australian Dental Association (Australian Dental Association, Dental Auxiliaries Committee, 1977) recommended that intending dental assisting students should have completed a minimum of three years of secondary education. In Malaysia, applicants are required to have completed three years of secondary education (Ministry of Health Malaysia, 1981, p.6).

It is apparent that, depending on the age at which schooling starts, potential dental assisting students should be between the ages of 16 and 18.

Whether there is a maximum age limit or not and if there is, what that age will be, would depend on such factors as policies of respective organisations and government bodies (for example, university education for all, irrespective of age; Ministry of Health Malaysia candidates must not exceed the age of 25. This is because of the consideration on remaining service years) and the purpose of a particular training programme (for example, a part-time theoretical and technique supplementary course need not have an age limit; as in the case of Dr Martin Luther King's training programme where it is intended to provide job opportunities for an economically deprived community, the age limit is extended to 55 years - see 2.2).
3.5.3 Academic Qualifications

The level of academic qualifications required of candidates will depend on the structure and content of the curriculum of particular programmes. A programme that incorporates significant amount of scientific principles and background knowledge would necessarily require that its students have the necessary foundation to support them through the course. On the other hand, where teaching is limited to that of basic skills and knowledge (e.g. task-based curriculum) a high academic qualification is not required.

The relative importance placed on academic qualifications would also vary on individual institution. This situation is seen at Eastman Dental Hospital (Blake, 1966; see also 2.2) where it was considered that academic attainment is not as important as practical ability, interest and dedication.

However, students to be selected should possess some academic background to ensure that they are capable of comprehending at least the basic theories and principles of dental assisting. The actual extent of academic qualification will be determined by the academic standard of particular programmes.

3.5.3.1 Some recommended academic requirements

These are presented to provide some guidelines when deciding on academic requirements for entrance into a dental assistant training programme. Again it is stressed that the final decision on what academic qualifications intending students should have would depend on the structure and content of the curriculum of particular programmes as specified by its objectives.
Both the American Dental Association (American Dental Association, Council on Dental Education, 1974) and the United States Public Health Service and United States Office of Education (U.S. Office of Education and U.S.P.H.S., 1965) recommended that candidates for dental assistant training programmes should have finished or completed high school at the diploma or equivalent standard.

The Australian Dental Association (Australian Dental Association, Dental Auxiliaries Committee, 1977) recommended that intending students should have completed a minimum of three years secondary education.

In Malaysia, the Ministry of Health specifies that applicants to its dental assistant training programme in Penang must possess the Lower Certificate of Education or its equivalent, i.e. passed the National Examination held after three years of secondary education (Ministry of Health Malaysia, 1981, p.6).

3.5.4 **Personal Qualities**

Dental assisting is a vocation that requires a very special type of person, as the work is complex and demanding. As an assistant she would be expected not only to assist the dentist at his work but also to deal effectively with patients, to be involved in creating and maintaining a harmonious dentist-patient relationship. Apart from good general intelligence, she should also possess the following qualities:
(a) **Aptitude** - unless there is a desire to learn on the part of the students, training will only be a wasteful exercise (Mills, 1977, p.xii).

(b) **Personality** - She should have a pleasant personality so that patients feel welcomed and comfortable. In addition she should be good tempered, patient, well-composed and disciplined. Because of the position she holds between patient and dentist, the assistant's ability to cope with the worries of the patient will be of utmost importance for the successful running of the dental practice (Grant and Harcourt, 1977, p.2-3).

(c) **Appearance** - being a member of a health profession, it is essential that the assistant displays personal cleanliness and smartness at all times (Grant and Harcourt, 1977, p.2-3).

(d) **Conversational ability** - Where possible this should be above average but not a chatter box. The dental assistant should be able to converse confidently and intelligently with people of all standing. This is invaluable not only in projecting the profession's image but also in psychological preparation of patients (Grant and Harcourt, 1977, p.2-3).

(e) **Adaptability** - This quality is desirable to ensure that graduates will be able to adapt herself to varying types of work in the dental practice and the varying situations that will be encountered in her working life (Grant and Harcourt, 1977, p.2-3).

(f) **Dependability and initiative** - this would greatly affect the efficiency and general well-being of her employer's practice.
(g) Manual dexterity - students to be selected should not display any clumsiness (Sciaky, 1969).

3.5.5 Method of Selection

Methods of selecting suitable candidates will depend on what criteria is being sought. Some of the commonly used methods are:

(a) Examination of candidate's past performance records - past school records are useful in ascertaining her academic background and some general character and personality. References from former employers are also useful in gaining information on the candidates. Examination results is only useful in determining candidate's academic eligibility.

(b) Interviews - this is useful for gaining further insight into candidate's background. A lot of personal qualities can be assessed by having an interview session.

(c) Written tests - can be conducted for assessing candidate's aptitude, degree of intelligence and ability to write correct and proper language.
3.6 EVALUATION OF TRAINING PROGRAMME

Evaluation is an integral part of all components of a programme. It enables comparison of actual outcomes with expected outcomes or objectives (Wheeler, 1974, p.267) to be made.

Evaluation is a vital process because without some quantitative or qualitative comparisons of actual and expected outcomes, it is impossible to know whether objectives have been realised and if they have been, to what extent. A good evaluation system is important because it can be used to help improve programmes.

With regards to dental assistant training programme, evaluation is essential to determine the extent to which programme objectives are achieved and also the effectiveness of the programme (whether it had served the purpose for which it was established) so that, where necessary, remedial actions can be taken to ensure success of these objectives and increase programme effectiveness. Evaluation would also require identification of "problem areas".

3.6.1 Determining Extent to which Programme Objectives are met

This can be achieved in several manners, some of which are:

(a) observations – a person or group of persons can be assigned to observe students at work, to assess their competency and to identify their deficiencies. Teacher observations can also be used for this purpose.
(b) assessments - results of clinical assessments and theoretical examinations can be used to determine success of a particular programme to reach its objectives.

(c) questionnaires - information can be obtained from staff and students with regards to the conduct of the course, which areas/subjects require more attention and how the programme can be improved.

(d) verbal feedback.

In seeking information regarding extend to which objectives are met, it is also essential that provisions be made for identifying the causes for which objectives are not met. With this information, remedial actions can be taken to ensure greater success.

3.6.2 Determining Effectiveness of Training Programme (whether it had successfully served its purpose(s))

Information gained in this aspect would determine whether a particular programme is being conducted in the right direction or not. Depending upon feedbacks, structure of curriculum or even objectives would have to be redesigned or modified.

Some of the ways in which information can be sought are:

(a) feedback from employer - this can be verbal or preferably, through questionnaires. Information sought should include employers' general view on performance of graduates as well as their (graduates') strengths and weaknesses at work.
(b) Feedback from graduates - information gathered should include such items as number of positions held since graduation, duties and responsibilities in the dental office, place of present employment and relevance of amount and content of course material in its application to their working life. This information is useful in estimating the value of the programme as it relates to job success.

(c) Success of students in national examinations (e.g. Australian Dental Assistant Association Proficiency Examination) can also be used as a criterion to evaluate programme success especially when objectives of the programme compare with that of the body conducting the examination.

3.7 SUMMARY

Definition of programme objectives must be based on identification of the various local factors that the programme is supposed to serve. Recommended objectives are only useful in providing guidelines as to what a dental assistant training programme should aim to achieve.

When objectives have been defined, curriculum duration would then have to be decided upon. This should not be based on some arbitrary time but rather the length of time required to achieve the set objectives.

Basic training facilities are required if efficient training is to be ensured. However, the extent and type of facility that are required and can be provided for will depend on such factors as objective of the training programme and the availability of space.
The decision to utilise audiovisual media should be based on consideration of whether there is a real need for them or not — whether they will actually enhance the teaching process. The type and model that is to be acquired will depend on the functions that these media are to perform. Knowledge of the advantages and disadvantages of particular media would be helpful in the decision-making process.

Consideration on setting up a library should be based on evidence of need as well as recognition of the advantages and disadvantages of having such a facility.

Success of a training programme (extent to which objectives are attained) will depend greatly on the teaching staff. The composition and number of teaching staff would depend on such factors as objective of the training programme, number of students under training and the amount of money available.

Selection of students would require consideration of such factors as number of candidates to be accepted, age of students, academic qualifications and desirable personal qualities. These factors would in turn be influenced by the objective of the training programme, extent of available training facility, structure and content of curriculum and what qualities are desirable in dental assistants.

Evaluation of a dental assistant training programme would involve determination of its success at attaining its objectives and whether it had served its purposes or not. Depending on the
information received/gathered in this evaluation process, necessary actions may be taken to improve its achievements and increase its effectiveness (in fulfilling its purpose of being established).
4. CURRICULUM

In the last chapter we have discussed some of the factors to be considered in the planning of a dental assistant training programme as they relate to what are required to ensure that the programme is able to fulfil its purpose(s) (formulation of programme objectives, training facility, staff, length of training programme, etc.). This chapter deals with the training curriculum at classroom level. It is important that classroom activities be so coordinated that they are funnelled towards the achievement of general programme objectives. In this respect, this chapter deals with:

(a) instructional objectives,
(b) design of curriculum,
(c) curriculum content – subjects,
(d) student evaluation.

4.1 OBJECTIVES OF TRAINING/INSTRUCTIONAL OBJECTIVES

A recapitulation of the broad objective of a dental assistant training programme is necessary to put this chapter into perspective to what had been said in the last chapter.

It had been stated that the general objective of an assistant training programme would include the content and learning experiences required to prepare the student to function effectively as an integral member of the dental health team and perform chairside
assisting and related office and laboratory procedures under the
direction and supervision of the dentist (American Dental Association,
Council on Dental Education, 1974; Australian Dental Association,
Dental Auxiliaries Committee, 1977).

Before formulation of classroom activities of a particular
programme is undertaken, it is important that the exact extent of
the above objective be determined (what is meant by "the content
and learning experiences required for effective functioning" - in
local terms). If not already performed, a job analysis of what
assistants are expected to know and be able to do must be performed
at this stage. Only then can teaching and training activities be
orientated towards identified local requirements of dental assisting.

How would one assure that classroom activities are directed
towards identified requirements? As a first step, general
instructional objectives must be defined. Because dental assisting
is a practically-orientated vocation involving manual skills, it is
essential that instructional objectives be defined in behavioural
terms. This would ensure that upon graduation students would have
the necessary ability and competence to perform their duties safely
(important from the patient's and dentist's points of views) and
efficiently (important to the dentist).

The general instructional objectives are then broken down
into specific instructional objectives to which classroom activities
are to achieve. A diagrammatic presentation is shown in Figure 2
as an illustration of how a general objective of "to provide knowledge
and skill in dental assisting" should be worked down to specific
FIGURE 2

Example of a method of specifying instructional objectives for a dental assistant training programme

To provide skill and knowledge in dental assisting

Clinical assisting  Laboratory assisting  Office assisting

Example of instructional/training (general) objective:
Student to be able to perform clinical assisting duties effectively.

chairside assisting preparation of radiographs general supportive e.g. fetching of materials and sterilisation of instruments.

Example of specific instructional/training objective:
Student must acquire a high degree of competence and efficiency at the chairside.

Skill

Example of specific lesson objective:
Student must be able to assist in 4-handed dentistry technique
- student must be able to hand the dentist the correct instruments for respective stages of a procedure.
- student must be able to keep the operating area clear without hindering the dentist.

Knowledge

Example of specific lesson objective:
Student must know the instruments used in conjunction with 4-handed dentistry
- student to identify, by technical names, the instruments used.
- student to be able to write down the stages in class II amalgam restoration and the name the respective instruments used in each stage.
classroom teachings in chairside assisting skills and knowledge. The same procedure should be followed through for all the other aspects of dental assisting until all the "skills" and "knowledge" to be incorporated in the training programme are listed down. Hence it can be seen that by careful definition of objectives, control of classroom activities can be instituted towards the achievement of firstly, general instructional objectives and then the general programme objectives.

Knowing exactly what is to be achieved would then provide a sound basis upon which the curriculum can be designed so that its various training activities can be directed towards the realisation of its objectives. The type of subjects to be taught and the extent to which these subjects are to be taught can also be decided upon.

As with evaluation of the training programme as a whole (see 3.6), evaluation of classroom activities is essential to provide evidence regarding the nature, the direction and the extent to which instructional objectives are achieved. Depending on what evidence is received, curriculum activities may or may not be modified or changed to ensure better success.

However, effective evaluation cannot be assured unless instructional objectives are so defined that they identify the level of performance that would be accepted as evidence that the student has achieved the objective (Mager, 1962). As an example, objectives of an instructional unit in forcep identification would read:
(a) students must be able to identify correctly by name, at least 13 out of 15 extraction forceps presented to them.

(b) under the same condition as above, students must be able to also identify whether the forceps are for the upper or lower dentition and for which tooth/teeth they are designed for. It is evident that unless 13 out of 15 forceps are identified correctly, the objectives of forcep identification have not been attained. An investigation can then be undertaken to identify the cause or causes of this failure so that performance can be improved.

To ensure success of a dental assistant training programme its classroom activities must be coordinated and streamlined towards instructional/curriculum objectives which in turn relate directly to general programme objectives. Coordination and streamlining can be more effectively accomplished when the instructional objectives are defined in behavioural terms and be so specified that control of classroom activities is manifested. To this end, the statement of objectives for an entire programme would consist of several specific objectives covering each class of skill and knowledge that the student is required to acquire. To enhance evaluation of the effectiveness of teaching and learning processes, statements of objectives should also specify the conditions which are considered acceptable evidence of success.
4.2 CURRICULUM DESIGN

The design of a dental assistant training curriculum would depend on such influencing factors as objectives of training and the extent of available training facilities as well as recognition of the basic principles underlying the learning process.

4.2.1 Influencing Factors

4.2.1.1 Objectives of training

The design of a training curriculum must ensure that the various training activities would culminate in the achievement of its objectives.

(a) Theoretical and practical components - The proportion of instruction hours to be devoted to theoretical teachings and practical exercises is dependent on the degree to which background knowledge and practical ability is emphasised as defined by the objectives.

A programme that places greater emphasis on equipping students with assisting skills would necessarily have its curriculum designed such that more instructional hours are spend on practical training than on classroom teachings. In the same manner, a programme that aims to provide students with a comprehensive knowledge of dental assisting as well as other related knowledge that would be helpful in their careers would have to design its curriculum such that ample time is allotted for instructions in these areas.
(b) **Subjects** - The type and extent of subjects to be taught in the curriculum would also be influenced by what is required so that achievement of objectives is assured.

A programme that aims to provide career mobility and advancement would necessarily be broadly based and extensive enough to ensure that students have the necessary foundation to further their education and careers.

Teachings in basic sciences may be limited or not be necessary at all in a programme that serves to prepare students with practical abilities for employment purposes. On the other hand, instructions in this area would be highly desirable and necessarily more extensive where a programme wants it students to understand the scientific basis of their assisting activities.

A course in office assisting procedures would have to be incorporated in the curriculum if an objective of training is to provide graduates capable of office assisting duties. Depending on the extent of this objective, instructions may be limited to an overview of office assisting or involve greater details of specific procedures. By the same token, teachings in chairside assisting procedures would be emphasised when students are expected to be highly proficient in this aspect of dental assisting.
4.2.1.2 Availability of training facilities

This would affect the design of the curriculum mainly in the area where experience in clinical assisting is to be provided in the curriculum but cannot be made available at the premises. Where use of affiliated institutions such as dental hospitals, dental clinics, dental schools and private dental offices is contemplated, it is important that the curriculum be so designed that it fits into the activities and commitments of these institutions without causing major disruptions to both the teaching and learning processes. The design of the training curriculum should ensure that student activities in these institutions can be closely monitored and coordinated towards the achievement of programme objectives.

4.2.2 Learning Principles and Design of Curriculum

Any training endeavour would be considered a failure unless students are able to learn from what is being taught, be able to relate this knowledge to their working activities and demonstrate the desired results as outlined by the objectives of training.

To ensure success (achievement of objectives) of a dental assistant training programme it is important that design of its curriculum takes into account the basic principles underlying the learning process.

Some principles of learning that would be useful in the training of dental assistants are:
(a) *motivation:* this is a major factor that stimulates the desire to learn, to be interested in what is being taught. A motivated student attends, assimilates, remembers and stores what has been taught, ready for use (Mills, 1977, p.xii).

(b) *meaningfulness:* this is an important factor if student's learning processes are to be enhanced. Unless there is meaningfulness in what is being taught, students will not only lose interest but also be more likely to forget and be less appreciative of whatever materials had been taught.

(c) *reinforcement:* this refers to an event that strengthens learning. Through reinforcements, students assimilate and remember better as well as appreciate the importance of materials presented.

(d) *transfer:* transfer of learning is the essence of education (Durocher, Mackenzie and Wintner, 1970). It is the process of taking learning from the classroom and using it in working life. Unless there is "transfer", a training programme such as that for dental assistant, could hardly be called a success.

How would one assure incorporation of the above principles of learning into the design of the curriculum so that learning can be ensured? Some of the ways in which this can be achieved are:

(a) *Integration* - This would promote meaningfulness and reinforcement of the various curriculum activities as well as facilitate the transfer of knowledge from the classroom to clinical practice.
Hence there is a basic need for the integration of the elements of the curriculum rather than treating them as isolated units. This approach is commendable because when materials are presented side by side, the similarities and relationship of the materials are not only more readily apparent but would also reinforce the importance of one another. When meaningfulness and reinforcement are established, transfer can be better affected.

The importance of integration is further emphasised when it is recognised that the practice of dental assisting is an integrated function whereby integration of knowledge within the assistant's mind and in her actions are extremely important. Without correlating mechanisms designed into the curriculum, this integration becomes significantly lessened.

(b) Identification of objectives - Students learn best when they know what they are supposed to learn and why the item being taught is important to their future success. Educationists agree that one predisposing factor for motivation is a knowledge of objectives and an acceptance of the relevancy of learning experiences (Durocher, Mackenzie and Wintner, 1970). Therefore, to ensure motivation and recognition of the relevancy of learning experiences to future success it is important that the curriculum identifies for the students the objectives of their training activities.

Identification of objectives would also help students recognise meaningfulness in what is being learned. Once students identify what they are to achieve, the relationship of their various activities and training objectives would become apparent.
(c) Proper sequencing of curriculum activities - The organisation of learning experiences plays an important role in facilitating learning.

Systematic sequencing of curriculum activities would ensure that teaching materials and activities are made meaningful to one another as well as to the objectives of the entire course.

When curriculum activities are presented in a logical and meaningful manner, associations are reinforced. Students will learn better and remember better.

Proper sequencing of theoretical and practical learning experiences would also ensure transfer of classroom knowledge to its practical applications. It had been suggested (Durocher, Mackenzie and Wintner, 1970) that transfer can be further facilitated by providing opportunity to practice skills as soon possible after they have been learned.
4.3 CURRICULUM CONTENT - SUBJECTS

Both the type and extent of subjects to be taught in a dental assistant training curriculum would depend on the general programme objectives and their respective instructional objectives.

For the purpose of this thesis the following areas of study are identified:

(a) general studies,
(b) basic biomedical sciences,
(c) dental sciences, and
(d) dental assisting.

The following description of curriculum content is not intended to be an exhaustive listing of subjects and of what degree of skill and knowledge each subject is supposed to impart. It is presented as a guideline to what is considered should be included in the curriculum content. Subjects identified under particular areas of study are not exclusive to their respective categories (for example, communication technique need not necessarily be exclusive to general studies but rather it may form part of the study in dental assisting). Integration is necessary and should be utilised to facilitate the transfer and association not only of theoretical knowledge to practical application but also between one subject to another.
4.3.1 General Studies

Subjects in this area are mostly related to the development of those knowledge and skills that would complement the dental assistants' activities in their working lives. As such the inclusion of these subjects is not mandatory but would provide added advantage to the students.

(a) Communication techniques - This may include lessons in speech and public speaking techniques, telephone conversation technique and letter writing technique. The ability to speak fluently and confidently is not only useful in every day conversation with patients but would be an added advantage when dental assistants are expected to participate in individual and group dental health education. Ability to converse properly on the telephone is essential as more often than not a practice is judged by "the person on the other end" when telephone enquiries are made. The ability to write letters properly is particularly useful when assistants are required to deal with office correspondence.

(b) Psychology - Incorporation of this subject in the curriculum is desirable so that students can better understand why patients act in their own peculiar ways. Understanding of the psychologies of these behaviours would then enable students to deal more effectively with patients - in reducing their anxieties and making them feel more comfortable and at ease, especially prior to dental treatments.

(c) Typewriting - Even though dental assistants are not expected to be expert typists, knowledge in this area would be a useful asset.
(d) *Interior decoration* - Even though knowledge of a commercial interior decorator should not be aimed at, knowledge on the fundamentals of the use of colour, arrangement of seating in the reception and selection of reading materials for the waiting room would prove useful in transforming the dental office into a more pleasant and appealing working area.

Inclusion of this category as such (general studies) may not be necessary when, due to its objectives, a programme only aims to teach those skills and knowledge directly related to dental assisting. However, one or two lessons on the above subjects conducted either as part of general introduction to dental assisting or in conjunction with teachings in the other areas of the curriculum (for example, office assisting, clinical assisting) would prove useful if graduates are to be really effective in their work.

4.3.2 *Basic Biomedical Sciences*

Subjects in this category should be included in the curriculum to provide background for instructions in dental sciences and dental assisting. It would, however, be useful to remember that knowledge in biomedical sciences is not really essential as far as technical ability of assistants to perform their duties and functions is concerned. Hence where a major objective of a training programme is to impart skills in dental assisting, teachings in this area can be minimised or even excluded, depending on how much background in this area of study is considered adequate to assist students in their training to become dental assistants. On the other hand, a
programme that aims to provide career mobility and advancement would find these subjects highly desirable or even essential as foundations upon which an assistant's future career can be built on. Nevertheless, whenever possible every effort should be made to include these subjects in the curriculum as they would certainly help students to better understand what they will be doing as well as enhancing better comprehension of what will be taught in dental science and dental assisting subjects.

In the Armed Services where knowledge in paramedical science is essential (these assistants may be called upon to help their medical counterparts in wartime crises) it is important that subjects in biomedical science are included in the curriculum to enhance comprehension of or reinforce (when paramedical studies has been done elsewhere) instructions in paramedical subjects.

Subjects that can be included in this category are:

(a) **General anatomy and physiology** - Basic knowledge of general anatomy and physiology would allow students to develop a better perspective of the relationship between the oral cavity and the rest of the human body systems. It would also help students understand the workings of the various systems and how these functions contribute to general well-being and ill health.

(b) **General pathology** - Some knowledge of the basic principles of pathology (causes, mechanisms and effects of diseases and inflammation) is essential in providing background for better understanding of the pathology of oral and dental conditions. Knowledge of pathology
would also enable students to better understand the reasons for the various procedures in dentistry especially the importance of maintaining sterility and preventing contamination.

(c) **Microbiology** - Knowing the characteristics of microorganisms (for example, how they are transmitted, how they protect themselves and how they affect diseases) would enhance understanding of the reasons behind the various sterilisation techniques and why such stress is placed on preventing contamination. This subject would complement the studies in pathology and vice versa.

(d) **Diet and nutrition** - The relationship between diet and nutrition to general well being and in particular oral health should be stressed. This subject would provide background in the relationship between diet and dental caries and periodontal disease.

This subject should form an important component of a training programme that prepares dental assistants who will be involved in dental health education work.

(e) **Paramedical instruction** - This is of especial importance to assistants in the Armed Services because of their added function during wartime. Subjects can include basic medical first aid (for example, resuscitation, wound cleaning, dressings and bandages) and basic nursing (for example, administration of injections, insertion of IV tubes and recognition of signs and symptoms of deteriorating life).
4.3.3 Dental Sciences

This forms the basis of theoretical studies in dental assistant training programmes. Subjects in this area would complement the practical aspects of the curriculum. Variations would occur but these are mostly related to the extent and depth of materials to be covered in each subject, depending on the respective objectives of training programmes.

(a) Oral anatomy and physiology - Knowledge in this area of study will enable the student to understand how the various structures in the oral cavity function to affect dental, oral and general health. This subject would also facilitate understanding of the mechanism of spread of infection.

(b) Dental anatomy and physiology - Knowledge of dental anatomy and physiology is essential if dental assistants are to fully understand and appreciate the various procedures in dentistry, the rationale behind these procedures as well as recognise the parts they (assistants) are to play in these procedures.

(c) Oral pathology - As dentistry is not only concerned with the care of teeth and periodontium, it is only appropriate that assistants have a basic working knowledge of this subject to recognise common oral conditions in health or otherwise and appreciate the factors which gave rise to these conditions.

(d) Dental pathology - Knowledge of dental pathology as it relates to the processes of dental caries and periodontal disease is highly essential if dental assistants are to fully appreciate the
responsibility of her profession, the various procedures in dentistry and to recognise her role in the profession. This subject and oral pathology will also enable her to understand why such stress is placed upon aseptic routines and procedures.

4.3.4 Dental Assisting

This involves the teaching of practically-orientated subjects that are directly related to the practice of dental assisting. Variations in actual subject content would occur depending on the roles and functions and extent to which dental assistants are required to perform these functions and roles. For example, office assisting capabilities may not be required at all or may be limited to patient reception and discharge, and ability to take intraoral radiographs may not be required apart from the ability to process exposed films.

(a) Four-handed chairside assisting - Theoretical aspects of this subject should aim to provide the students with the principles of four-handed dentistry and how proper execution of this technique of assisting can help increase productivity as well as reduce fatigue to the dentist and herself.

Practical aspects of this subject should concentrate on the proper development of four-handed assisting technique - how to keep the operating field clear without hindering dental operations, how to coordinate their activities with that of the dentist by recognising and anticipating his needs.
(b) *Instruments* - Recognition of instruments and their particular use in dental operations are important prerequisites for efficient assisting. A general instructional objective would be that students be able to recognize the various types of dental instruments in dentistry, identify their uses and know their maintenance.

(c) *Dental materials* - Knowledge of properties of dental materials would provide the student with an understanding of the relationship between material properties and how they are manipulated. Students would then be able to recognize the importance of proper proportioning and correct mixing techniques to produce the desirable properties out of these materials.

Practical aspects of this subject should aim to provide students with the skills and techniques of manipulating dental materials so that maximum beneficial properties can be derived out of these materials (for example, recognition of correct consistencies).

(d) *Dental terminology* - Knowing correct dental terminologies will not only help general communication but also facilitate dental charting process.

(e) *Charting* - This is an essential part of dental practice as it provides a record to which future references can be made. To ensure that charting is effectively and correctly done, students should be familiarised with commonly-used charting systems, dental terminologies (unless already taught as a separate subject) and the various designations for fillings, dressings, extraction.
Practical aspects of this subject should aim to develop correct and accurate charting skills.

(f) Specialities of dentistry - Instructions on the various aspects of dentistry (example, endodontics, periodontics, crown and bridge, oral surgery, etc.) would provide a general overview of the scope of practice in dentistry. Not only will the assistants be made known of her possible areas of interest (that can be pursued in her later career) but will also make her aware of the special requirements of the various fields of speciality (for example, instrumentation for orthodontics, endodontics, etc.) and her role in these fields.

(g) Sterilisation and disinfection - Sterilisation and disinfection of instruments are the most responsible aspects of the work of the dental assistant. Unless sterilisation is properly carried out, there is a grave risk of spread of infection.

Theoretical instruction in this subject should emphasise the relationship between microorganisms and infection and how effective sterilisation and disinfection can greatly reduce the risk of spread of infection. The importance of maintaining sterility and prevention of contamination must be stressed.

To ensure that effective sterilisation is performed, students should be familiarised with the types and uses of various sterilising equipment and disinfection agents as well as recognise their limitations.

Practical aspects of this subject should concentrate on the procedures and techniques of sterilisation and disinfection.
(h) Laboratory procedures - Unless already incorporated in dental materials, theoretical aspects of this subject should provide students with necessary background knowledge to recognise the importance of proper manipulation of laboratory materials (plaster, stone, cold cure acrylic) and success of prosthetic treatment.

Practical teachings should aim to develop skills in assistants that would enable them to assist the dentist in the fabrication of good prosthetic appliances.

(i) Dental radiography - The use of x-rays as a diagnostic aid has greatly increased in the past decade or so. Lessons in radiography would provide students with an understanding of the general principles of radiography, the rationale behind its use, the importance of producing good radiographs and the dangers of x-rays and the necessary precautionary measures.

Theoretical instructions should include reasons for taking radiographs and the various factors that affect the production of good radiographic images.

Practical aspects of the subject should aim to develop competence in students to take (when this is required) and process radiographs as well as recognise maintenance requirements of processing solutions.

(j) Drugs in dentistry - Because of her nature of work, dental assistants have easy access to the various drugs and medicaments used in dentistry. It is therefore important that assistants have a working knowledge of the use of these drugs and medicaments - their actions, side effects, toxic effects and dangerous interactions with other
commonly-used drugs. Students should be made aware of the laws governing dispensing and use of drugs and the dangers of drug abuse. It should be stressed that as dental assistants, they are not permitted by law to dispense any dangerous drugs (or any drugs as prescribed by local law) without consent from the dentist.

(k) First aid—Knowledge of first aid procedures is important not only because the assistant is a member of the health profession but also unexpected dramas are not uncommon in dental offices. Even though assistants may not be called upon to play the main role (unless when the dentist is not available) in life-saving emergency situations, valuable seconds can be saved and used effectively when they (assistants) are knowledgeable of the procedures involved.

Instructions should familiarise students with methods of resuscitation and use of first aid kits.

(1) Office assisting - As dental assistants may be called upon to do some office assisting duties it is essential that they be knowledgeable of the more common office procedures.

Instructions in this subject should include operation of recall system, scheduling of appointments, patient charging, filing and correspondence techniques. Knowledge in handling insurance (dental) claims would also be useful.

(m) Dental ethics and jurisprudence - Students should be made aware of what standard of conduct and behaviour is expected of them from their colleagues and the dental profession as a whole. They should
also be made aware of her legal responsibility to the dentist and patients.

(n) Dental health education - Teachings in this subject should be included in the curriculum especially when dental assistants are expected to be involved in this area of dentistry. Even though when dental assistants may not be called upon to give talks on dental health, knowledge in this area would prove useful when it is considered that at one stage or another, assistants will have to give some "advice" to patients.

Instructions in this subject can include the essentials of preventive dentistry, psychology, material preparations (e.g. posters) and speech techniques.

4.4 STUDENT ASSESSMENT

This is an essential component of the curriculum since it would provide the evidence of whether students have indeed learned from the training activities, of whether the training process had in fact been effective in achieving its objectives.

Assessment of student assistants should be done in two areas - practical and theoretical. Practical assessments would provide information whether adequate skill had been attained whilst the theoretical component allows assessment of the extent to which students have understood the reasons behind their practical activities.
4.4.1 Practical Assessment

Evaluation of student's practical ability should be based on measurements against accepted standards rather than against performance of other students. Students must be able to demonstrate acceptable levels of competency if they are to be of any value to their future employers and at the same time not pose as potential hazards to patients.

To facilitate practical assessments, "progress cards" can be used in which every procedure or stages of a procedure are checked and marked against established standards. This ensures close control of practical activities and identification of weaknesses in the teaching and learning processes (for example, in the preparation of kalzinol base a student fails to produce a mix of the required consistency. When every stage of this procedure is assessed it would be easy to identify the cause or causes of such failure which can be due to inadequate instruction, student's own ignorance or faulty materials).

To ensure reliability of assessment results and uniformity of assessment process, it is essential that clinical tutors and examiners be orientated and made aware of the objectives of training and what are the accepted levels of proficiency and competency.

Practical assessments should also be done on a continuous basis rather than limiting the assessment to an end of training examination (i.e. every day assessments instead of one final assessment at the end of the course). This not only ensures that the evidence received is more reliable and realistic but also
enables close monitoring of student progress. Instructors would be better able to pick up student's specific areas of weaknesses and is therefore in a better position to help improve her performance. From the learning point of view, continuous practical assessment would also be desirable since it provides students with the knowledge of how they are faring with their efforts. This gives them the opportunity to improve their performance when they are not up to standards.

4.4.2 Theoretical Assessment

Assessment of knowledge pertaining to the practice of dental assisting can be performed in one of several ways. Depending on what is to be assessed, one of the following types of examination can be used. In most instances, a combination would be necessary in order to provide the range of evidence necessary to evaluate their comprehension of materials taught in the curriculum.

4.4.2.1 Written examinations

Two basic types of questions that can be utilised in written examinations are the supply type and selection type (Marshall and Hales, 1972, p.23,36,45,68).

(a) Supply type - In contrast to the selection type of questions where students select answers from given alternatives, this type of questions requires students to write down their responses either in the form of an essay or correct words and phrases.
(1) **Essay questions** - this is especially useful in assessing students' higher mental processes such as application and organisation of materials. An advantage of using this type of question is that it presents an opportunity of assessing students' ability to write correct and proper language. A major setback is the difficulty in assuring objectivity when responses are scored.

(2) **Completion question** - This is a written statement which requires students to supply correct words or short phrases in response to incomplete sentences, questions or word association. It can be used to measure the recall of terms, names and concepts and principles. It is, however, of limited use in assessing students' ability to write correct and proper language. Unless properly structured, this type of question is subject to ambiguity. In contrast to the essay type of question, it allows greater scorer agreement and objectivity when responses are scored.

(b) **Selection type** - Two major weaknesses of this type of question are that it tends to encourage guessing and it cannot be used to measure ability to organise materials or to clearly express answers according to proper language usage rules. Its major advantages include assurance of scoring objectivity and since less time is required to answer these questions more content materials can be examined for a given length of time.

(1) **True-false questions** - These are useful where measurement of acquisition of factual, non-interpretive information is desired, for example, technical terms and proper names. Compared to
multiple choice questions, the tendency to guess is greater in this type of question as there is a 50% chance of obtaining the correct answer. However, the true-false item exhibits greater efficiency in the utilisation of time expended in construction and refinement of items (Marshall and Hales, 1972, p. 69).

(2) **Multiple choice questions** - This may be used to measure higher level mental processes of the cognitive domain - knowledge, comprehension, application, analysis and evaluation (Marshall and Hales, 1972, p. 46). Compared with true-false questions, multiple choice items require more time to answer, hence fewer questions can be asked in a given period of time.

4.4.2.2 **Oral examination**

An advantage of this form of assessment is that there is active interaction between the examiner and the student. Considering the fact that written examination only assesses what the student knows as presented by what is written (and not everybody is a good writer, especially under examination conditions), oral examination provides a useful method of ascertaining students' real knowledge - its scope and depth.

When conducted in conjunction with practical assessments, students can be asked to explain their actions for particular procedures. This would help determine students' comprehension of the relationship between theoretical teachings and practical applications.
Oral examinations are also useful in clarifying doubts when discrepancies occur between written assessment results and what the examiner feels particular students are capable of.

4.5 SUMMARY

For a dental assistant training programme to be successful, its classroom activities must be coordinated towards the achievement of curriculum objectives and thence programme objectives. A major factor that can affect coordination is the manner in which curriculum objectives are defined.

The design of the curriculum also plays a major role in determining success. To ensure that objectives of the curriculum can be realised, its design must recognise the various principles of learning and utilises these principles to affect learning of knowledge and skills being taught in the curriculum.

The type of subjects and extent to which subject materials are taught would depend on what is considered adequate knowledge and skills for effective functioning as defined by the objectives of the curriculum.

Assessment of student performance is an essential component of the curriculum for it provides the necessary evidence upon which the success of teaching and training activities are evaluated. Assessments of both the theoretical and practical aspects of the curriculum are necessary to ascertain whether students have actually acquired the prescribed knowledge and level of competency.
5. DISCUSSION

Numerous factors are involved in the formulation of a dental assistant training programme. Unless these factors are carefully considered, it is highly unlikely that a dental assistant training programme will be able to successfully fulfil its purpose of being established. To ensure that as many factors as possible are considered it is important that a systematic approach is undertaken in the preparation of the training programme.

When contemplating the establishment of a dental assistant training programme, it is important that the need and desirability for it, in terms of local demands and conditions, be first established.

Questionnaires can be sent to the local dentist population and other federal and state agencies that employ assistants (for example, health commissions, dental hospitals) local dental society, dental assistant association and university dental school seeking such information as:

(a) Is there any need for a dental assistant training programme? and
(b) If there is, will it be desirable that this programme be run on a formal basis?

Unless there are definite indications of need and desirability, establishment of such a programme is hardly justifiable.

Only when it has been established that there is need and desirability for a formalised dental assistant training programme
will the formulation of such a programme begins. Some of the processes to be considered in the formulation of a dental assistant training programme are formulation of its training objectives, design of its curriculum and evaluation.

A senior dentist (for example, a principle dental officer) or the dentist who will be responsible for the conduct of the intended programme may be assigned to undertake the above tasks (formulates objectives, designs curriculum, considers how programme to be evaluated). He may in turn form his own special committee (need not necessarily be a formal one) to help him perform this assignment.

For a dental assistant training programme to be useful to the community it is supposed to serve, its curriculum must incorporate the teaching of that knowledge and skill relevant to what is required of its graduates to know and be able to do when they enter the working force. However, a curriculum cannot perform this function unless its objectives are based on valid local requirements and conditions.

An essential initial step in the preparation of a dental assistant training curriculum is therefore the definition of its objectives. However, two preliminary steps are necessary if validity of these objectives is to be ensured. These are job analysis and identification of training requirements and constraints.

*Job analysis:* This is the identification of the duties and tasks which is associated with dental assisting (in local terms) and the determination of the necessary skills and knowledge to perform those tasks and duties. Information compiled at this stage can be used
to formulate tentative training objectives which need to be considered against existing constraints to ensure that they (objectives) are workable within the confines of these constraints.

Questionnaires can be sent to local dentists, dental societies, dental assistant associations, dental assistants, dental schools and other federal and state agencies that employ assistants to obtain information on the various duties and tasks performed by assistants such as:

(a) type of duties performed - even though dental assisting is usually composed of clinical assisting, laboratory assisting and office assisting, local practice of dental assisting may not involve all these three functions, it may only involve clinical assisting or just clinical and laboratory assisting. It is important to realise that unless this information is obtained there is a strong possibility that relevant aspects of dental assisting (in terms of local requirements) may not be included in the curriculum. On the other hand, irrelevant aspects may be incorporated in the curriculum resulting in unnecessary wastage of efforts and money.

(b) which particular duty is mostly performed (for example, assistants may be mostly involved in clinical assisting but would only occasionally be called upon to do office assisting duties). Information in this area would help determine which aspects of dental assisting require more emphasis than others and where necessary (for example, in the face of severe financial constraints) omissions can be made of those lesser important aspects from the curriculum.
(c) what constitutes a particular duty, that is the tasks involved in the performance of that duty. For example, clinical assisting may be composed of chairside assisting, preparation of radiographs and general supportive roles (for example, sterilisation of instruments, fetching materials that are away from the operating area). This would provide information on what subjects to be included in the curriculum.

(d) to what extent these tasks are performed — whether chairside assisting forms the major task of clinical assisting duty or would an assistant spend equal time on chairside assisting and other supportive tasks. This information would help determine the extent of subject materials to be included in the training process.

(e) what constitutes a particular task (i.e. its task elements) such as, would chairside assisting be restricted to four-handed dentistry or would it also involve removal of sutures and chairside patient education; is preparation of radiographs involve both taking and processing or just the processing of films? This information would provide further refinement in deciding subject materials to be taught in the curriculum.

It is also essential that opinions be sought on what other aspects of dental assisting should be included in the curriculum or be more emphasised if formal training is introduced. For example, it may be desired that word processing be introduced in view of the changing trend towards computerising dental records. It may also be desired that more emphasis be placed on basic and dental sciences
to provide better foundation for career mobility and advancement. This information is important if the intended training programme is to be really useful to the community it is to serve.

Seeking job information and analysis of jobs performed by dental assistants into their component duties, tasks and task elements are evidently important procedures to be undertaken if training objectives are to be soundly based on local requirements. A priority listing of knowledge and skills can then be prepared which would be useful when extent of training processes has to be limited.

Identification of training requirements and constraints: This is the second preliminary step before finalisation of training objectives. Job analysis had provided information upon which tentative objectives are set. This step would identify those requirements necessary to achieve the tentative objectives as well as existing constraints. Correlations of information gathered from these two steps would then enable the formulation of final objectives which are valid (in terms of local requirements) and realistic (workable within the confines of existing constraints.

Identification of training requirements and constraints can be achieved by referring to guidelines and recommendations made by respective dental associations and/or other bodies that had produced such guidelines and recommendations, visiting other similar institutions, consultation with heads of these institutions, consultation with other pertinent members of the dental profession (for example, university lecturers, representatives from the Dental Association and Dental Assistant Association) and inspecting possible training sites.
Information that should be gathered in this step include:

(a) target population, that is, to whom the course is going to be aimed at. Identification of target population is necessary to ensure that candidates to be selected are those capable of comprehending intended teaching materials. Unless identification of target population is undertaken, a mismatch is most likely to occur between the training processes to be conducted and student capability to comprehend materials presented in the curriculum. Other factors requiring consideration include number of students to be accepted, their age requirements, academic background and special personal qualities that are considered essential in dental assisting (e.g. good personal hygiene and dependability).

(b) teaching staff - identification of teaching staff is necessary to ensure that when final objectives are formulated, the various activities associated with these objectives can be carried out effectively and efficiently. Examples of information to be sought under this heading include number of required and available teaching staff, composition of teaching staff and desirable teaching qualifications and personal qualities.

(c) training facilities - identification of required and available training facilities is necessary to ensure that both training and learning processes can be affected effectively and efficiently. Use of facilities in affiliated institutions (such as dental hospitals, dental centres, dental schools) or private dental offices may be necessary where practical training cannot be provided at the premises. Some of the other factors requiring consideration
include type and extent of equipments required and can be provided for, location of training programme, availability of space, possibility of acquiring audiovisual aids and need for a library.

(d) money - recognition of financial constraint is essential so that only financially feasible objectives are formulated. The amount of money available is perhaps one of the most important constraining factors in that it affects, among other things, the number of staff that can be employed and the type and extent of facilities that can be made available which in turn are essential to the success of the training programme in attaining its objectives.

Formulation of training objectives: Information gathered in the preceding steps had provided a sound basis upon which objectives that are realistic, both in terms of validity and workability, can be formulated.

However, success of a training programme does not rest only on the identification of what is expected of its graduates and the identification of training requirements and constraints. Success also depends on the various training efforts that will be undertaken to achieve those identified objectives.

A very important aspect of objective formulation is the definition of the objectives. Unless great care is taken in defining these objectives, the various training activities will be haphazard and uncoordinated, each activity heading its own way instead of striving towards the objectives. Furthermore, evaluation of whether these objectives have been achieved or not will be difficult to make.
Reference to books on techniques of defining objectives such as "Preparing instructional objectives" (Mager, 1962), Gronlund's "Stating behavioural objectives for classroom instruction" (Gronlund, 1970) and "Developing vocational instruction" by Mager and Beach (Mager and Beach, 1967) would be of great value when formulation of training objectives are being considered. Consultation with educationists (such as university lecturers or someone familiar with educational concepts of training) and heads of other training institutions conducting courses for dental assistants should be undertaken whenever possible.

Nevertheless, the definition of training objectives should have the following characteristics:

(a) the desirable training/learning outcomes should be defined in behavioural terms. Defining learning outcomes in behavioural terms enhances assessment of whether objectives have been achieved because it would be known what students will be doing when they have accomplished the objectives.

For example if an objective of training is defined as "knowledge of instruments used in class II amalgam preparation" it will not be known what is meant by "knowledge" - is it just knowing or is it just recognising these instruments? On the other hand, if the objective is defined as "student must be able to identify by name, the instruments used in class I amalgam preparation" it is evident that unless these instruments are correctly identified by name, that objective has not been achieved.
This characteristic which allows definite identification of achievement of objectives is important especially where training of dental assistants is concerned. It ensures that graduating students will have the prescribed ability to perform their functions effectively and safely. These are especially important because dentist's productivity is highly dependent on effective assisting and some patient contact will be inevitable in their (graduate assistants) working lives.

(b) The statement of objectives for the entire programme should consist of several specific statements covering each class of skill and knowledge associated with identified duties, tasks and task elements (in this context "identified" would mean those duties, tasks and task elements that had been decided upon to be included in the training curriculum). This ensures that all identified functions have their own specific objectives, the achievement of which will culminate in the attainment of general training objectives (see also Fig.2 in 4.1).

By defining each class of skill and knowledge associated with each identified duty, task and task element, it would be possible to institute control over training activities (because each activity must strive towards its own objective). This control of training activities is essential if success is to be achieved in the most efficient manner possible.

(c) Objectives of training should also be defined such that the conditions that are regarded as acceptable standards of performance are specified. These specifications would further enhance the
evaluation process and ensure that graduating students will have at least the minimal standard of skill and knowledge as deemed necessary for effective and safe functioning.

For example, an objective which reads "student must be able to identify by name, the instruments used in class II amalgam preparation" should be further refined to specify what is considered as acceptable level of "ability to identify" these instruments. A preferable objective should then read "given a set of 12 instruments used in class II amalgam preparation, students must be able to identify at least 10, by name". Hence it can be easily known that unless 10 out of 12 instruments are identified correctly, training in that particular field has not been successful.

When formulating training objectives, it is also important that accreditation guidelines be consulted if employment mobility of graduates is to be ensured. Where provisions for career mobility and advancement are being considered, consultation with accreditation guidelines and institutions conducting the relevant courses should be made to ensure that graduates have the required academic background for enrolment.

It is evident that great care and effort must be taken in the formulation of training objectives because success of a training programme is greatly dependent on them - both in terms of its (i.e. training programme) usefulness to the community it is supposed to serve and its ability to achieve its objectives.
Design of training curriculum: The next stage in the preparation of a dental assistant training programme is the design of its curriculum. Again consultation with dental educationists or persons familiar with the education aspects of auxiliary training (such as heads of other similar institutions) will be of great value in efforts to ensure that an effective and efficient design is formulated. Reference to training guidelines and recommendations (prepared by local dental associations or other bodies such as W.H.O.) as well as reviewing reports and articles in the dental literature will also prove useful. Where affiliated institutions are to be used for practical training and experience it is highly commendable that these institutions be consulted so that coordinated activities can be effected.

Essentially the curriculum of a dental assistant training programme consists of two components - theoretical teachings of the science of dental assisting and a practical component on the arts of dental assisting.

The amount of time to be devoted to these two components relies on the intended amount of knowledge and skills to be imparted, as defined by the objectives of training. However, there must be ample time not only for teachers to perform their functions effectively but also for students to assimilate what is being taught, to develop the desired ability and level of competency to perform their duties effectively and safely. Unless sufficient time is provided for, quality of graduating students will be in serious doubt.
Design of a dental assistant training curriculum must also be considered from a learning point of view since success of training is ultimately judged by what students have learned from the various training activities. Incorporation of such learning principles as motivation, meaningfulness, reinforcement and transfer is essential to affect better learning.

Motivation is an important factor if learning is to occur. Unless students are motivated it is highly unlikely that the various training activities will have any impact upon them. Motivation can be promoted by identifying to the students the objectives of their training and how these objectives relate to their success as dental assistants.

Meaningfulness is important if learning processes are to be enhanced. Meaningfulness helps the student to learn not only by showing the relevance of their training activities to their future success but also by associating new learning with what is already known. Meaningfulness can be instituted by:

(a) Informing students of the objectives of their training and the relationship of these objectives to their future functions as dental assistants. Students learn better when they know what they are supposed to learn and why the items being taught are important to their future success. Once students recognise what they are to achieve and why they are to achieve the objectives, the relationship of the various activities that they will be involved in will become apparent.
(b) Integration - integration of subjects rather than treating them as isolated units is commendable because when materials are presented side by side, their similarities are more readily apparent.

For example, instead of treating microbiology, sterilisation and pathology as separate units and leaving it to the student to work out the relationship presented, it would be better to integrate these materials to illustrate how the properties of microorganisms affect the pathology of diseases and how sterilisation can stop the transfer of diseases.

(c) Proper sequencing of training activities - this ensures that teaching materials and activities are presented in a logical manner enhancing better understanding through association of new learning to what is already known.

Reinforcement refers to an event that strengthens learning. Through reinforcements, students assimilate and remember better as well as appreciate the importance of materials presented. Reinforcement can be instituted through integration and proper sequencing of training activities. When materials are presented side by side and in a logical and meaningful manner, associations are reinforced.

Transfer is the process of taking learning from the classroom and using it in working life. Unless there is "transfer", a training programme such as that for dental assistants can hardly be called a success. Integration and proper sequencing of training activities are useful in facilitating transfer. Transfer can be facilitated
by providing students the opportunity to practise skills as soon as possible after they have been learned.

Another aspect of designing a curriculum is the consideration of type and extent of subjects to be taught.

Essentially, the type and extent of subjects to be incorporated in the curriculum is dependent on what is considered adequate knowledge and skills to perform effectively the various duties, tasks and task elements identified by its objectives.

Provision for career mobility and advancement is another factor that influences the type and extent of subjects to be taught. A programme that aims to provide career mobility and advancement will necessarily be more broadly based and extensive to ensure that its graduates have the necessary foundations upon which their careers can be built on. Consultation with institutions conducting further courses in dental assisting or other relevant courses, and reference to accreditation guidelines should be done if students are to be adequately prepared for these future undertakings.

Even though in this thesis the subjects that can be included in a dental assistant training have been categorised into basic sciences, basic biomedical sciences, dental science and dental assisting, it is important to note that this categorisation was rendered necessary for the purpose of presentation. As has been said earlier, integration is necessary and should be utilised if learning is to be facilitated.
Evaluation: Provision for evaluation should be made in the preparation of a dental assistant training programme. Unless this is done it would be impossible to know whether the programme has actually achieved its objectives and whether the objectives achieved are relevant to the requirements of the community. Depending on the results obtained, remedial actions can be taken to ensure better success in the above two areas.

Evaluation of a dental assistant training programme would therefore involve:

(a) Determination of the extent to which its training objectives are achieved - information should be sought on whether students have indeed learned from the training activities, whether they have acquired the prescribed knowledge and skill.

Information in this aspect can be obtained in a number of ways, two of which are:

(i) observation of students during their practical sessions. This can be followed by an interview to ascertain their understanding of the procedures that they had performed. This method of evaluation would provide a broad idea of the success of the training process.

(ii) examination of the results of clinical and theoretical assessments - this provides a better view of the success of the training programme in achieving its objectives.
Determination of programme effectiveness (whether it had successfully served its purpose) - information gained in this aspect evaluates whether the programme is being conducted in the right direction or not, whether the products of its training process compare with what is required by the local practice of dentistry.

Information in this aspect of evaluation can be obtained by sending questionnaires to graduates' employers and to the graduates themselves. Information sought from employers can include their assessment of graduates' performances and their (graduates') strengths and weaknesses at work. Information sought from graduates can include such items as number of positions held since graduation, functions and responsibilities in the dental office and relevance of amount and content of course material in its application to their working lifes.

Summary

Several processes need to be undertaken in the preparation of a dental assistant training programme to ensure that it is successful both in fulfilling its purpose of being established and in achieving its objectives.

This discussion has outlined some of these processes. They are:

1. Establishment of need for the training programme,
2. Job analysis,
3. Identification of training requirements and constraints
4. Formulation of training objectives,
5. Design of curriculum, and
6. SUMMARY AND CONCLUSION

The dental assistant is a non-operating auxiliary who works within the clinical area in which dental care is provided. She does not independently provide any part of this care but assists the operator to do so.

The dental assistant of today has come a long way from just a casual office helper mainly involved in running errands and other trivial housekeeping chores. She is an acknowledged full-time member of the dental health team without whom the dentist will be significantly handicapped in the performance of his clinical duties.

The dental profession assigns a wide variety of functions to the assistant in the performance of her duties. Surveys conducted by the International Dental Federation (Leatherman, 1969) and World Health Organisation Regional Office for Europe (Allred, 1977) reported that extraoral duties of dental assistants vary from secretarial and reception to exclusive chairside assisting. In some countries, dental assistants also perform educative roles in prevention sometimes for individuals, at other times for groups.

In Australia dental chairside service is concerned with assistance to the dentist at the chairside, dental health education, basic dental x-rays, application of rubber dam, pre and post operative instructions, irrigation of the mouth and removal of sutures as well as office management (Australian Dental Association, Dental Auxiliaries Committee, 1977). In Malaysia, dental assistants are
involved in chairside assisting, dental health education, basic dental x-rays, general surgery duties (for example, sterilisation, pouring and trimming plaster/stone models) and office management.

Increasing demand for dental services coupled with shortage of dentists and the high cost of training dentists had prompted the profession to look at various means of increasing its productivity. One of these is by more efficient and effective use of dental assistants. As early as 1944 Klein (Klein, 1944) had shown that by using one and then two dental assistants the dentist could increase his treatment capacity by 33% and 66% respectively. Waterman (Waterman, 1952) and Kilpatrick (Kilpatrick, 1971) also reported significant increases in efficiency, decreased work load (per operation) and shorter operating times with efficient and effective use of dental assistants.

Dental assistants help increase the dentist's productivity by providing him with an extra pair of hands during dental operations (four-handed dentistry) and by relieving him of other extraoral duties that do not require his special professional and academic ability. The dentist is thus able to see and treat more patients in a given period of time. In private practice situations, this would mean better incomes while in governmental set-ups, greater service to the community.

By providing the dentist with an extra pair of hands, dental assistants help increase productivity by minimising unnecessary wastage of time during dental operations. This is evident when it is considered that each time the dentist moves for an instrument or each time he stops to better his view of the operating area,
valuable time is wasted. The dental assistant can help reduce this unnecessary wastage of time by passing to the dentist the instruments he needs, keeping the operating area clean by efficient use of triple syringe and evacuator and preparing the necessary restorative and impression materials.

Relieving the dentist of extraoral duties that do not require his professional attention also helps increase productivity since it ensures that the dentist and his close-support assistant are not unduly removed from their chairs while performing dental operations. In this case the dental assistant furnishes the operatory with cleaned and sterilised instruments, supplies her counterpart at the chairside with materials that are not directly accessible, makes the necessary additions to prepared standardised trays (when these are used), processes and mounts radiographs and takes impressions from the dentist and pours them in plaster or stone. In a two-chair surgery, the assistant prepares the next patient and clears the preceding chair ready for the next appointment. The assistant can also answer the telephone and, where necessary, shields the dentist from unnecessary disturbances. Hence it can be seen that the dentist is spared of unwarranted chores and is able to concentrate his time in providing service to his patients.

From the foregoing it is apparent that efficient assisting has provided dentistry with an avenue for increasing its productivity. However, unless dental assistants are properly and effectively trained, their value in helping the profession increase its productivity can be greatly reduced.
In considering the setting up of a training programme for dental assistants it is important that the need for it is first established. This need should be based upon local demands and conditions rather than on some perceived ideas and intuitions. Some of the major factors that require considerations are whether there is a real need to increase productivity at all and if there is, would there be sufficient justification for having such a programme.

"Need" and "desirability" for formalised training programme for dental assistants are also dependent on several social and economical factors. The dentist may not want his assistants to be formally qualified for fear that he may have to pay them more in salary and wages. Dental assistants would want such a programme because it would give them a certain amount of status in line with their other medical and dental counterparts. A community that is already paying too much for dentistry would not be in the least interested in having to support a further dental project unless, of course, there is a promise of reduction in costs of dental services through better efficiency and productivity.

The above are just examples of factors that need to be considered in deciding whether a dental assistant training programme is warranted. When it has been established that there is a real need to increase productivity and when it has been agreed that this would be accomplished through more efficient assisting, formal training programmes should be considered favourably over "on-the-job" training because of its greater assurance of, among other things, more efficient training and better public protection.
Some examples of training programmes for dental assistants have been presented to provide some background and insight into the conduct of these programmes. These examples have shown that there are great variations in the conduct of dental assistant training programmes such as duration of training (ranging from 10 months to 3 years), percentages of instructional hours spent on theoretical and practical teachings (from 3% theory and 97% practical in Singapore to 65% theory and 35% practical in Denmark), type of subjects taught (ranging from exclusive dental assisting subjects to inclusion of such subjects as typewriting, speech improvements and diction training, English composition and grammar and telephone techniques) and format of training (from part-time evening sessions for employed assistants to a full-time vocational high school study of 3 years duration). Even though the range of training programmes presented are limited, these examples have helped illustrate that these variations are necessary because of the varying nature of local demands and conditions and objectives of respective training programmes.

Section 3 of this thesis discusses some of the factors to be considered in the preparation of a dental assistant training programme. These are:

(a) objectives of training programme,
(b) length of training programme,
(c) training facilities,
(d) teaching staff,
(e) selection of students,
(f) evaluation of training programme, and
(g) formulation of its training curriculum.
In its broadest sense the objective of an assistant training programme is to provide the content and learning experiences required to prepare the student to function effectively as an integral member of the dental health team and perform chairside assisting and related office and laboratory procedures under the direction and supervision of the dentist.

However, when objectives of a training programme are being formulated it is important that the various local influencing factors such as financial constraints, urgency of need for trained assistants and type of assistants required (i.e. in which area of dental assisting should graduates be more competent than others) be first identified. It is important that steps be taken to find out exactly in local terms, what is meant by the "content and learning experiences required for effective functioning". Unless objectives are based on recognised local demands and conditions, the training programme will be most unlikely to fulfil the purpose or purposes of it being established.

Even though great variations occur in the length of dental assistant training programmes (ranging from 10 months to three years) it is important to appreciate that a prime consideration is not the duration of training, but rather the length of time required to achieve the set objectives. There must be ample time for students to comprehend knowledge being imparted and develop the desired ability and competence to perform their duties efficiently, effectively and safely.

The type and extent of physical facilities required for the training of dental assistants would depend on the programme
objectives and the availability of space. There must be adequate facilities to provide for effective teaching and learning. Cramming of free floor space with too many equipments is not always a wise practice as this tends to reduce the effectiveness of teaching and learning processes.

Even though use of audiovisual aids is commendable from an educational point of view, the decision to invest in such media should be based on consideration of whether there is a real need for them, whether they will significantly enhance the achievement of objectives that their purchase and use are warranted. An important point to remember is that these aids are mainly useful in facilitating the communication of information for the development of concepts and ideas. Their use in teaching practical skills is fairly limited and as such are of limited value in a practically-orientated training programme.

The decision to establish a library would require careful investigation even though on the surface it may have seemed such a good idea. Any decision should be based upon evidence of need as it relates to programme objectives (whether education or training forms the essence of the programme) and recognition of the good (availability of research and reference materials) and bad points (confusion upon students) as well as recognition of extra commitments (costs of establishment and maintenance, selection of books, articles) of having such a facility. Perhaps a library as such may not be necessary at all - one or two shelves in the staff and/or student common rooms may be adequate and just as useful.
Composition of teaching staff in a dental assistant training programme would depend on the objectives of the programme. Basically, dentists and senior dental assistants would form the core of the teaching staff. Depending on the type and extent of subjects to be taught, dental technicians or other non-dental teachers (such as psychologists) may be required. The number of teaching staff to be utilised should ensure effective teaching and supervision of student activities especially in the practical aspects of the curriculum. To ensure enhancement of learning processes it is highly desirable that staff members to be appointed have some teaching background or at least possess recognised teaching inclinations. Wherever possible, the dentist on permanent staff (who is also usually the course coordinator) should be a formally qualified teacher.

Selection of students would require considerations of such factors as number of candidates that can be accepted, their academic qualifications and other desirable qualities that would make them good assistants. Number of candidates that can be accepted for a particular programme would depend to a large extent on the capacity and availability of training facilities. Cramming of classes would indeed reduce the effectiveness of teaching and learning processes. Other influencing factors include number of available teaching staff, amount of money available to support running of the programme and the extent of need for trained assistants.

Specification of age requirements may be necessary when it is intended to restrict the number of eligible candidates. The minimum age is usually associated with the number of school years required
to provide candidates with the necessary academic background to carry them through the course. Depending at which age schooling starts, this can be between the ages of 16 and 18. The maximum age limit is usually determined by the purpose of a particular programme (for example, a programme that aims to provide job opportunities to heads of households in an economically deprived community may extend the age limit to 55 years - see Dr Martin Luther King's Dental Assistant Programme - 2.2) and consideration of the number of remaining service years upon graduation.

The level of academic qualifications required of candidates will depend on the academic standard of the programme. Students should possess sufficient academic capability to comprehend materials being taught.

Nevertheless both the American Dental Association (American Dental Association, Council on Dental Education, 1974) and the United States Public Health Service and United States Office of Education (United States Office of Education and United States Public Health Service, 1965) recommended that candidates for dental assistant training programmes should have finished or completed high school at the diploma or equivalent standard. The Australian Dental Association (Australian Dental Association, Dental Auxiliaries Committee, 1977) recommended that intending students should have completed a minimum of three years secondary education. The Ministry of Health of Malaysia specified that applicants to its dental assistant training programme in Penang must possess the Lower Certificate of Education or equivalent, i.e. passed the national examination held after three years of secondary
education (Ministry of Health Malaysia, training programme for dental assistants in Malaysia, 1981, p.6).

Desirable qualities that should be inherent in potential students include good general intelligence, aptitude and interest in dental assisting, pleasant personality, neat appearance, good personal hygiene, adaptability, dependability and presence of initiative.

Some of the commonly-used methods for selecting potential students have been presented in this thesis. These are examination of candidates' past performance records, interviews and written tests. Examination of candidates' records would provide such useful information as their academic background and some general character and personality. References from former employers are also useful in gaining information on the candidates' general attitude and capability. Interviews are useful for gaining further insight into candidates' backgrounds. A lot of personal qualities can be assessed by having an interview session. Written tests can be conducted for assessing candidates' aptitudes, degree of intelligence and ability to write correct and proper language (when this is considered as a prerequisite for entry).

Evaluation of the training programme is essential to determine its success both in achieving its objectives and in fulfilling its purpose(s) of being established. Based on what information is received, remedial actions may be taken to ensure greater success.

Some of the methods of obtaining information on the success of a programme in achieving its objectives are through observations of students during their clinical sessions and examination of results
of practical and theoretical assessments. Questionnaires can be sent to employers of graduates and also to graduates themselves in seeking information on the success of the programme in fulfilling its purpose or purposes of being established.

Section 4 of this thesis deals with some of the factors to be considered in the formulation of a dental assistant training curriculum. For a dental assistant training programme to be successful in achieving its objectives it is essential that its training activities be so coordinated that they are funnelled towards the achievement of these objectives. A major factor that can steer training activities is the definition of training/instructional objectives.

As a first step, general training objectives must be defined. These general objectives of training are then broken down into several specific definitions covering each class of skill and knowledge that are to be taught in the training process. These steps would ensure that all training activities have their own specific objectives to aim at, the achievement of which will culminate in the attainment of the programme's objectives.

Because dental assisting is a practically-orientated vocation involving manual skills and to a greater or lesser extent, some patient contacts, it is essential that instructional objectives be defined in behavioural terms. This would give better assurance that upon graduation, students would have observable ability and competence (as prescribed by the objectives) to perform their duties efficiently and safely. Having the training objectives in behavioural terms would also allow easier evaluation of the teaching and learning processes.
Another major factor that influences success of a training programme is the design of its curriculum. To ensure that its objectives can be realised it is essential that the design of the curriculum recognises the various principles of learning and utilises these principles to affect learning of knowledge and skills being taught. The recognition and utilisation of learning principles is an important point of consideration if it is remembered that a major criteria for evaluating success of a training programme is how much its students have learned from the various training activities.

Some of these principles are motivation, meaningfulness, reinforcement and transfer. Some of the ways in which these principles can be utilised are integration of teaching materials and activities, identification of training objectives to students and proper sequencing of training activities.

Subjects to be taught in a dental assistant curriculum can be broadly categorised into general studies, basic biomedical sciences, dental sciences and dental assisting.

Subjects in general studies are mostly related to the development of those knowledge and skills that would complement the assistants' activities in their working lifes. As such, the inclusion of these subjects is not mandatory but would provide added advantage to the students. Some of the subjects that can be included in this category are communication techniques, psychology and typewriting.
Knowledge in basic biomedical sciences is useful to provide background for instructions in dental sciences and dental assisting subjects. It would, however, be useful to remember that knowledge in this area of study is not really essential as far as technical ability of assistants to perform their duties and functions is concerned. Instructions in basic biomedical sciences can include general anatomy, general pathology, microbiology and diet and nutrition.

Instructions in basic dental sciences forms the basis of theoretical studies in dental assistant training programmes. Subjects in this area would complement the practical aspects of the curriculum. Some of the subjects in this category are oral and dental anatomy, physiology and pathology and dental materials.

The category of dental assisting involves the teaching of practically-oriented subjects. Some of the subjects in this area of study are four-handed chairside assisting, instruments, charting, dental terminology, sterilisation and disinfection, laboratory procedures, dental radiography, drugs in dentistry, first aid, office assisting and dental ethics and jurisprudence.

It is important to recognise that the above categorisation of subjects is done mainly for the purpose of discussion. Integration of subjects is necessary and should be utilised to facilitate better learning through associations, not only of theoretical knowledge but also between one subject and another. It is also important to realise that the type of subjects and extent to which subject materials are taught would, in the final analysis, depend on what is considered adequate knowledge and skills for effective functioning as defined by the objectives of the curriculum.
Assessment of student performance is an essential component of the curriculum for it provides evidence upon which success or failure of teaching and training activities can be evaluated. Assessments of both theoretical and practical aspects of the curriculum are necessary to determine whether students have actually acquired the prescribed knowledge and level of competency. Several methods of assessment have been presented (such as use of "progress cards" for practical assessment; multiple choice questions, essay type questions and short answer questions for theoretical assessments; oral examination) but the final choice of methods of assessment would depend on what type of information is being sought.

It is evident that numerous factors are involved in the preparation of a dental assistant training programme. To ensure that as many of these factors as possible are considered, it is important that their considerations be undertaken in a systematic manner. The discussion part of this thesis deals with some of the procedural processes involved in the formulation of a training programme.

In the first instance, need and desirability on the local level have to be established. This involves the sending of questionnaires to the local dentist population and other federal and state agencies that employ assistants (for example, health commissions, dental hospitals), local dental societies, dental assistant associations and university dental schools.

When it has been established that there is need and desirability for a dental assistant training programme it would then be necessary to do a job analysis to identify those tasks and
duties which are associated with the local practice of dental assisting. The identified duties and tasks are then correlated with the necessary knowledge and skills to perform them. Tentative training objectives can then be formulated.

A senior dentist (for example, a principal dental officer) or the dentist who will be responsible for administering the intended programme can be assigned to do this job analysis as well as the other processes involved in the preparation of the training programme (identification of training requirements and constraints, formulation of objectives, design of training curriculum and consideration for evaluation). He may in turn form his own committee (need not necessarily be a formal one) to help him undertake these assignments.

The next stage in the preparation of a dental assistant training programme is the identification of training requirements and constraints which, when weighted against the previous tentative objectives would ensure that training objectives formulated are both valid (in terms of local requirements) and workable. Information that needs to be gathered in this process include identification of the target population and the requirements and availability of teaching staff, training facilities and money.

Formulation of training objectives forms the next step in the preparation of a training programme for dental assistants. An important aspect of objective formulation is the definition of the objectives which, when properly stated, can be used to guide the various training activities towards the achievement of training objectives as well as a means for evaluating the success of training.
To achieve the above ends (i.e. guiding of training activities and evaluation) it is important that the definition of objectives includes specific statements of objectives covering each class of knowledge and skill associated with identified duties and tasks ("identified" at this stage would mean those duties and tasks that had been accepted both valid and workable) and the specification of learning/training outcomes in behavioural terms and the conditions that are regarded as acceptable standards of performance.

The fifth stage in the preparation of a dental assistant training programme is the design of its curriculum. This involves consideration of such factors as the amount of instructional hours to be devoted to theoretical and practical teachings and the incorporation of such learning principles as motivation, meaningfulness, reinforcement and transfer into the design of the training curriculum.

Another important aspect to be considered in the preparation of a dental assistant training programme is how the programme would be evaluated to determine its success at achieving its objectives and whether the objectives achieved are relevant to what is locally required of dental assistants. Unless provision for evaluation is made it would not be known what the shortcomings of a programme are. This in turn would result in the programme being continuously run both ineffectively and inefficiently.

Some of the ways in which evaluation of a dental assistant training programme can be performed are examination of students' clinical and practical results, observation of students during their practical activities and sending out questionnaires to employers of graduates and the graduates themselves.
Conclusions

1. Numerous factors need careful considerations in the preparation of a dental assistant training programme. Unless these are done, it is very unlikely that such a programme will be successful both in fulfilling its purpose of being established and in attaining its objectives.

2. To ensure that as many of these factors are considered it is important that the preparation of a dental assistant training programme be done in a systematic manner.

3. Need and desirability for a dental assistant training programme must first be established. This need and desirability must be based on documented local evidence rather than on some assumed or preconceived ideas. Unless there is need and desirability, establishment of such a programme is hardly justifiable both scientifically and morally.

4. Preparation of a training programme for dental assistants starts with the formulation of its objectives. Formulation of training objectives must recognise what is locally required of dental assistants for effective and efficient functioning as well as identification of training requirements and existing constraints. Unless these factors are taken into account, objectives set will not only be invalid but also unworkable.

5. The definition of training objectives is another factor that influences success of a training programme in achieving its objectives. Unless objectives are clearly and specifically defined, training processes will be haphazard and uncoordinated instead of striving towards the objectives of training.
6. Another major factor that influences success of a training programme is the design of its curriculum. It is important to realise that success of a training programme is, in almost all cases, gauged by what its students have learned from its various training processes. With this in mind it is essential that the design of a dental assistant training curriculum recognises and incorporates the various learning principles to affect better learning.

7. Evaluation is another factor that needs to be considered in the preparation of a dental assistant training programme. Unless provision for evaluation is made, it is impossible to know whether the programme has actually been successful both in attaining its objectives and in serving the purpose of it being established. When it is not known whether a programme has been successful or not, necessary measures will not be taken to ensure continuing success or improvement of previous performance.
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