

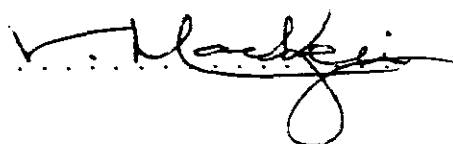
**DESIGNING A PROCUREMENT AND SELECTION PROCEDURE  
FOR PROSPECTIVE STUDENTS IN RADIOGRAPHY**

THESIS SUBMITTED IN FULFILLMENT OF THE REQUIREMENTS FOR THE  
MASTER'S DIPLOMA IN TECHNOLOGY: POST SCHOOL EDUCATION IN THE  
SCHOOL OF TEACHER EDUCATION AT THE CAPE TECHNIKON.

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DATE OF SUBMISSION: MARCH 1992

This is to certify that the content of this thesis is my own work and that opinions expressed therein are my own and not necessarily those of the Technikon.

Signature: 

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## SUMMARY

Although there are too many applicants for the number of posts available in radiography courses, the standard of the applicants has not improved and the rates of attrition have not decreased.

The problem was investigated against the background of South Africa and the 21st century, with particular reference to manpower needs, demography, population trends, education, health and the economy.

An attempt was, therefore, made to provide recommendations to improve the situation in radiography.

Before the research was conducted, the background of radiography, pertaining to South Africa was sketched. Reference was made to the various international organisations which had contributed to the development of the profession of radiography in this country.

The position of the technikons, as tertiary education institutions was highlighted and their relation to radiography training mentioned.

To understand the close liaison between the technikons and the employers of student radiographers, the present position of radiography as a vocation and as a profession, and of radiographers as professionals, was discussed. This included the concept of co-operative education and experiential training.

The significance of technology versus human beings, and of its relevance to education, radiography and science was explored to illustrate the background for which procurement and selection must be made.

Principles of procurement relevant to radiography were then discussed. Particular mention was made of the need for a job analysis and its constituent description and specifications regarding selection of students.

Cognizance was taken of the guidelines concerning recruitment, selection and induction. The selection process was researched in more detail viz. the need for an application form, a biographical questionnaire, references, reports, an interview and psychological testing, with emphasis on the latter two modes. This information was to be utilised to reduce attrition rates.

Questionnaires were distributed to a cross-section of 2000 qualified radiographers in Southern Africa to obtain opinions on the qualities required in such a profession allied to medicine. The response of 51% served as a basis for recommendations on procurement for radiography.

Information was obtained on the background to the respondent as well as scholastic requirements, personal qualities, interests, aptitudes, background and community service with reference to prospective radiographers.

Identical interviews were also conducted with the radiographers in charge of training centres throughout South Africa, to establish the respective methods of selection and success of the procedures. Ideographic interviews were then carried out on senior radiographers to determine and rate the most important aspects of work performed in radiography.

The responses obtained from the questionnaire were computerised and statistics used to interpret the qualities required for a competent radiographer. This, in turn, allowed recommendations to be offered for the type of applicant to be accepted for radiography training.

All information gained, in conjunction with the nature of the work involved, allowed a less subjective approach to procurement and selection.

Recommendations, based on the conclusions reached from responses to questionnaires and interviews, covered recruitment, selection and induction of student radiographers, ident-

ifying changes that should prevent wasted finances plus provide a better service to the public.

Recommendations were also made for future research and which are to be offered to radiography training and employer bodies.

No matter how objective a selection procedure might be, it must be remembered that every person is unique:

“Every man is in certain respects

Like all other men

Like some other men

Like no other men”

(Sprinthall, 1971: 19).

## OPSOMMING

Hoewel daar 'n ooraanbod aan aansoekers om die beskikbare poste in radiografie is, het die gehalte van die aansoekers nie verbeter en kan die uitsaksyfers nie verminder word nie. Onderzoek is na hierdie probleem ingestel teen die agtergrond van Suid-Afrika en die 21ste eeu, met besondere verwysing na die werkkragbehoefte, demografie, bevolkingstendense, onderwys, gesondheid en die ekonomie.

Die ondersoek het gelei tot 'n poging om aanbevelings te formuleer ten einde die toedrag van sake op die terrein van radiografie te verbeter.

Voor die navorsing onderneem is, is die agtergrond tot radiografie, wat Suid-Afrika betref, geskets. Daar is ook melding gemaak van die verskillende internasionale organisasies wat tot die radiografieberoep in hierdie land bydraes gelewer het.

Die plek van die technikon as tersiêre opvoedkundige instellings is beklemtoon en verbande met radiografie-opleiding gelê.

Om die *noue skakeling tussen die technikon en die werkgewers van kwekelingradiografiste* te begryp, is die huidige posisie van radiografie as loopbaan en as beroep asook dié van radiografiste as beroepslui, bespreek. Dit behels die begrip koöperatiewe onderwys en ervaringsonderrig.

Die belangrikheid van tegnologie teenoor die mens, en van die relevansie daarvan teenoor onderwys en die wetenskap is verken ten einde die agtergrond waarteen werwing en keuring geskied, toe te lig.

Die beginsels van werwing wat op radiografie betrekking het, is daarna bespreek. Die behoefte aan 'n taakontleding met die gepaard gaande -beskrywing en -spesifikasies is veral gemeld wat die keuring van studente betref.

Daar is gelet op die riglyne vir werwing, keuring en oriëntering. Die keuringsproses is in besonderhede nagevors, naamlik die behoefte aan 'n aansoekvorm, 'n biografiese vraelys, getuigskrifte, verslae, die onderhoud en sielkundige toetsing met die klem op die laaste twee metodes. Hierdie inligting is bedoel vir aanwending ter vermindering van die uitsaksyfer.

Vraelyste is onder 'n deursnee-profiel van 2000 gekwalifiseerde radiografiste in Suider-Afrika versprei om menings te peil oor die eienskappe wat die beroep, gesien sy verband met die mediese beroep, verg. Die respons van 51% het as grondslag vir die aanbevelings oor die werwing vir radiografie gedien.

Inligting is oor die respondente verkry ten gesigte van agtergrond asook opleiding, persoonlike eienskappe, belangstellings, aanlegte, agtergrond en gemmenskapsdiens rakende voornemende radiografiste.

Presies dieselfde onderhoud is gevoer met radiografiste aan die hof van opleidingsentrums oor die hele Suid-Afrika ten einde die onderskeie keuringsmetodes en die welslae daarvoor te bepaal. Ideografiese onderhoude is daarna gevoer met senior radiografiste om die tempo en die belangrike aspekte van die radiografiese werk vas te stel. Die response op die vraelys verkry, is gerekenariseer en statisties verwerk om die eienskappe waarvoor 'n bevoegde radiografis moet beskik aan te dui. Hierdie bevindings op hulle beurt het gelei tot aanbevelings vir die soort aansoeker wat vir radiografie-opleiding aanvaar kan word.

Alle inligting bekom oor die aard van die betrokke werk, het tot 'n minder subjektiewe benadering tot werwing en keuring gelei.

Aanbevelings gegrond op die gevolgtrekkings na aanleiding van vraelyste en onderhoude dek werwing, keuring en oriëntering van kwekelingradiografiste, met 'n aanduiding van vermindering wat verkwisting van werkkragte en beter openbare dienslewering tot gevolg behoort te hê.

Aanbevelings rakende toekomstige navorsing vir radiografieopleidings—en werkgewer-  
sinstansies is ook gedoen.

Nieteenstaande hoe objektief 'n keuringsmetode mag wees, moet dit altyd onthou word  
dat elke persoon uniek is:

“Every man is in certain respects

Like all other men

Like some other men

Like no other men”

(Sprinthall, 1971: 19).



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# CHAPTER 1

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## CHAPTER 1

### GENERAL ORIENTATION AND IDENTIFICATION OF PROBLEM

#### 1.1 INTRODUCTION

Radiography, like many other professions related to the medical field, is constantly evolving. Although change is the only constant in life, it is not uncommon for it to be regarded as a threat and hence to be resisted. Professor Bronowski, referring to his theory on the Ascent of Man, said: “Everyone is afraid for their confidence and of the future” (Watson, 1985: 300). However, Hellriegel (1982: 153) in *Management of Organisational Behaviour* said: “The most effective way to cope with change is to help create it.”

A profession so closely related to medicine, technology, education and training is, by its very nature, constantly adapting to the environment and its demands. Not to do so would be to toll the profession’s death knell. Those involved in this discipline are therefore having to anticipate and overcome problems in this process.

Radiographers also have to be aware of and adapt to an alarming rate of change—also evident in people generally. The future might well require a somewhat differently moulded radiographer to the one that until now has been accepted. Response to change and increasing flexibility will undoubtedly be vital to modern and post-modern society.

The student has to become a professionally competent radiographer, but there is a delicate balance which has to be achieved—sophisticated technology versus human beings, be they patients, colleagues, members of other professions or the public—“providing the interface between caring and technology” (Watson, 1985: 290).

It is therefore imperative that criteria for recruitment and selection of student radiographers be objective, reliable, valid, and as relevant as possible to the profession. Personal characteristics and attributes should be considered, not just academic prowess. If the best

of both worlds is not apparent in radiographers, Watson (1985: 292) blames it on recruitment, education and training.

Radiographers form a vital and committed part of the health care team of professionals, that provide a 24 hour service. Members of the public deserve the best possible treatment, not only because they are taxpayers, but more importantly because they are human beings. The very reason they are subjected to medical procedures at large, small, state, public or private institutions, is that they are ill, injured or, at least, worried.

Student radiographers are usually salaried trainees employed to assist in helping to provide a valuable service to the community and they also happen to be paid by the tax payer. The best possible recruitment and selection, is therefore, warranted in order to ensure that the maximum benefits may be derived from public expenditure, while the best candidates are trained for the ranks of the profession.

## **1.2 THE PROBLEM**

With the turn of the century on hand within less than a decade, concerted efforts are needed to meet the challenge of the changes that will accompany it. Sound criteria need to be developed for the selection of prospective radiographers if they are to be able to cope with the future effects on requirements of the profession. The problem must also be seen in the context of the country's manpower needs, demography and economy, as well as its education and health patterns.

### **1.2.1 Manpower Needs**

Although the number of applications received annually from prospective students escalates each year, it is becoming increasingly difficult to select sufficient students with the desired qualities required of skilled professionals capable of working in a hospital environment. It is imperative that objective criteria be compiled to enable the country to utilise all its people to their maximum potential.

Although the formulation of criteria is particularly relevant to the emergent “New” South Africa with its concurrent socio-political changes, there is unlikely to be “New” money for health services in the foreseeable future, as it seems to be on an inexorable slippery road to a third world situation (Klopper, 1986). Even though the needs of South Africa is the first consideration, the demands of neighbouring states and the world should be borne in mind when selecting radiographers.

The Van Wyk de Vries report (1974) accentuated the need for high level technical training to remedy the shortage of skilled professional persons, while the De Lange Report (1983) emphasised that approximately 80% of training should be of a vocational nature in order to provide for the labour market. Since then the Walters Report (1990) and the discussion document entitled “Education Renewal Strategy” (1991) have both endorsed similar recommendations.

Radiography needs to take cognizance of the foregoing and to be guided by its own needs. To prevent the profession from being flooded with quantity rather than quality, not only should market indicators and trends be monitored but recruitment and selection should once again be the point of departure, as also recommended by Ehrens and Louw (1978). Human resources could then be tapped to the advantage of radiography, which can be encouraged to take its rightful place in the technical world.

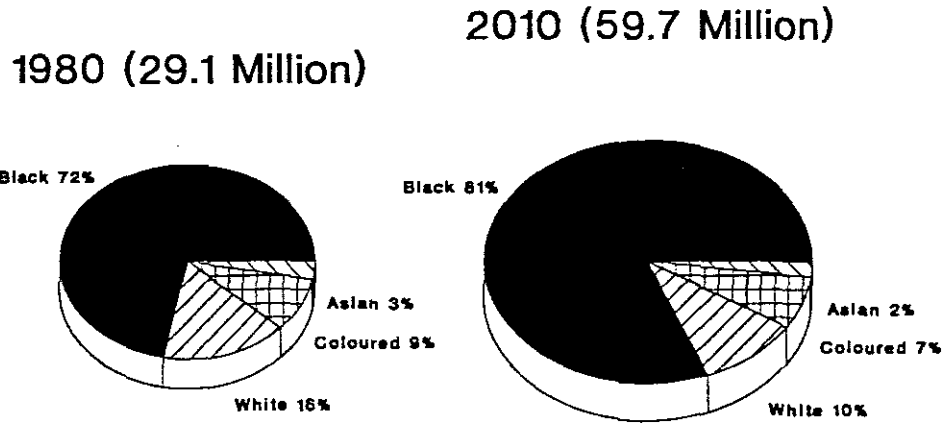
Minimal qualifications will not produce a practitioner of the calibre necessary to take the profession into the next millennium.

### 1.2.2 Demography

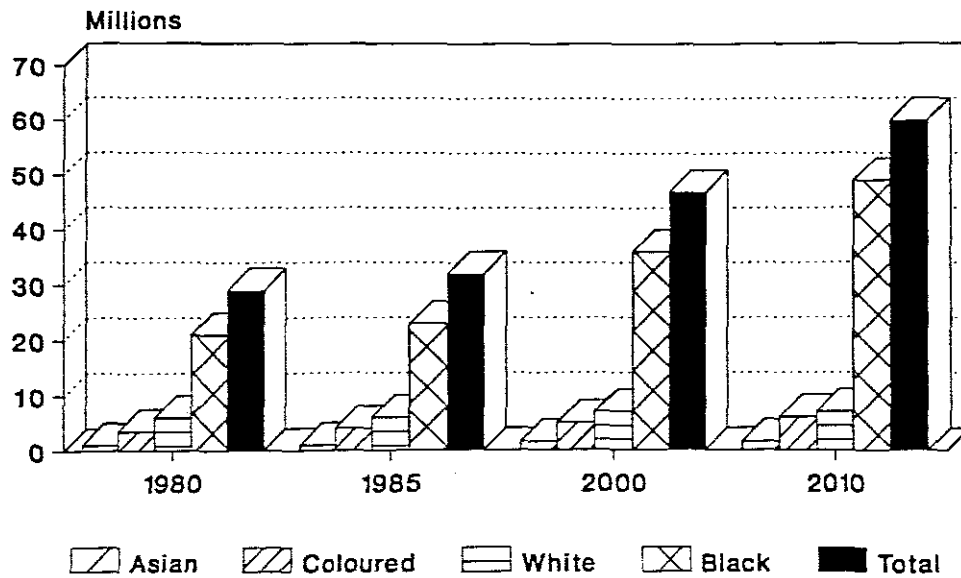
Like many other parts of the world, South Africa cannot afford to ignore projected statistics of expected population growth (Fig. 1–1). This is particularly relevant if informed decisions are to be made concerning standards of living, including health and education—all of which will involve planning that will affect future radiographers.

Figure 1-1

## South African Population Structure



## Total Population in South Africa 1980 to 2010



Source: Population Trends (The Urban Foundation, 1990).

Sources such as the United Nations and the Human Sciences Research Council indicate that by the year 2000–2025, Southern Africa will not only be more densely populated, but it will also have developed into a more pronounced mixture of first and third world conditions. It was the Indian Prime Minister, Jawaharlal Nehru, who originally coined the term “third world” to mean underdeveloped countries.

In keeping with the general world trend, South Africa will also become increasingly urbanised (Fig. 1–2), as is supported by Dewar and Watson (1990: 210). The move to the cities is predicted to rise to 60,9% in the year 2000 and to 73,3% by the year 2025 (Urban Foundation, 1990).

Because of the increasing population and a tendency for it to concentrate in urban areas, even more applications for radiography training can be expected. One of the major problems is that, largely because of the present educational system, a significant section of the population does not possess the basic prerequisites to enter a technical professional training. Stringent screening before selection is necessary but utilises valuable time, effort, money and manpower. For this reason it is vital to devise a more reliable method for selection of student radiographers in order to employ scarce resources judiciously.

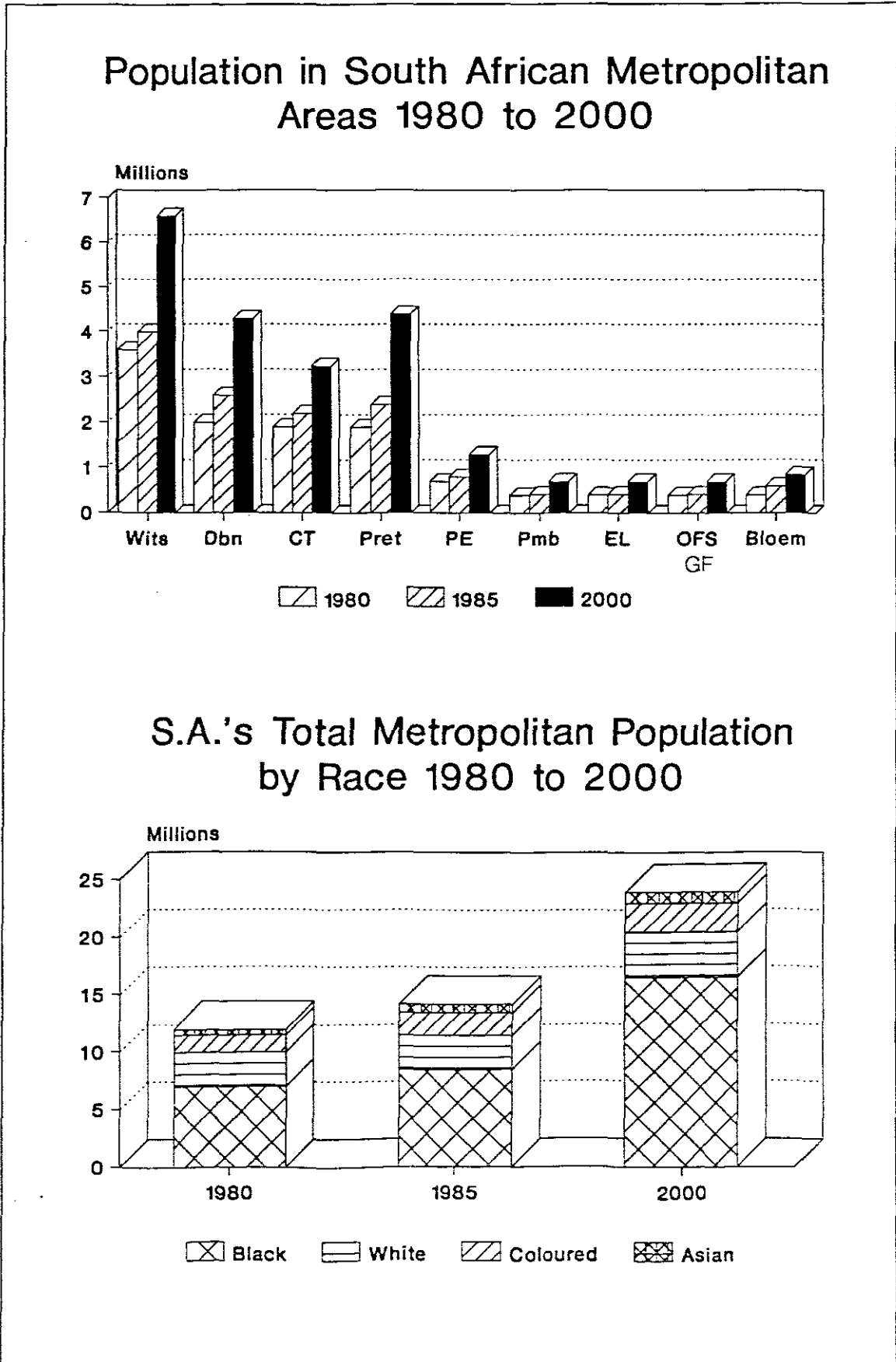
Not only will selection be made from larger numbers, but it will also have to consider more applicants originating from a greater diversity of cross-cultural and socio-economic backgrounds.

The chairman of the Council for Population Development in 1991 said: “It would be the biggest irony in the history of this country if we reach a commendable political dispensation just to be threatened with social and economic destruction as a result of our inability to curb our population growth” (De Lange in *South African Consumer*, 1991: 16).

### 1.2.3 General Health Care by 2000

Radiographers should be allowed to continue playing their part in meeting the needs of the public in terms of the aspirations of the World Health Organisation endorsed in the agreement signed

Figure 1-2



Source: Population Trends (The Urban Foundation, 1990).



at Alma Ata, USSR in 1978. The contribution of radiographers to this promise must be an assurance of adequate standards of radiographic education (Watson, 1985: 290).

Better health care gives rise to longer life, which in turn results in a population of a higher median age posing its own health and economic problems. In other countries, such as Canada, similar problems have been met (Burnaby Hospital's Report, 1990: 4). Golding & Tosey also refer to the high technology/high cost treatment needed by the older patient (1990: 196).

However, if responsible family planning is not practised, the combined effect of overpopulation, under-education, poor health and worsening socio-economic conditions will prevail, as is referred to in the *Hospital and Nursing Year Book of Southern Africa* (1991).

The result is a population of older people requiring particular health care, a large proportion of under-educated youth and the very real problem of underutilisation of manpower plus unemployment. Professor J.P. de Lange supported Dr D. Mullin of the Central Economic Advisory Service in his estimation of 45% of the population being unemployed by 1995 (*Cape Times*, 1989). All of these factors give rise to particular physical, mental and social problems.

It is evident that with these increasing demands on the profession in the near future, unstructured selection with its consequent attrition rates in the radiographic profession cannot be afforded.

#### 1.2.3.1 Tuberculosis (TB) and Acquired Immuno-deficiency Syndrome (AIDS)

Poor socio-economic conditions, particularly in urbanised areas, often give rise to an increase in diseases such as TB.

Hippocrates provided the first recorded clinical description of the disease in 400 BC and yet in the Western Cape alone, the increase of this condition is said to have reached epidemic proportions (Oliver, 1991).

Robert Koch formulated the aetiology of TB and discovered the tubercle bacillus in 1882. It is ironic that he twice visited Cape Town, now ranked as one of the areas with the highest incidence

of the disease (James, 1982: 17). He also observed that TB far outranked the most dreaded infectious diseases by the number of victims it claimed (Collins, 1982: 782).

The relationship of this disease to AIDS cannot be ignored, as is supported by a number of recent articles, e.g., in *The American Journal of Radiology*: “The Aids epidemic is the major factor accounting for the resurgence (of TB)” (Diagnostic Imaging, 1991: 28) and a French newspaper, *Le Monde*: “The increase is directly linked to the spread of the AIDS virus, as those affected are very susceptible to TB. This is due to the consequences of weakened or compromised immune systems” (Bath, 1987: 266).

According to an International Conference on AIDS held in Italy, 90% of all AIDS cases are likely to originate from the developing world. The World Health Organisation estimates that of the 40 million people likely to be infected by Aids in the year 2000, 9 out of 10 will be from Africa or Asia. Sub-Saharan Africa already has 6 million cases of AIDS infection (*The Argus*, 1991b). In Cape Town, half of the population over 15 years of age could be HIV (Human Immuno-deficiency Virus) positive by the year 2000 (Oliver, 1991).

### 1.2.3.2 The Role of the Radiographer

As professions allied to medicine, including radiographers, play an indispensable role in the campaign against infectious diseases, their training is of vital importance (South Africa: Official Year Book, 1989/1990). A sound future depends on a sound core of these professions and radiography services can only become more strained as disease patterns increase.

The first mobile x-ray unit, known as “mass radiography”, travelled into the South African community in 1947 (Collins, 1982). The larger the population (mass), the greater the onus on the radiographic profession.

Bearing in mind the holistic (physical, mental and social) approach of health care to the patient, a concerted effort must be made to select the right persons at all times. This is especially valid

for radiography, if the problem pertaining to manpower, demography, health and economy are to be objectively addressed.

Wastage due to poorly selected staff cannot be afforded.

#### 1.2.4 Education

Although UNESCO expressed a wish for education for all by 1989, the reality of this depends to a large extent on the actual country (Husen, 1985).

It would, perhaps, have been more to the point to have expressed a wish for literacy for all, i.e. training in language and writing skills, especially with World Literacy Day having been commemorated on 8 September, 1991. Even if South Africa succeeds in a venture of this kind in the foreseeable future, the challenge is to meet the need for basic, and particularly secondary, education with a scientific basis. The constantly increasing tertiary influx is unprepared for coping with technological and scientifically oriented professions because of the backlog. The problem is accentuated by the lack of adequately trained teachers. In 1989 only 45% possessed relevant and effective qualifications and national averages for pupil to teacher ratios ranged from 19:1 for Whites to 51:1 for Blacks (Education Renewal Strategy, 1991). In an attempt to forecast the supply of manpower according to skills levels, the National Manpower Commission Report (98/1987) highlighted the redistribution of educational levels between various population groups (Du Preez, 1990).

Even though there are so many applications for radiography, many applicants do not possess the basic educational requirements nor do their qualifications meet the desired minimum standard, as has been experienced at various hospitals, e.g. Groote Schuur.

There can only be an increase in the number of applicants in future, as largely urbanised scholars seek employment; especially if salaried training makes a position even more attractive.

It is well documented that the relation between education and earning capacity is inextricably linked and that everyone should be afforded the opportunity to develop to his/her maximum potential. However, this should not be used as an argument to allow standards of education, training and radiography to be jeopardised. As quoted in the official reports of commissions chaired by Wiehahn (1980:4) and Rieckert (1978: 35), people are correctly regarded as human capital. Education is, therefore, an investment in human capital, which in turn raises productivity—the more efficient education is, the more valuable the results are to a country. It is also said that education is the corner stone of any true profession (Watson, 1985: 292).

Without a pronounced effort at reducing the educational backlog, the profession of radiography is likely to be affected for some years, until more applicants possess the required qualifications. Recruitment and selection need to be even more structured, objective, reliable and valid in an attempt to reduce potential risks and the ensuing waste of money, time and effort. Society has a clear interest in maximising the numbers of students who finally graduate (Fischer, 1987: 42). The disappointment and frustration of unsuccessful students and the lack of competent qualified radiographic staff need to be considered. Any such atrophy in numbers means that fewer radiographers then have to shoulder the workload, including more duties during unsocial hours, which, in turn gives rise to dissatisfaction and disillusionment.

Vocational training towards a career in radiography falls largely under the auspices of technicians. Selection of potential radiographers needs to be related as closely as possible to the requirements and basic competencies of the profession, as is also supported by Cattell (1985: 160).

Emphasis needs to be placed on preparing more students for careers in technical disciplines and the public needs to be informed of the role of the technician in these careers.

Winning nations have a firm commitment to technology at all levels, particularly at school. Olivier (1984), quotes Sir Richard Luyt: “A nation that neglects its education, forfeits its future”.

### 1.2.5 Economy

The public and health services are accountable for public funds but have found it increasingly difficult to provide a service comparable to that supplied before costs escalated and the rate of exchange fell. The present Minister of National Health, Dr R. Venter, has stated that money will have to be raised by hospitals if a similar service to that previously offered is to be maintained (The Urban Foundation, 1991: 2). Dr D. Owen, the former British Foreign Secretary warned that: "Without sustained economic growth there can be no social development" (Chiwese & Seales, 1991: 7).

Radiography, too, is affected by these constraints. All avenues that could possibly yield economics and secure savings, including an attempt to decrease the wastage caused by the loss of student radiographers due to incorrect recruitment and/or selection, should be explored.

Rationalisation of training institutions should be objectively studied. If these institutions are to receive subsidies from the Treasury, the economic viability of these students remaining as salaried trainee employees also needs investigation.

As student radiographers are exposed to both theoretical and practical aspects of training, they are ideal candidates for the system of "co-operative" or experiential education implemented by *technikons*. Objective selection and close "co-operation" between employers, *technikons* and students is, therefore, essential if both theory and exposure to the profession of radiography are to be adequately experienced by students as laid down by the Certification Council for Technikon Education Act (Act No. 88 of 1986) (South Africa, 1986).

The costs involved in producing a highly technical qualified professional who has been exposed to an expensive training involving expertise, manpower and equipment as well as the experiential or clinical component, are quite exorbitant. Searle *in* Coetzer (1981: 161) estimated the budget per student based on the following formula:

Total tuition cost =  $\frac{a}{b+c+d+e+f+g}$ , when:

a = Annual budget of school college;

b = Number of students in year;

c = Mean of salary of number of tutors concerned with student affairs;

d = Number of students at hospital;

e = Mean of salary of clinical tutors;

f = Annual cost of uniforms/shoes per student;

g = Mean of annual salary per student.

Disregard: Subsidy on low cost board and lodging.

Other personnel administrative costs.

Cost of materials in x-ray departments, clinical units and standard of staffing required for a training school.

Cost of sending personnel to train as tutors/clinical experts to keep training programme viable.

Cognizance must, however, be taken of technikon fees paid by radiography students versus the service rendered by them. However, Belsheim (1986: 216) states that the necessity for recovering some overhead, increases the cost of registration fees.

Radiography training takes place under the auspices of technikons at hospitals or private practices and, as such, is strictly speaking a vocational training. Guidance given at schools needs to be better directed as to the needs of the profession, the market and the qualities and attributes of radiographers.

Selection, in turn, should be more structured and scientific if technikons are to qualify for the financial subsidy on successful students, meet the demands of the market, and reduce the attrition rate due to incorrect vocational choices, poor recruitment, subjective selection and failures.

### **1.3 RADIOGRAPHY—SELECTION PROBLEMS**

Although a vast number of enquiries and applications are received for training in radiography, selection has not become less complicated, nor has it prevented certain students from being incorrectly selected for radiography and hospital oriented work.

*Proof of this is usually:*

- (i) failing subjects;
- (ii) leaving the course before qualification;
- (iii) being unhappy once qualified as a radiographer.

Radiography needs to exploit the talent at present available among the population to its fullest potential. However, the problem in selecting suitable trainees for the profession is that applicants are often not in possession of the required/desired minimum entrance qualifications and are hence academically suspect. The diverse socio-economic spectrum in the midst of too rapid urbanisation aggravates this problem. The predicament is exacerbated by the impact of technology, with a highly sophisticated environment as its corollary. This gives added impetus to the thrust of a largely youthful population—in a population that according to the Department of Manpower is expected to double by the year 2000—crying out for a livelihood.

Minimal qualifications will not produce practitioners of the calibre necessary to take the profession into the 21st century with its acceleration of high technology. Therefore, selection should, as a first priority, be based on the precise needs of the career.

### **1.4 HYPOTHESIS**

Selection of student radiographers should be more objective, valid and reliable than it is at present, as there are many applications for a limited number of posts. Better utilisation of personpower would, in turn, provide a better service to the public. By reducing wastage, the economy of the country would also benefit.

The attrition rate, due to a variety of reasons could be reduced if selection was more objective, structured and scientific. Selection should be tailored to suit the task analysis of the practising radiographer.

The selection of the right trainees should then produce students who on qualification are able to perform the basic competencies required and be capable of professional growth. They should also be more motivated to continue in their chosen profession if selection were more accurate.

As was previously stated, it could mean a considerable saving in money, time, manpower and energy if selection produced trainees of the right calibre. It would also provide the public with a better radiographic service and improve the image of radiography as a profession.

## **1.5 RESEARCH METHODOLOGY**

The proposed method of attempting to prove or disprove the hypothesis will be as follows:

- (i) 2000 questionnaires will be sent out to a cross-section of qualified radiographers in South Africa and neighbouring states (Appendix A). All potential employers of radiographers, of whom some 3 500 are registered with the South African Medical and Dental Council, will be circulated.
- (ii) The information gained from the completed and returned questionnaires will be analysed by computer to determine the characteristics and qualifications considered necessary for a practising radiographer. This will be used to establish a profile on which to base the development of a selection process.
- (iii) Personal interviews with qualified radiographers from a cross-section of the profession will be used to determine the most important aspects of radiography and this will be correlated with the information gained from the questionnaires.



- (iv) Personal/telephonic interviews will be undertaken with tutors in charge of all radiography training institutions in South Africa in order to compare their selection procedures with one another. This will be done using a questionnaire with similar content (Appendix B).
- (v) A comprehensive and on-going computer-aided literature study of relevant references will be undertaken with the object of taking cognizance of findings on the subject of selection internationally.
- (vi) Recommendations will be made for the compilation of a procurement and selection procedure to be tested on future student radiographers.
- (vii) Once recommendations have been tested, a selection battery can be devised on the basis of empirical information.
- (viii) The relevant training institutions and/or other interested parties will be notified of the proposed selection procedures.
- (ix) Should it be proved feasible, the structure of the training for the National Diploma in Radiography could be amended to more accurately suit the practical needs of the qualified radiographer and, thereby, the general public.

## **1.6 PROPOSED METHOD OF CONTINUING STUDY**

To appreciate the need for more objective selection of students in perspective, radiography should be seen against its historical development. The background to the development of radiography as a profession will be covered in chapter two, with particular reference to the link with the technikons as institutions of vocational training.

Chapter three will deal with the problem of co-operative education and technology as these affect radiography. The principles of procurement relevant to radiography will be highlighted in chapter four.

A study, undertaken with the aid of questionnaires sent to a cross-section of radiographers to identify the qualities required for prospective radiographers, will be described in chapter five and information data obtained from questionnaires and interviews. The data obtained from the responses to the questionnaires will be analysed in chapter six in an effort to match the information against the actual needs of personnel in practice. Chapter seven will cover recommendations based on the conclusions reached in chapter six. The recommendations will be relevant to radiography, the public and employers.

Chapter eight will cover recommendations and pertinent suggestions for further research.

## CHAPTER 2

### HISTORICAL BACKGROUND OF RADIOGRAPHY AND CAREER TRAINING

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## CHAPTER 2

### HISTORICAL BACKGROUND OF RADIOGRAPHY AND CAREER TRAINING

To be able to appreciate the present status and problems of radiography in South Africa, it calls for an overview of the origin of the profession.

#### 2.1 DISCOVERY OF X-RAYS

Dr W.C. Röntgen, a Professor of Physics at the University of Wurzburg, Germany, discovered x-rays on 8 November, 1895 and was awarded the first Nobel Prize in 1901. Röntgen's x-ray technology was in constant process of development and an ever-increasing number of fields would rely on its possibilities (Donizetti, 1967 and Comet Company, undated). It is interesting that Röntgen started his vocational training at the Utrecht Technical School in Holland and later furthered his education at the Federal Polytechnic School in Zurich, Switzerland.

Two observations of his pertaining to study habits and economic considerations worth noting are:

- (i) telling his students that human knowledge was constantly advancing and that keen observation in all exercise was required and
- (ii) the cost of "x-ray" tubes was already "too expensive" (Glasser, 1972: 88).

#### 2.2 RADIUM AND RADIOACTIVITY

The advent of nuclear medicine and radiotherapy can be traced to the discovery of radioactivity by Henri Becquerel in January 1896 and of radium by the Curies in July 1898 respectively. Becquerel happened to be a Professor of Physics at the Polytechnical School in Paris, (a "polytechnique" was the most esteemed science teaching establishment in France at the time) (Donizetti, 1967: 204). The first known radiotherapy department was estab-

lished in Europe in 1900. Lord Rutherford split the atom in 1904, followed by Aston's defining of isotopes in 1919, thus establishing nuclear medicine—one of the first treatments being documented in 1949—a typical phenomenon of the atomic age.

### 2.3 RADIOGRAPHY IN SOUTH AFRICA

Soon after its discovery, x-rays were being used in South Africa during the *Tweede Vryheidsoorlog* in 1899. Radiographers have always been in the forefront in dealing with emergencies and crises, hence the need for particular personality characteristics as part of selection criteria.

The following organisations deserve particular mention as ones that have made a considerable impact on the training of radiographers in South Africa: The British Society of Radiographers and the Society of Radiographers of South Africa. The International Society of Radiographers and Radiological Technicians (hereafter referred to as I.S.R.R.T.) should also be mentioned for its contribution in this field.

#### 2.3.1 The British Society of Radiographers

The South African system of training originated in the United Kingdom. The Röntgen Society (1917) acted as the forerunner of the British society, which was established in 1920. It was largely founded “to promote the science and regulate the practice of radiography and to consider and discuss all the subjects affecting it” (Harris, 1970: 3). 1969 saw this changed to read “to promote the science of radiography and radiotherapy” (Moodie, 1970: 64).

In 1923 the aims and objectives of the society were framed with, *inter alia*, protection of both the public and the radiographer in mind. Of special importance was the emphasis on adequate technical training. Henceforth any trainees would have to undergo compulsory training and exhaustive examination. They also had to maintain a high standard of technical efficiency. Although the first special examination took place in 1921, the first qualifying

examination of the society was written in 1922. From an informal training of 8 months duration, the "course" was extended to cover a full 2 years, with the first formal training courses running from 1930. A separate qualification in radiotherapy saw its inception in 1944, but examinations in this discipline only took place from 1951 (Moodie, 1970: 58).

The deleterious effects of atomic power became only too obvious on the silver anniversary of the British Society, when at 00:20 (London time) Hiroshima was hit by a nuclear bomb. The Daily Express summed it up: "The world has changed overnight" (Harris, 1970). The old adage that only certainty in life is change, demands that radiographers be adaptable and flexible. By implication, they need a sound knowledge of the risk/benefit ratio of using radiation. Thanks to the catalytic effect of Röntgen's discovery, Great Britain became the "nursery" of radiographic skills.

It is accepted that despite the destruction and suffering brought on by war, it provides opportunities for rapid technological advancement. In radiography, such technological studies were made in foreign body localisation and, not surprisingly, in treating acute multiple fractures. Darkrooms also became better ventilated. Radiographers were seconded to the army, where many gained experience and stayed on in the radiography profession at the end of the war. Training thus benefitted from the years of wartime experience (Mould, 1980). Only in 1950 was formal training for tutor radiographers introduced. Successful completion of such training was marked by a Teacher's Endorsement. This training entailed time spent in a School of Radiography and later also included part-time attendance at a polytechnical institution.

By 1954 all employers of radiographers in Britain were to appoint only qualified radiographers by virtue of the Medical Auxiliary Regulations (Moodie, 1970: 62). The council for Professions Supplementary to Medicine controlled training, qualifications and codes of practice. The need for recruitment was specifically mentioned in 1959.

Since 1977, the British Society of Radiographers has dealt with issues pertaining to industrial relations, while the newly constituted College of Radiographers has as its primary function education, training and examinations.

### 2.3.2 The Society of Radiographers of South Africa

In 1928 the South African Medical and Dental Council (Hereafter referred to as SAM&DC) made provision for the registration of “supplementary health personnel” and in 1930 a branch of the British Society of Radiographers was established in South Africa—the first functioning “provincial” branch outside the United Kingdom.

Initial training of radiographers commenced in South Africa in 1933, but all candidates were required to sit the British examination. The General Hospital in Johannesburg was followed by those in Durban, Cape Town, the Eastern Cape and Pretoria in the training of radiographers, although the British examination could still be written in South Africa until 1964. Pretoria also instituted the first Afrikaans radiography course in 1947.

The war years (1939-1945) supplied the initial training for many who were to stay in the radiography profession afterwards. Accommodation was provided at the Technical College in Johannesburg for this purpose and it was from here that those newly trained radiographers set out for North Africa (Tompkins, 1976: 9).

The South African Society of Radiographers was established in 1951, immediately followed by the institution of the South African Diploma in Radiography under the auspices of the SAM&DC (Tompkins, 1974: 3). 1959 marked the origin of both the Council of Allied Medical Professions, and the journal of the society, viz. *The South African Radiographer*.

It is significant that when the British journal, *Radiography*, first appeared in 1935, there was a contribution from South Africa—entitled “A Radiographer in South Africa” (Tompkins, 1935: 65-68).

Equality of pay for both sexes was recommended in 1959 and an acute staff shortage was recorded in 1960 (*The South African Radiographer*, 1961). The current market trends in respect of staffing should always be considered when recruiting and selecting prospective radiographers.

The syllabus, training and pass requirements for South African radiographers were revised in 1961 and diagnostic radiography was separated from therapeutic radiography. The original qualification progressed to a National Diploma under the control of the Department of Education Arts and Science, later renamed the Department of National Education (1960-1969) and eventually changed to the Department of Education and Culture. Due to government policy, the Department of Internal Affairs conducted examinations for "coloured" students, the Department of Education and Training registered "blacks" while Asians resided under the Department of Education and Culture. The Society of Radiographers insisted that all who qualified were eventually issued with National Diplomas.

Two registers, one for trained and one for untrained radiographers were instituted by the SAM&DC (Tompkins, 1962). Registration had initially started in 1945, and the first diagnostic record was in 1953. Separate registers for diagnostic and therapeutic radiographers were evolved from 1958 and the first radiotherapy registration was recorded in 1959. Radiographers form the largest group of the "paramedical professions" (Grové, 1977).

During October 1965, the Federal Council of Paramedical Professions hosted an "open" clinical evening to enable scholars to learn about the various options available to them. It was hoped to make instruction available within and without the borders of South Africa. The need for promoting radiography and recruiting the most suitable scholars remains a top priority for all concerned with training.

The first international radiological congress in South Africa took place in Johannesburg in 1968 and since then the Society of Radiographers has followed the tradition. By the third congress, an education seminar was included.



1974 saw the ushering in of a new era in South African radiography, when the first Professional Board of Radiography was formed. A new constitution for the Society of Radiographers and a National Council was instituted. It was envisaged that these steps would allow radiographers to take their rightful place in the field of “paramedical professions” (Tyrer, 1974). The functions of the Professional Board include promotion of high standards of professional education and conduct, both of which aspects need to be considered when placing students.

Professor E. Levine, on opening the Third National Radiography Congress in Johannesburg in 1974, observed that there was a great need to improve the training of radiographers “to produce a person who is technically adequate” taking into consideration “the enormous advances over the last decade”. He also mentioned “the increased demand in both practical and theoretical content” and “the need for a science background”. Professor Levine had already noted that South Africa was suffering from a lack of manpower in the face of an ever-increasing demand for radiographic services and that some institutions had grown by 255% over a 10 year period. There was, thus, a need for more training schools and tutors.

When the Minister of Health, Dr S. van der Merwe, opened the Fourth National Congress on 29 August, 1975, he emphasised the present and future importance of radiographers in the paramedical professions of the health services. He also stressed the importance of keeping pace with developments in the medical and technological fields. “Training”, he said, “had to expand to meet these needs and, in so doing, should not lose out to the competition which exists for more talented school leavers”.

Both speakers considered similar points significant to the future of radiography and these still need to be considered when recruiting and selecting students today.

Both the Education Committee and the Higher Education Committee of the Society of Radiographers were established in 1975. It was the latter committee which administered the first Higher Diploma in Radiography in South Africa in 1977 (*The South African*

*Radiographer*, 1976). This meant that radiographers no longer needed to travel to the United Kingdom to obtain an advanced qualification.

1977 was to be a year of considerable significance in the history of radiography in South Africa, as it was then, too, that the training for the National Diploma in Radiography was extended to 3 years to comply with regulations governing the duration of National Diploma Courses. MacKenzie (1974) and Le Roux (1976) had already advocated such a step in order to produce a more competent radiographer.

The first radiographers to qualify as tutors in South Africa were recorded in 1977. Schools of Radiography in Johannesburg and Durban used the Colleges for Advanced Technical Education (later to become Technikons), while Cape Town relied on the Cape Technikon since 1987, after initially utilising the University of Cape Town for the purpose of training radiographers as teachers.

All radiographers were placed on a combined SAM&DC register and by 1980 it was compulsory for qualified radiographers and students to be registered.

Johannesburg and Durban commenced ultrasound training but only the latter centre is *functioning at the time of writing this script*. In his opening address at the first Radiography Teachers' Seminar held in Cape Town in 1977, Professor Müller mooted the point of increased costs involved in a 3 year training as against the loss to the profession due to attrition. He suggested the need for more attention to be given to the recruiting of males and generally for more students of all races to be trained (*The South African Radiographer*, 15(3), 8).

The Public Health Amendment Act (Act 42 of 1971) provides that practising radiation workers have to have adequate knowledge and experience and are fully conversant with health and safety measures applicable to electronic products under their control, before they may operate such equipment unsupervised. The radiographer is seen as the Department's ally in helping to reduce unnecessary radiation dose to the population (Le Roux,

1976). This is why it is vital for selection always to be made with reference to the responsible nature of radiography as a career which serves the public.

The motto of the British Society is "*Ex umbris eruditio*" and that of the South African Society is "*Clarius e tenebris*". Both of these can be broadly reduced to: "obtaining clarity from the shadows"—the task of the radiographer.

#### **2.4 THE WORLD HEALTH ORGANISATION (W.H.O.)**

The basic tenet of the World Health Organisation as conceived by the United Nations Organisation in New York in 1946 is: Health for all people is fundamental to the attainment of peace and security (Hutchinson, 1979).

In 1948, the W.H.O. became a specialised agency encompassing six regions, including Africa. The objective of attaining the highest possible level of health by all in this sub-region must extend to radiography, always mindful that health is a complete state of physical, mental and social well-being. This was accentuated by Dr H. Mahler, the Director-General of W.H.O., when he pleaded for primary health care for all by the year 2000 (Alma Ata Agreement, U.S.S.R., 1978).

#### **2.5 THE INTERNATIONAL SOCIETY OF RADIOGRAPHERS AND RADIOLOGICAL TECHNICIANS**

The International Society of Radiographers and Radiological Technicians is a non-profit organisation designated by a symbol featuring a bust of Wilhelm Conrad Röntgen.

The concept of this organisation was first raised in Munich in 1959 but it was only in 1962 that the idea was fully accepted in Montreal with the establishment of this society. South Africa was a founder member.

The aims of the I.S.R.R.T. are to advance the science and practice of radiography, radiotherapy and allied subjects by promoting improved standards of training and research into technical aspects of radiation medicine and protection. It also includes the exchange

of information and the dissemination of results to practitioners throughout the world (Vaithilingam, 1984).

The services of the World Health Organisation include the promotion of medical and technical research and assisting multilateral training programmes for medical and technical workers in the health field. Its support of radiological projects in the technical field was proved when it assisted in the implementation of a basic radiological system specifically designed for developing countries in the Seventies. Even such a basic system requires radiographers operating at the most elementary levels to possess certain basic competencies.

Active partners in the field of radiography/radiology that are associated with the World Health Organisation are:

- (i) *International Society of Radiologists*
- (ii) *International Commission for Radiological Education*
- (iii) *European Association of Radiologists*
- (iv) *International Atomic Energy Agency.*

The combined aim of these bodies is the improvement of education and training in radiography, including clinical and scientific aspects, which will be of benefit to the patient. Radiographers are ably represented at the World Health Organisation through the *International Society of Radiographers and Radiological Technicians*.

From the point of view of the radiography fraternity, the world is divided into 3 zones for administrative purposes and congresses:

- (i) Europe and Africa;
- (ii) the Americas;
- (iii) Asia and Australia.

Since 1966, when the education committee of the I.S.R.R.T. was formed, an educational seminar has been held on a regular four year basis. The topics covered included methods

of teaching, modern approaches to learning, integration of theoretical and practical training, clinical education, the method of teaching specific subjects, patient care, radiation hazards and protection, teaching guides and networks.

The terms of reference of the educational committee are to:

- (i) Co-ordinate educational activities;
- (ii) Arrange academic programmes at world congresses and teachers' seminars;
- (iii) Advise on programmes for regional congresses;
- (iv) Study background material suitable for use in individual countries as guidance in educational and general professional matters;
- (v) Conduct periodic surveys to keep abreast of information on training requirements of member societies (I.S.R.R.T., 1984: 7).

The International Society of Radiographers and Radiological Technicians has been officially affiliated to W.H.O. since 1967 and has collaborated with it on strategies such as "Health for all by the year 2000" and devising a basic radiological system for developing countries.

The I.S.R.R.T. also works in close co-operation with the:

- (i) International Society of Radiologists;
- (ii) European Association of Radiologists;
- (iii) International Commission for Radiation Protection.

In 1968 a World Radiographic Educational Trust was established. Again, South Africa was one of the first donors. The international society was granted the status of a charity in 1979 (I.S.R.R.T., 1984: 6).

## **2.6 THE ROLE OF THE TECHNIKON**

With the introduction of a three year National Diploma in Radiology in 1977, it became apparent that extra teaching space and tutorial staff were needed. Arising out of the

changing pattern of training, a work party was formed under the chairmanship of a senior nurse educator in Cape Town to investigate the rationalisation of radiography training in the Western Cape. The conclusion reached was involvement with technikons, which would provide extra staff both for tutorial purposes and to administer examinations. In 1977 the Cape Technikon became the first technikon to be directly involved in radiography training, and from 1980 the Peninsula Technikon joined in the programme. Radiography is internationally regarded as a highly sophisticated and technically orientated vocation. It was, therefore, accepted that training in this field properly belonged at tertiary level and to the technikons, as institutions aimed at career-oriented education.

In order to appreciate the relevance of these tertiary institutions to needs of training in radiography, their historical evaluation will be outlined briefly.

### 2.6.1 Historical Evolution

The history of “in-service” training has its roots in the British system of apprenticeship. The South African Railways, the Mines and the Chamber of Commerce were among the first employers to have used a similar approach— especially for technical training—the earliest records of technical education dating from 1884 (South Africa: Official Year Book, 1989/90).

By 1922 this type of training was “upgraded” to that of “higher education”, by which time technical colleges had come into existence (South Africa: Official Year Book, 1989/90). These institutions were already semi-autonomous and state subsidised.

True vocational tertiary courses saw their inception in 1955 but it was the National Education Act (Act No 40 of 1967) that finally accepted post-school education (South Africa, 1967). Those technical colleges which were to be accredited were promoted to colleges for Advanced Technical Education. The Van Wyk De Vries Commission (1974) recommended that the latter institutions be treated parallel with universities, albeit different

in the nature of their approach, and in 1983 an Advisory Council for both these tertiary institutions was established.

In 1979 an Act of Parliament changed the status of Colleges for Advanced Technical Education to that of technikons, allowing the latter to offer full tertiary level education and training (Raad van Geesteswetenskaplike Navorsing, 1984). Just prior to this change in status, radiography training in the Western Cape came within the ambit of these institutions for the first time (1977). By 1984 virtually all centres hosting training in radiography were destined to be registered at a technikon (Advanced Technical Education Amendment Act, Act No 84 of 1983) (South Africa, 1983). This act regulates, inter alia, courses of study, examinations and subsidies to technikons. The National Policy for General Affairs Education Act (Act No 76 of 1984) (South Africa, 1984) played an important role in the transfer of radiography training to technikons and by 1989 the Professional Board for Radiography resolved that this would indeed be so.

The Treasury allocates subsidies to technikons based on the number of successful radiography students, making recruitment and selection most important. Radiographers, therefore, are partly accountable for subsidies allocated according to the norms laid down for post-school institutions (SAPSE) and for training hospitals (SAHNORM). The document SAPSE 150 and 151 provide guidelines for credits accorded for academic workload (1988).

In addition, the Education Act (Act No 88 of 1986) has since established a Certification Council to control norms and standards at technikons (South Africa, 1986).

Co-operative education and its relevance to radiography training will be dealt with in chapter three. The effect of professionalism and technology on the above will be considered, before analysing research undertaken in an attempt to compile a more objective approach to procurement and selection of students applying to train and study for radiography.

## CHAPTER 3

### CO-OPERATIVE EDUCATION, RADIOGRAPHY AND TECHNOLOGY

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## CHAPTER 3

### CO-OPERATIVE EDUCATION, RADIOGRAPHY AND TECHNOLOGY

Co-operative education, the profession of radiography and technology are inextricably linked. The following is a discussion of this relationship to highlight its relevance to the ensuing study of selection of prospective radiographers.

#### 3.1 CO-OPERATIVE EDUCATION

Co-operative education refers to the tripartite partnership of co-operation between the educating body, the employing body and the student. In the case of training radiographers, co-operative education links technicians, hospitals/private practices and students.

For co-operative education to function effectively, the technician and the employers need to liaise closely (Van den Berg, 1991: 160), generally by means of advisory committees on which members from both the educational institution and the profession are represented. These need to collaborate with and complement each other, forming an interdependent partnership to facilitate operational activities. Dr Turmeau, on opening the 4th World Conference on Co-operative Education in Edinburgh, stressed the need for more “positive partnerships” (Turmeau, 1985). This concept is also supported by Linklater (1987), Maslarov (1988) and Verbitsky (1988). If this “partnership” is ignored, Levine (1987: 16) warns that the student’s education could then be determined largely by the college and not by the marketplace.

Financial implications must be considered when selecting students, who are the responsibility of the other two “partners” in the theoretical and practical aspects of training. South Africa cannot afford to waste manpower and money due to indiscriminate selection.

According to Van den Berg (1991), co-operative education is based on certain premises:

- (i) Student is exposed to the reality of the work situation.

- (ii) Student normally receives remuneration for work performed.
- (iii) Student performance is supervised and evaluated.
- (iv) Student progress is monitored.
- (v) Total in-service training period, as against theoretical instruction, is predetermined.
- (vi) Student performance is formally examined and the in-service training is taken into account in the award of the diploma.

The implications of each of the above should be considered when compiling a selection battery to meet the needs of the profession.

### 3.1.1 Career Profiles

To ensure that co-operative education meets the requirements of the employment market for radiographers, it is essential to correlate training with the needs of the practising radiographer. Selection of prospective radiographers should, therefore, be objectively related to the needs of the profession. A job profile should be considered before embarking on the design of a procedure to be adopted for recruitment and selection.

The more rapidly a profession changes, the more rapidly the corresponding job profile has to be adjusted as has been advocated by De la Haye (1981) and Laauwen (1985). This is especially valid in a field that is subject to rapidly changing technology. Specifying job content is a prerequisite for identifying training needs and objectives. Job content, in time, provides the motivation for the choice of training methods and media. However, career profiles will stagnate if the training is not regularly validated and updated, which means that the curricula and syllabuses must be reappraised and justified in terms of the future. This concept is supported by Briggs (1977), Mouton & Blake (1984) and Toffler (1971).

### 3.2 VOCATIONAL TRAINING

The basis of co-operative education and of the missions of the technikons is to train persons for careers, bearing in mind that it is the total human being that is to be educated (Van der B Louw, 1991: 1).

It is largely the quality of schooling which determines the academic background of the trainee and this is where the problem lies, especially in South Africa. Not only secondary but also primary school education must be considered the basis of the final “academic” product of the school. There are many other factors, such as personality and aptitude, which also have to be considered and these will be addressed later. The provision of education in the past took formative educational value systems, rather than manpower needs, as its point of departure. This has prompted a questioning of the relevance of educational programmes (Prior, 1990: 1).

According to the Van Wyk De Vries report (1974) the state subsidised each university student by 77,4%, yet only approximately 15% of the school population who completed secondary education at that stage possessed the aptitude to cope with a university course. Moreover, not only pre-vocational education, but also vocational guidance would have to be studied. However, these problems will also be addressed in subsequent chapters.

To obtain employment, both practical experience and theory are necessary, but the former is crucial in practice as it is what the job entails. It is the relationship between theory and practice that determines the calibre of vocational training. Vocational training is rated as being post-secondary education. If the best features of pedagogy (secondary level) and andragogy (tertiary level) can be combined, Mouton and Blake (1984: xii) advise that the advantages be termed “synergogy”. They also point out that the adult learning years start at 12 to 15 years of age (Mouton & Blake, 1984: 1).

Once completed, training equips radiographers to practise on the public—on their human beings. It is, therefore, vital that they not be allowed to obtain the qualification should they

prove lacking in competency. If vocational standards are not upheld by all co-operative partners, unskilled “professionals” will be a danger to the community. No country can afford or should consider such a risk. The certification council needs to uphold standards, with particular reference to examination results and practical training.

### 3.2.1 Status

Vocational problems are sometimes related to what is regarded as personal “status” related to the profession. The public needs to be more aware of the actual position and worth of technicians, which in turn would enhance the image of vocational training.

It is possible that potential radiographers may be lost to the profession and the country because there are still those who view a degree as superior to a “vocational” qualification. This despite the fact that graduates, are unable to obtain employment in which their degree can be used (Rautenbach, 1991). The latter is a serious consideration if the present manpower is to be optimally utilised and if the population is to be educated according to their true ability and aptitude. Realism needs to be encouraged with reference to these students.

At a seminar on Relevant Technological Education in South Africa (August, 1991), Professor Ashley from the University of Cape Town suggested that universities should not dominate tertiary education, while Professor Rautenbach of the University of Stellenbosch advocated one technical university, thereby also rationalising career-oriented education. The latter also warned that South Africans should be willing to accept that everyone is needed for various aspects of employment and that every job is important. “Status”, he said, “should be based on productivity”, and intimated that everybody should be promoted on the premise of their ability to produce results.

To attract the best suited candidates to a vocational career such as radiography, it is essential to enhance the image and status of the training. This, in turn, should improve the professional image of the practitioner and allow selection of more suitable applicants. The

aim is to produce the most productive employees possible—to the benefit of the profession, the patient and the public at large.

### 3.3 TECHNOLOGY

There are many definitions of technology but a comprehensive and particularly apt one was that formulated by Professor Human of Stellenbosch University: “Tegnologie is die volgehoue ekstensie van menslike produktiwiteit (effektiwiteit en doeltreffendheid) deur benutting van artefakte en prosesse”. However, as Shippey (1991) pointed out: “Die mens staan sentraal en nie die masjien nie”.

#### 3.3.1 The Human Factor

Technology is part of everyday life and affects everyone. It can offer distinct advantages, such as broadening of knowledge, to those who are exposed to it; but, on the other hand others who are not directly involved may be detrimentally affected—usually the poor and underprivileged. In South Africa, such exclusion and technological selectivity means a serious loss of sorely needed manpower. The need to utilise the manpower to its fullest potential was referred to in chapter one.

The Council for Scientific and Industrial Research (1989), by virtue of its perception of the impact of technology, interprets the effects of technology as being global, rapid, complex and interdisciplinary. It is emphasised that South Africa must keep pace with technological advances to survive (Du Preez, 1990 and Eksteen, 1991).

Also vital is the need for the population to become technologically literate, i.e. understanding equipment and relevant instructions, including operational ability. The need for print literacy is an essential prerequisite (Morrow, 1991). The new technology is people-directed—educated and skilled people (Wiid, 1990: 27).

Joseph Wood maintains: Technology made large populations possible; now large populations make technology indispensable (Hart, 1991: 41).

### 3.3.2 Technology Versus Science

It has been postulated that technology is not science and vice versa but that it is also not possible to divide the two. Morrow (1991) regards technology as the “motor of history” while science can be seen as the “vehicle”. Technology can also be defined as the application of science. Mathematics and science are viewed as the two supporting pillars of technology, yet a large proportion of South African scholars do not have access to these subjects (Figaji, 1991). However, many schools do not possess electricity, which prevents the use of media such as audio-visual items of equipment. This and the lack of qualified teachers makes the learning and understanding of science and mathematics particularly difficult. These factors all serve to complicate selection of suitable candidates for a profession such as radiography as proper training and later practice both demand skill in understanding and using high-technology equipment and accompanying techniques.

Van der Vyver (1984: 2) advocates that selection for the study of sciences and technology at technikons must be based on scientific principles. He also warns that care must be exercised not to select only on academic merit because of the practical nature of the training.

### 3.3.3 Technology and Education

It becomes more obvious each year that secondary education needs to consider the need for knowledge, which can qualify the pupil to be better suited to the workplace. The generalist is more adaptable than the specialist, an important principle that needs to be considered in radiography training.

A number of countries have already moved in the direction of greater emphasis on technology in education. Japan and Germany were two of the first countries to do so and, with the advent of Eurotechnet, this trend is followed in other European countries. In

Denmark, Dohn & Nystrup (1988:127) advocated that curricula be reviewed to adapt them to the present needs of society, including such rapidly growing areas as biological and technical sciences, human relations and information processing. These have all instituted a “technological” bias to secondary education (Traebert, 1991 and Eksteen, 1991). According to the Walters Report (1990) and the Education Renewal Strategy (1991), South Africa is considering moving in a similar direction.

As the majority of the population can be said to have been educationally “disadvantaged” over the past 40 years, they can only hope for training in other than highly technological fields and hence have already been lost to radiography. Figaji (1991) quotes any group as being measurable by using the “relative handicap factor”. Without education and skills, people cannot become fully fledged members of a technological society and without educated and skilled persons, technology and consequently the economy is liable to fail (Wiid, 1990: 27). The Walters Report (1990) and the document on Education Renewal Strategy (1991) circulating at the present time both make recommendations similar to the foregoing proposals, i.e. to encourage compulsory technological education to at least the level of standard seven.

Such technological bias in the schooling of the population could help remedy current problems, especially for the black population who suffered through the lack of being technologically oriented and, because of their historical lack of technological role models (Figaji, 1991). These historic circumstances, therefore exclude the majority of the population from technology until such time as the “high technology” gap has been bridged and “technological cultural shock” has been overcome.

Selection for technological professions in South Africa needs to be totally objective. As technikons are seen as the leaders in technical and technological education, the maintenance of standards is of prime importance, especially in radiography where patients are affected by the trainee. Kruger (1990: 25) sees an immediate need for a joint venture

between government, the private sector, major institutions and education interest groups to create more technikons as opposed to universities.

### **3.4 RADIOGRAPHY, HEALTH AND TECHNOLOGY**

Ten years ago, when the De Lange Commission published its recommendations, it was stated that there had been an explosion in medical knowledge, science and technology. This continues to escalate and affects the entire population, thus making medical care much more expensive.

The solutions to a high infant mortality rate, the extended survival of modern man, chronic infectious disease (e.g. tuberculosis causing the largest percentage of deaths) (Benatar, 1981) all rely in turn on technology to provide answers. Not least was the South African invention of photofluorography by a radiographer, Captain K G F Collender as a diagnostic aid to T.B. (Collins, 1982: 786).

In the interim, radiography is urgently required to help provide solutions to health problems and, in so doing, it also relies heavily on technology. A vicious circle is created, when selection is curtailed by a lack of technologically oriented and educated applicants.

The forecast of the National Manpower Commission puts the demand for the ancillary medical professions by 1995 at approximately 23 000 (NMC Report RP 98/1987). As radiography constitutes the largest portion of the professions allied to medicine, it is essential that sufficient numbers of radiographers are trained. Rautenbach (1991) warns against the shortsightedness of not training sufficient numbers on the grounds of present day expenditure and advises to always overtrain in order to adequately cover future needs. This is most applicable to the radiographic profession, where the consequences of under-training have been witnessed in the Transvaal and in Canada in recent years. The freezing and abolition of posts only serves to compound the problem.



### **3.5 PROFESSIONAL SCOPE OF RADIOGRAPHERS**

The regulations defining the legal scope of radiographers are set out in section 33(1) of the Medical, Dental and Supplementary Health Service Professions Act (Act 56 of 1974) (South Africa, 1974). This includes diagnostic, therapeutic, nuclear medicine and ultrasound radiographers (Appendix C). The radiography profession is represented on the South African Medical and Dental Council, by the Professional Board for Radiographers.

It is to be noted that certain aspects are common to all disciplines in radiography encouraging a common core to the body of knowledge/skills required:

- patient care
- administration
- radiation protection
- equipment
- drug control.

### **3.6 PROFESSIONS AND PROFESSIONALS**

#### **3.6.1 Professions**

It is said that professions control information which is valuable to the public and, as such, execute key tasks (Goodlad, 1984: 3). Information, such as diagnostic results, frequently calls for effective communication to those less informed; and such communication constitutes a fundamental part of a professional's work.

Central to vocational professions is a special technical competence gained from complex formal education. In the light of the "technological explosion", technical competence needs to be of a high quality. What people perceive as a profession affects the flow of recruits.

It is implied by Becker in Anderson (1974: 5) that a profession knows, maintains, controls and enjoys an esoteric body of knowledge, of which, in one sense, it holds a monopoly.

Kottler (1982) maintains that the phenomenal progress in technology has brought about increased benefits to patients. However, Walton in Goodlad (1984: 45) warns against the progress in science (e.g. discovery of x-rays to computerised tomography) giving rise to a diminished concern for patients as people. The Code of Professional Conduct of the British College of Radiographers (1985) refers to professional accountability in relation to work, patients and colleagues.

### 3.6.2 Professionals

Hughes (1963: 7) stated that “professionals profess to know better than others the nature of certain matters and to know better than their clients what ails them .....”.

The professionals are the agents through which society deals with its major problems and in the case of radiography requires capital investment in technology, e.g. sophisticated x-ray equipment. Therefore it is imperative that professionals continue to change, evolve and to keep abreast with current trends.

According to Anderson (1974: 6), Schein provided a valid summary as to what characterises a professional:

- engaged in full-time occupation
- strong motivation and lifetime commitment
- specialised body of knowledge, acquired during prolonged period of education and training
- decisions made on behalf of client
- service orientation in absence of self-interest
- service based on objective needs of client and mutual trust
- autonomy of judgement of performance based on ethics, professional standards and codes of conduct
- knowledge is specific as defined by training
- not allowed to advertise.

Professional associations define criteria for admission, educational standards, formal entry examinations, registration, career structures and areas of jurisdiction. As radiography is classified as a profession (Watson, 1985: 289), the aforementioned qualities cited above should be considered when selecting prospective students.

In the light of the foregoing problems and in order to obtain information pertinent to possible improvements to the selection procedures for radiography students, the principles of procurement will be discussed in chapter four.

## CHAPTER 4

### PRINCIPLES OF PROCUREMENT RELEVANT TO RADIOGRAPHY

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## CHAPTER 4

### PRINCIPLES OF PROCUREMENT RELEVANT TO RADIOGRAPHY

Before investigating the desirable required qualities for selecting prospective student radiographers, it is necessary to refer to the principles of procurement of employees. Procurement needs to be preceded by the establishment of whether there are actually any vacancies and whether these may/have to be filled.

#### 4.1 PROCUREMENT

The dictionary definitions of procurement are: “to contrive to obtain” (Chambers) and “to succeed in getting” (Oxford). Flippo (1984: 113), within the context of organisations, endorses these general definitions by referring to procurement specifically as “determining the type (and number) of persons to be hired”. This procedure is also called “manning” (Institute of Personnel Management Study Guide).

Procurement formed a fundamental principle in Plato’s *Republic*; and as early as the 16th century, the writer John Huarte mentioned personnel selection. Even Münsterberg in the early 20th century mentioned procurement almost as if he anticipated the later developments in industrial psychology. During and after the world wars, intensified psychological testing was used—with the emphasis on intelligence and psycho-motor skills.

Before prospective job incumbents can be appointed, it is necessary to plan for recruitment and selection. In so doing, it is advisable to first analyse the job in order to ensure that applicants are hired on a scientific basis. It is also necessary to plan the constructive utilization of human resources, taking into account demography, the economy, as well as technological and social trends. Human resources are considered the most important assets to employers (Beach, 1975: 219).

## 4.2 JOB ANALYSIS

A job can be defined as a collection of tasks, which constitutes the work of one person (Plumbley, 1978: 19). Reference to a job analysis is an attempt to prevent the appointment of the wrong type of person in a particular position. By assessing the content of the job, guidelines can be compiled for the desired qualities required from prospective candidates. (Beach, 1975: 199) maintains that it is necessary to determine not only the tasks that comprise a job, but also the skills, knowledge, abilities and responsibilities needed for successful performance.

When compiling such an analysis, it is important to take into account:

- (i) the purpose of the job;
- (ii) the position of the employee in the organisation;
- (iii) the principal duties and responsibilities of the employee;
- (iv) specific tasks which need to be performed;
- (v) working relationships with other sections and departments;
- (vi) the physical and social environment in which the job is to be performed;
- (vii) the mental and physical requirements to do the job.

To identify the requirements needed to perform a specific job, a job analysis can be done.

This consists of:

- (i) a job description and
- (ii) a job specification.

The methods considered best for obtaining a job analysis comprise the use of questionnaires, interviews and observation. This is particularly true if these methods are applied well, as these methods, if correctly applied, help to reduce any suspicion the respondents/interviewees might harbour towards such an investigation (Flippo, 1984: 116).

#### 4.2.1 Job Description

A job description is an organised factual statement of purpose of what is done, how it is done and why it is done. It includes the objectives of the work and duties, operations and procedures carried out (De la Haye, 1981: 209).

When describing the duties prescribed by a job, it is advisable to identify and to concentrate on the important issues (the crux of the job) only. Time spent on particular aspects is worth noting and these can be scored on a basis of one to ten (Milne, 1979). Certain standards of performance have to be achieved in a given time.

Job descriptions are, therefore, important for procurement, job evaluation, performance appraisal and for training. However, to be of value, these descriptions need to be reassessed at regular intervals, especially if there are changes in job content.

Allen (1987: 4) maintains that there is no better guide for recruiting, selecting and appraising performance than a realistic, carefully written "position charter".

#### 4.2.2 Job Specification

A job specification encompasses the qualities required in a person to be able to perform the job satisfactorily. These are the basic requirements needed to completely carry out relevant tasks. Flippo (1984: 114) defines a job description as: "The minimum acceptable human qualities necessary to perform the job properly. These clarify the type of person needed to avoid the tendency of drawing up an over-idealised specification".

Attributes to be considered should be divided into those which are:

- (i) essential,
- (ii) desirable, and
- (iii) contra-indicated.



Two classifications of human attributes were popularised: the seven-point plan by Professor Alec Rodger and the five-point plan by T.M. Fraser (Plumbley, 1978: 24). Rodger listed:

- Physique, health and appearance
- Attainments (educational, skills, knowledge and experience)
- General intelligence
- Special aptitudes
- Interests
- Disposition
- Circumstances.

However, Russell (1987: 128) also suggests:

- Age range
- Motivation.

The person's specification and career profile should enable recruitment to be more objective, but Allen (1987: 5) warns that environmental considerations may affect performance.

### **4.3 RECRUITMENT**

Before recruitment can be put into practice, it is essential to know the nature of the job requirements. This information pertaining to the nature of the job can largely be obtained from a job analysis.

Recruitment is a process of searching for employees and stimulating them to apply for jobs (Flippo, 1984: 144). However, Milne (1979) stresses the importance of finding the right persons. The success of such a recruitment programme can be evaluated by the end result, as can the development and maintenance of manpower sources.

It is essential to attract candidates on the basis of providing as much relevant information as possible in order to enable them to take well-informed decisions. Advertising is a

powerful tool of recruitment, but inefficient methods carry the penalty of squandered expenses and hence cost (Plumbley, 1978: 41). Whichever method of advertising is used, it must attract the right people to stimulate them to apply for a particular position. All information disseminated during recruitment programmes must be factually accurate and psychologically attractive but realistic. Milne (1979) also suggests that if recruitment is not honest, it is unethical and shortsighted.

Good administration of a recruitment project contributes to a large extent to good selection.

#### 4.4 SELECTION

Again, it is essential to refer to the job analysis to assist in matching the right person to the job. This is also emphasised by Reeve in Basson (1981: 5).

The objective of selection of prospective employees is to sort the applications so as to eliminate as soon as possible those judged to be unqualified to meet the job requirements. To expedite this process, it is possible to screen these applicants through preliminary selection.

Beach (1975: 239) advises that the whole person should be judged before rejecting an application, as human beings are too complex for single gauges to be effective or accurate. Socher in Fransman (1990) reported that there is a widespread feeling that matriculation should not be the sole criterion for admission.

There are a number of methods which can be employed to make selection more comprehensive and as many of these as possible should be used. Biographical questionnaires and confidential reports/references are examples of obtaining certain information but interviewing candidates is a prime consideration, as there are attributes which cannot be identified on paper. Psychometric tests may also be valuable.

The selection process is time consuming and expensive, hence the consequences of faulty selection need to be weighed, as the results are wasted time and money for both employer and employee (Refer to the formula of the cost of attrition by Searle in chapter one).

Before pre-selection or final selection occurs, it is necessary to gain maximum information on the candidate. This is why biographical questionnaires forming part of the application form, confidential references and testing should be considered before interviewing the applicant. The final decision on which applicants to select should be made by the largest number of people affected by the job.

#### **4.5 BIOGRAPHICAL QUESTIONNAIRE**

The application form is a valuable basic selection instrument, which should be completed in the applicant's own handwriting.

As much information as possible is required to assist with the initial screening process. Questions should therefore cover all the relevant aspects. However, questions should be kept simple, should discourage dishonest answers and neither be superfluous nor irrelevant. The manner in which questions are couched and the consequence of these questions should cater for the level of applicant, e.g. school leavers, who constitute the majority of applicants.

Information that may be requested:

- Personal particulars—including health
- Background (historical, social)
- Education—secondary/post-school/tertiary
- Vocational training
- Employment history
- Leisure interests
- Reason for application
- Self-assessment.

Such data may serve to provide provisional indicators of evidence concerning biographical data, personal circumstances, career pattern, attainments, self expression, interests, intelligence, aptitudes, behaviour patterns and preferences. At this stage, it is possible to identify those candidates who may safely be qualified from further consideration or recount of their lack of essential requirements.

Additional information may be gleaned from references, interviews and further tests to support the provisional data inventory.

#### **4.6 REFERENCES**

References are considered to be valid only if they are confidential and candid. To encourage confidentiality, stamped and self-addressed envelopes should be provided for the return of the testimonials/references to the employer.

Responsible representatives of schools, tertiary institutions and former employers are usually the most reliable sources of information. There is doubt as to the value of "social" references completed by friends of the family, etc. Those from e.g. organisations of religion and clubs can be accepted as extra sources of information. References and medical reports need only be requested once the original screening on paper has been finalised, so as not to waste the time, effort and money of applicants.

#### **4.7 INTERVIEWS**

Interviews, although the most widely used single method of selection for employment, can prove unreliable because of their subjectivity (Flippo, 1984: 155). Therefore it is vital that every endeavour towards maximum objectivity is made, bearing in mind that a human being is assessing fellow human beings. Structured interviews are vital to ensure objectivity, by allowing each interviewer to ask specific questions and to follow a set pattern. Interviewers should, preferably, be trained in the art of objective interviewing (Beach, 1975: 241).

The interview provides an opportunity for not only checking and discussing data, but for those qualities which are not readily apparent on paper, e.g. physical characteristics, speech, voice, communication, oral expression, dress, general appearance and manners.

#### 4.7.1 Preparation

All relevant information should be integrated beforehand. Great benefit is derived by approaching the interview carefully prepared and with good interviewing skills (Bowden & Miller, 1979: 107).

Although Beach (1975: 241) recommends having the results from practical or psychometric tests available for the interview, this is not always practicable or possible. As such tests are very expensive and time consuming, they are best applied only to those interviewees who may possibly be acceptable after the initial interview.

#### 4.7.2 Physical Setting and Conducting of Interview

A private, comfortable environment, conducive to stimulating mental rapport and communication, is essential. However, the interviewee should be seated so as not to be able to see what the interviewer is writing.

To encourage communication, the interviewer should listen attentively and projectively and should avoid closed-ended or discriminatory questions. Thought-provoking statements should also be included.

Types of body language (kinesics, oculosics and proxemics) should not be underestimated in both the interviewer and the interviewee, as signs of e.g. nervousness, impatience, irritation, etc.

Interviews should commence punctually and be timed but should appear relaxed and unhurried. Interruptions such as visitors or telephone calls should be discouraged (Bowden & Miller, 1979: 108).

Notes should always be taken during the interview to record details while fresh to the mind of the interviewer. It also helps the applicant feel that his/her application is seriously considered. A tape recorder could be used, but is likely to make the applicant self-conscious. Allowance needs to be made for nervousness in an ego-threatening situation (Cape Technikon, 1987: 8). Plumbley (1978: 145) also warns that care should be taken to avoid bias, prejudice and the “halo” effect (allowing views on the previous candidate to colour those to be made on the present candidate) when interviewing many candidates and so lose objectivity.

#### 4.7.3 Number of interviewees

It must be decided who is to be present at the interview and how it is to be conducted. This will depend on the level of the job applied for and it is recommended that it should not be too intimidating for school leavers, who have not yet been exposed to much of this kind of experience.

Opinions on the ideal number of people who should be involved in an interview vary from 1 to 5. Easy rapport is established in a one-to-one situation, but 2 or more offer the advantage of reduced subjectivity. However, the more trained people involved in interviewing and selection, the more objective the interview is likely to be.

#### 4.7.4 Assessment

Plumbley (1978: 137) recommends 3 objectives:

- (i) to establish whether the candidate is suitable for employment. This is supported by Milne (1979: 72) who advocates elimination into those candidates who are obviously weak, those who are somewhat doubtful and those who are strong possibilities;
- (ii) to ensure that the candidate has an accurate picture of the job; and
- (iii) to conduct the interview in such a manner that the candidate feels that it was a fair hearing.

The skilled interviewer will gather the facts and carefully relate them to the needs and requirements of the job, without jumping to conclusions (Bowden & Miller, 1979: 108).

Evaluation should be performed as soon as possible after the interview, while the impression made by the candidate is still fresh in the mind of the interviewer(s). Interviewees should also be informed of the outcome of the interview as soon as possible.

Telephonic interviews can be arranged for those applicants who for genuine reasons are unable to attend.

As a pre-selection tool, interviews are a valuable means of initial screening of those applicants:

- (i) who do not measure up to the job requirements
- (ii) on whom it is considered worthwhile to conduct further tests.

#### 4.8 TESTING

Testing is defined as an objective, standard, careful measure of a sample of behaviour (Anastasi in Owen & Taljaard, 1988: 11). Psychometric testing is expensive and time consuming. However, if it can be afforded, it should be used on those applicants who have already survived a stringent initial screening process. In the United States of America it was found that the use of tests to measure an applicant's inherent or acquired abilities has increased by 80%, while the use of references had declined to less than 50% (Institute of Personnel Management, undated: 7).

It is important that tests used are objective. Objectivity relies on reliability and validity. Reliability is indicated by the reliability coefficient obtained when a test gives the same consequential results. To ensure validating of tests, it is recommended that the size of the sample to be tested should not be smaller than 30 (Flippo, 1984: 167), although Owen & Taljaard (1988: 23) maintain that smaller groups raise the standards of selection.

For a test to be standardised implies uniformity of procedure in administering and scoring the test (Anastasi, 1968: 23).

Owen & Taljaard, however, warn that it is a legal requirement that such tests be controlled by a professional qualified to conduct the tests. He/she must also analyse the results obtained, with reference to tables of norms to allow comparison with other people of similar age and education (Act on Doctors, Dentists and Supplementary Health Groups, Act No. 56 of 1974) (South Africa, 1974). Qualified persons are registered with the Professional Board of Psychology under the SAM&DC. Prospective candidates are therefore warned of “bogus” personality and aptitude testers and tests.

There are three stages involved in the interpretation of test results:

- (i) actual scores are related to appropriate norms;
- (ii) test performance is compared with earlier record;
- (iii) results are related to job requirements.

The factual information is especially valuable when selecting for training courses of lengthy duration and can be helpful in selecting those mature students most likely to respond to training (Plumbley, 1978: 165).

However, Owen & Taljaard (1988: 70) emphasise that the ethics of psychology should always be borne in mind when considering using psychometric testing, i.e. (i) all people are the same in certain respects, because as human beings they share certain traits; (ii) some people have the same characteristics but differ between groups and (iii) every person is unique.

Therefore, test scores should not be used as the sole criterion for selection but should supplement and strengthen the tools mentioned earlier in this chapter.



#### 4.8.1 Main Types of Tests

According to Act 56 of 1974, psychological tests are divided into 3 types, viz. A, B and C, and each may only be used by specifically qualified persons.

“A” tests are mainly tests of learnt intellectual abilities. However, scholastic achievement tests, which are not psychological tests, are not covered;

“B” tests are mainly tests of primary cognitive abilities; and

“C” tests are mainly personality tests.

Psychometric tests are further divided into 5 main categories, classified according to the type of human behaviour to be measured. These are:

- (i) Intelligence
- (ii) Aptitude
- (iii) Achievement
- (iv) Vocational
- (v) Personality

There are different types of tests consisting of various methods for measuring the above qualities. Those tests considered most relevant to procurement of radiographers are:

##### 4.8.1.1 Intelligence

Intelligence is thought to be determined by physiological processes in the brain which are considered to be affected by genetic and environmental factors.

This category of test includes the measurement of mental ability, learning ability, verbal competency, word fluency and memory.

Although there are differences of opinion on the best single index for measuring intelligence, Spearman’s g-Factor is the most generally accepted universally.

Intelligence quotient (I.Q.) can also be calculated from aptitude tests (Owen & Taljaard, 1988: 163).

#### 4.8.1.2 Aptitude

Aptitude is related to the ability to learn work of a specific kind. Aptitude therefore depends on the conditions or characteristics of an individual's ability to acquire, with training and practice, interest, attitude and motivation, some specified knowledge or skills to achieve a certain level (Owen & Taljaard, 1988: 146).

A Senior aptitude test (S.A.T.) consisting of 12 tests can give an indication of verbal appreciation (understanding); calculation (numerical ability); vocabulary; comparisons; pattern completion; speed of perception; spatial visualisation (2-D and 3-D); memory and writing speed. Visual perception is particularly significant in radiography, as has already been mentioned by Jones (1977) and Adrian-Harris (1979).

Raw marks obtained from test results are converted to a stanine form. This ensures greater accuracy without losing finer detail.

Psycho-motor skills, including manual dexterity and hand-eye co-ordination, are particularly difficult to isolate for measurement. No single test suffices for all permutations, but specific tests can be devised by psychologists to measure specific items pertaining to particular demands of a job.

#### 4.8.1.3 Interests

The range of interests that a candidate should possess in order to be better suited for a particular job or vocation can also be measured. A test commonly used consists of an inventory of 19 fields of professional interest.

Very broadly, the 19 categories of interest for which persons can be tested are: fine arts, performing arts, language, historical service, social work, sociability, public speaking, law,

creative thought, science, practical—male, practical—female, numerical, business, clerical, travel, nature and sport. There are also tests available to assess attitudes and adaptability to individuals and environment (PHSF) and anxiety (IPAT) (Fourie, 1990a).

#### 4.8.1.4 Personality

The concept of personality is the most difficult aspect of a human being to measure. It is far too broad to be capable of meaningful definition (Institute of Personnel Management, undated: 52). An individual's personality includes intelligence, knowledge, skills, habits, attitudes, likes and dislikes, needs, goals, beliefs and much more. What is important, is the individual's ability to adjust to the work situation.

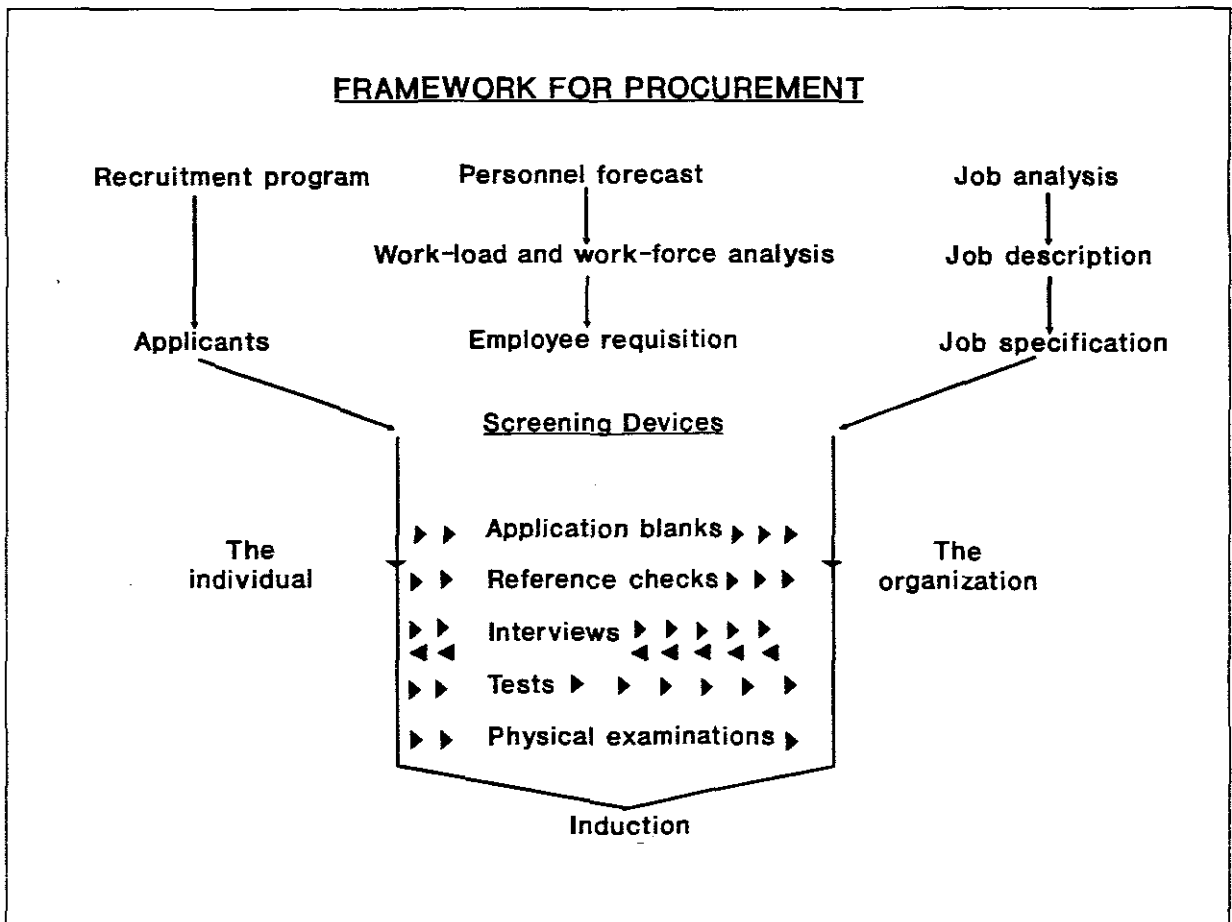
The Institute of Personnel Management guidelines on manning (undated: 52) suggest that the most useful way to consider personality is to look at it in a dynamic sense, as the result of the interaction between the basic drives of an individual endowed in a particular way, with the requirements of the culture in which the individual has grown up. The drives of man are largely controlled by the will and by motivation, and may be classified into:

- (i) Instinctive, organic needs.
- (ii) The need for activity.
- (iii) Emotional needs.

As there is no real measurement for personality, only those aspects which are important from an occupational point of view are normally assessed, the most relevant of these being motivation and interpersonal relationships.

Figure 4–1 summarises the necessary steps for the procurement of personnel.

Figure 4-1



Source: Personnel Management (Flippo, 1984).

#### **4.9 PRESENT PROCUREMENT SITUATION IN RADIOGRAPHY**

Information gained from interviews held during 1990 and 1991 with radiographers in charge of training centres throughout South Africa and with senior radiographers at Groote Schuur Hospital, revealed the following:

- (i) There was no universal or standard procurement procedure among these centres, but
- (ii) there were similarities in the approach used for procurement at most centres.
- (iii) There was a general desire to improve procurement and/or procurement procedures.
- (iv) As a job analysis had not been carried out, procurement lacked an objective basis.
- (v) Assertive recruitment was not practised.
- (vi) Psychometric testing was not employed.

To determine the qualities which would enable a radiographer to cope with the type of work required, it was decided to distribute questionnaires to a cross-section of qualified radiographers throughout Southern Africa.

The importance of various aspects of work encountered by radiographers was rated by an ideographic study involving senior radiographers.

Chapter five will deal with the design of the questionnaire, while chapter six will cover the analysis of the responses to the questionnaire.

Chapter seven will deal with the implications of the responses obtained from the questionnaires and these will then be used to formulate a procurement and selection procedure for prospective student radiographers based on the principles of procurement as discussed in this chapter.

## CHAPTER 5

### INVESTIGATION OF QUALITIES REQUIRED FOR PROSPECTIVE STUDENT RADIOGRAPHERS

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## CHAPTER 5

### INVESTIGATION OF QUALITIES REQUIRED FOR PROSPECTIVE STUDENT RADIOGRAPHERS

#### 5.1 INTRODUCTION

Radiography is a discipline to which many aspects of the well-documented taxonomy of Bloom applies i.e. knowledge, skills and attitudes (Bloom, 1979). Within radiography as a caring profession, these aspects could be classified under the popular nomenclature of “head, hand and heart”, i.e. cognitive, psycho-motor and affective, with the accent on “heart”. However, there are also many qualities beyond Bloom’s taxonomy which need to be considered.

A questionnaire was designed with a view to ensuring a more objective method of compiling a procurement and selection procedure. Later in this chapter both the questionnaire and the analysis of results obtained by means of it will be dealt with.

In addition, personal or telephonic interviews were also conducted with radiographers in charge of schools/colleges of radiography throughout South Africa during 1990 and 1991 (Appendix B).

#### 5.2 THE QUESTIONNAIRE

Questionnaires were circulated to a cross-section of qualified radiographers to obtain opinions based on experience. These would provide an indication of qualities deemed necessary for student radiographers. Many of these would also apply to qualified staff—with due consideration of career profiles and the professional scope of a radiographer.

### 5.2.1 Design of questionnaire

The questionnaire was anonymous, bilingual (English and Afrikaans) and as “user friendly” as possible. A semantical differential scale of 1 to 5 as devised by Osgood, accommodated respondents who did not wish to express pronounced opinions (Schutte, 1991: 8).

A covering letter from the head of the Division for Radiation Medicine at Groote Schuur Hospital and a page explaining the reasons for the research was attached. The latter also contained instructions on how to complete the questionnaire and a deadline for the return of the completed document. *These dates differed slightly, depending on when the various batches were dispatched (Appendix A).*

## 5.3 DISTRIBUTION AND RESPONSE TO QUESTIONNAIRE

### 5.3.1 Distribution

There are approximately 3680 radiographers registered with the South African Medical and Dental Council, of whom over 3000 are diagnostic and just over 100 are therapeutic. The remainder includes nuclear medicine and ultrasound. During March, 1991, questionnaires were distributed to 2000 prospective respondents selected to cover all of the fields of specialisation mentioned, and to include the following major types of bodies in South Africa and neighbouring states:

- state
- local authority (e.g. council)
- mining
- military
- university
- technikon
- hospital
- private practice



The institutions covered varied in size and operated as general, specialised and/or training faculties. Even radiographers who were known to have retired, had left the profession or were unemployed, were also invited to participate in the survey, as their responses could have proved a corrective on responses by practising radiographers only.

### 5.3.2 Response

A total of 1020 questionnaires (51%) was returned providing universally acceptable statistics for nomothetic research purposes.

Because respondents did not all complete certain selections or sub-sections to the questions, the responses will not always total 100% of the number of questionnaires returned, but this deviation has been compensated for in the analysis. The raw data was computerised as statistics based on proportion of the responses rather than simply the final majority or minority.

## 5.4 INFORMATION REQUESTED

The questionnaire was divided into 3 sections. Information gained from each will form the basis for recommendations, to be set out in chapter 6.

Section A covered professional information on employment and prior knowledge of radiography by the respondent in an effort to assess the success of recruitment for and promotion within the profession.

Section B was designed to obtain data on scholastic particulars, e.g. school subjects and studying as well as responsibility attaching to positions held.

Section C was devised to cover personal, physical, social, economic, extramural and employment aspects. This would allow maximum information to be obtained on what the radiographers consider necessary to practice successfully.

Wherever feasible, space was left for suggestions, which proved extremely worthwhile and will be discussed in conjunction with the analysis.

#### 5.4.1 Professional Information (Section A)

##### Language

71,5% completed the questionnaire in **English** and 28,5% in **Afrikaans**.

##### Rank

**Rank** ranged from radiographer (57,6%) through senior (24,9%) and chief (8%) to that of control (2,1%). It included those engaged in training plus lecturers and senior lecturers (Total = 3,6%).

Two nurses who are involved in producing radiographs and 37 radiographers presently not employed or employed in other capacities also responded (3,8%).

Questionnaires which were submitted by third year students from private practices had to be ignored for the purpose of this study, as only qualified radiographers could give opinions based on sufficient experience.

##### Employer bodies

These included state and private hospitals (70,3%), radiological private practices (22,1%), day hospitals (0,7%), City Council clinics (0,2%), The Department of Health (1%), the Medical Bureau (0,1%), the Medical Research Council (0,2%), the mines (0,1%), technicians (0,7%), universities (0,7%) industry (0,2%) and research (0,1%).

3,6% of respondents were unemployed.

##### Knowledge of Radiography Prior to Radiography Training

Of the 1108 respondents to this question, 64,3% indicated that they had known “**more or less**” what radiography entailed, while 18,9% confirmed that they **had known** exactly what was involved. However, 16,8% had **no idea** of what radiography involved.

#### 5.4.2 Scholastic Information (Section B)

##### Matriculation Subjects Most Suitable for Radiography.

Interest was expressed in all matriculation subjects and suggestions were made as to subjects not listed in the questionnaire (Figure 5–1 and Appendix D).

**Other subjects suggested** by respondents were the following:

- psychology (this subject heavily outweighed the others)—one respondent specified clinical psychology
- public relations (2nd)—one respondent preferring “human relations”
- anatomy (3rd)—one respondent indicated anatomy as studied in art/ballet
- chemistry (4th)
- photography (5th)
- first aid (5th)
- physical education (5th)
- communication
- ethics
- physics
- economics
- book keeping
- general knowledge

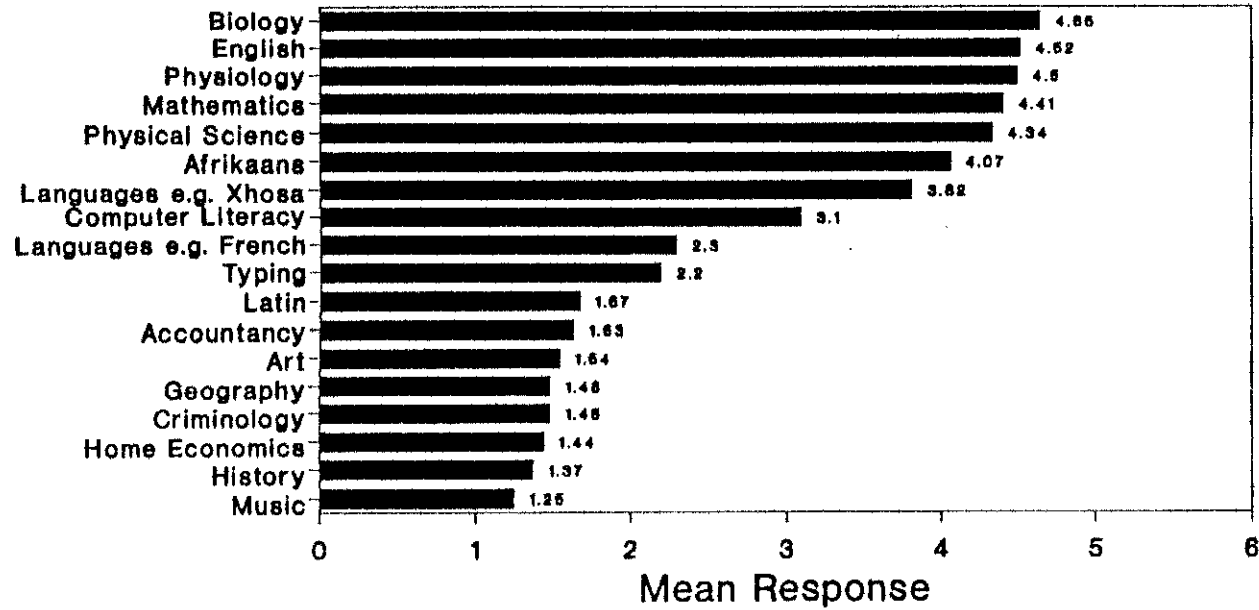
##### University Exemption

77% considered an exemption necessary.

##### Effective Study Habits

60,6% thought it **most important** for student radiographers to be capable of effective study habits.

## The Relevance of Matric Subjects to Radiography



Note: The mean response for each question was calculated using the number of respondents to each scale category as a percentage of the total respondents to each question.

Figure 5-1

### Position of Responsibility at School

This was an example of where a scale of 1 to 5 proved most effective; 43,2% chose the **middle** of the scale, but 26,9% opted for a **rating of 4**.

### Membership of Clubs and Societies

Again, the majority (46,8%) voted for the **average** rating while 22,1% selected a **rating of 4**.

### 5.4.3 Personal Information (Section C)

#### Importance of Commencing Training Immediately After Matriculation

On average 33,8% of respondents expressed a preference for the **age of 18**. Further along the scale (4) was 24,2% and (5) equalled 25,1%.

#### Age at Which it is Considered too Old to Commence Training

A total of 992 respondents answered the question as it was asked, but some others preferred to add their own comments, e.g. older than 50, never too old, depends on individual. The total number of responses therefore finally exceeded 992.

The majority (43,4%) felt that **40** was **too old**. However, 33,1% thought that the maximum age should be 50 while 25,4% opted for the age of 30.

#### Choice of Sexes

**Both sexes** was the choice of 80,6%. Females were preferred by 18,7%. Only 7 (0,8%) indicated preference for males. One respondent was of the opinion that they could give “problems” but did not elaborate. The reason some respondents preferred females was the salary considered too low for breadwinners.

#### Fixed Proportion of Males

A total of 998 was divided into 76,1% **negative** and 23,9% positive replies.

### Percentage of Males

The percentage of males considered for employment varied from 0-100. The largest number of radiographers (45,1%) thought that **50%** was **preferable**. 31,2% of radiographers followed with a choice of 40% males.

One who would like 80% of the appointees to be male, also suggested that this should be considered with a predominantly Black establishment.

### Marital Status

Most (60,2%) felt that either **single or married** students could be selected, while 39,5% thought they should be single.

### Children

53,4% thought it was better **not to be parents during training** but 46,3% felt it was not relevant. A number of comments intimated that students with families including children was acceptable, provided that the children were at an age where they were more independent or provided that there was a good support system at home.

### Physical Qualities

- Health

Virtually everybody (82,5%) agreed that good health was **necessary** to cope with a profession such as radiography.

- Mass

Cognizance was taken of the possible ambiguity of the question pertaining to mass when analysing the results. The wording overweight was interpreted by most as being that it was important for a radiographer **not to be too heavy**. One radiographer also mentioned the significance of being **underweight**.

Of the 1003 who answered the question, 33,8% were **non-committal**, while 24,4% thought that mass was most important and 23,1% opted for 4 on the scale.

- Height

A somewhat different pattern emerged here. The majority (38,3%) was **non-committal** but 24,4% regarded height as being unimportant, while 15,3% and 15,2% rated it as 2 and 4, respectively.

- Strength

Again the majority (37,2%) chose the **middle of the scale**, but the leaning was towards the higher ratings: 32,5% (4) and 18,9% (5), respectively.

- Fitness

Of the total number of respondents, one took health to include fitness. However, 35,7% were of the opinion that fitness merited a **4 on the scale**, while 30,6% saw it as being **most important**.

#### Additional comments

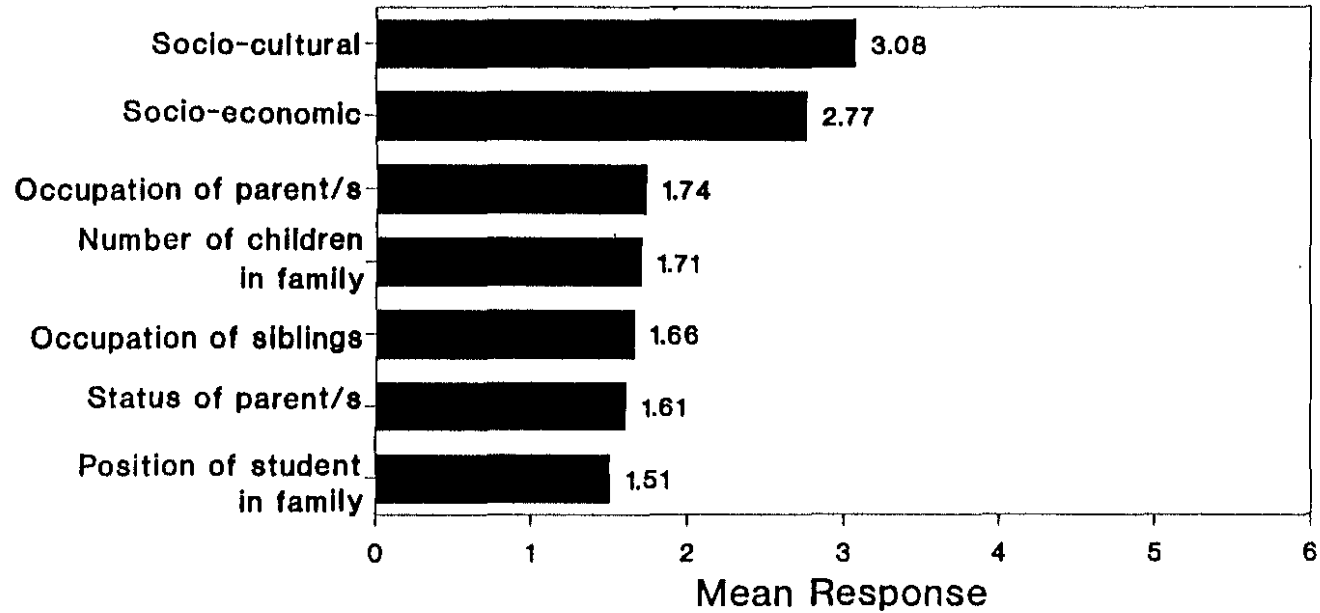
These included the need for the following (not in order of importance):

- history of family health
- no physical disability/handicap
- strong constitution
- no back problems
- healthy feet
- good eyesight
- mobility/active/ability to work quickly
- non-smoker
- mental attitude/psychological health/ emotional stability/well-adjusted personality
- alertness

#### Background

**Socio-cultural** and **socio-economic** considerations were rated as being most likely to affect a student's ability to cope with training for a radiography course (Figure 5–2 and Appendix E).

## The Relevance of Background to Radiography



**Note:** The mean response for each question was calculated using the number of respondents to each scale category as a percentage of the total respondents to each question.

Figure 5-2



### Personal Characteristics

The questionnaire indicated that there are many characteristics which are considered necessary for radiographers to possess. The combination of **qualities** which were **most highly regarded** are:

- responsibility, conscientiousness and integrity
- co-operation
- punctuality and regular attendance
- ability to accept discipline, take orders and be self-disciplined
- attitude to colleagues of all ranks
- perseverance and ability to work without supervision
- ability to cope with stress
- communication and listening skills
- empathy
- neatness

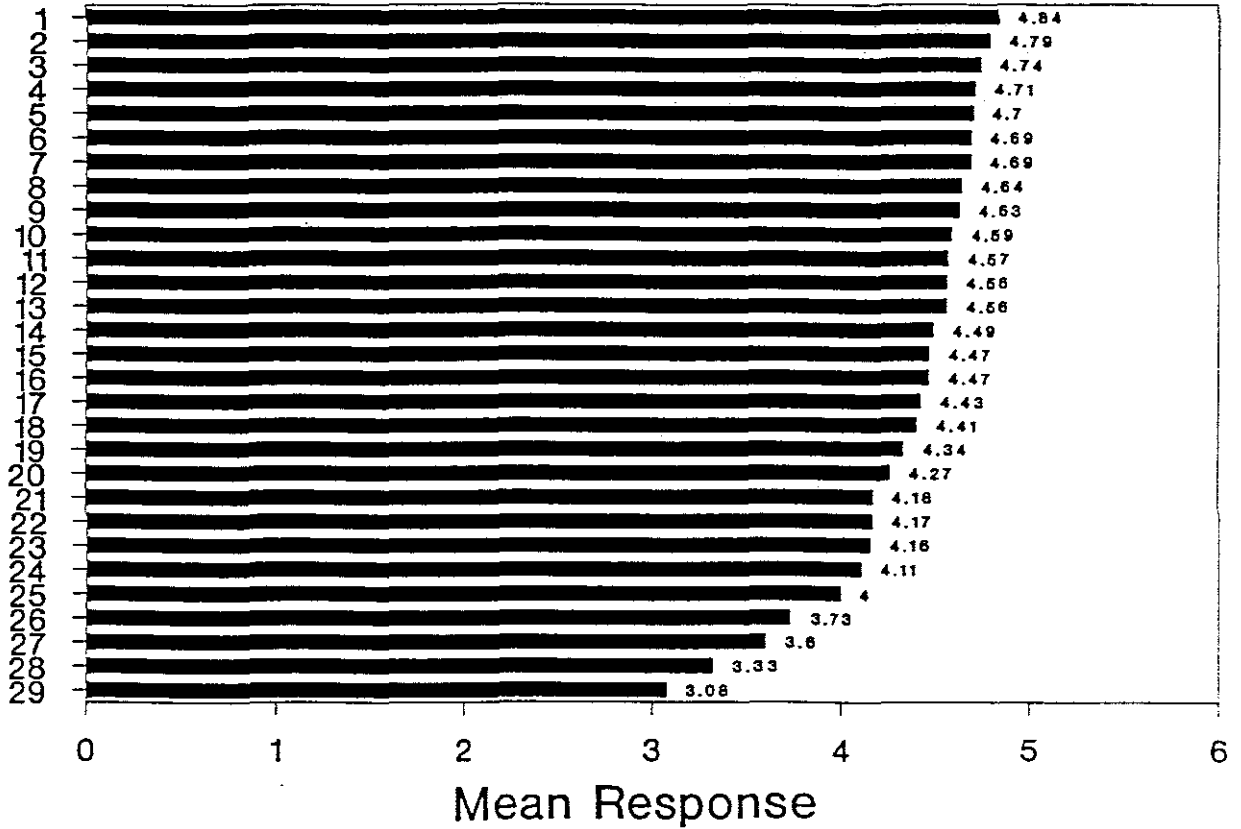
(Figure 5–3 and Appendix F).

**Additional suggestions** received ranked by frequency were:

- patience (outweighed other suggestions)
- initiative, sense of humour and unselfishness (2nd)
- adaptability (3rd)
- ability to cope in emergency, common sense, compassion, intelligence and sympathy (4th)
- ability to work with others, ability to accept criticism, attitude to patient, charitable, confident (not possessing inferiority complex), creative, even-tempered, practical and religious (4th)
- ability to work with all ages, honourable, industrious, having insight, interested, logical, mature, no alcoholic or criminal record, positive, reliable and willing to learn.

Figure 5-3

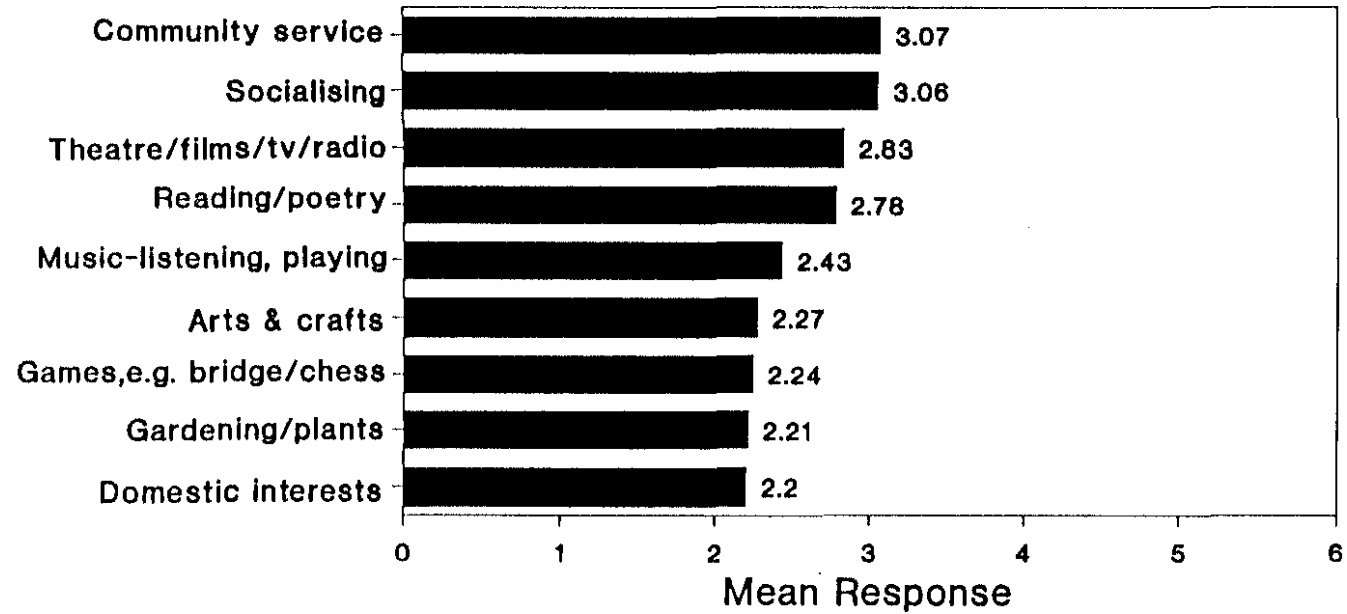
## The Relevance of Personal Characteristics to Radiography



Note: The mean response for each question was calculated using the number of respondents to each scale category as a percentage of the total respondents to each question.

- 1 -Responsibility
- 2 -Co-operation
- 3 -Punctuality
- 4 -Discipline - self
- 5 -Discipline-ability to accept
- 6 -Attitude to seniors
- 7 -Conscientiousness
- 8 -Superv.-ability -work without
- 9 -Attitude to Juniors
- 10 -Perseverance
- 11 -Attitude to peers
- 12 -Human relations
- 13 -Attendance-regular
- 14 -Stress-ability to cope with
- 15 -Integrity
- 16 -Commun. e.g. to express self
- 17 -Orders-ability to take
- 18 -Empathy
- 19 -Neatness
- 20 -Listening skills
- 21 -Stamina
- 22 -Orders-ability to give
- 23 -Manual dexterity
- 24 -Blood-ability to cope
- 25 -Appearance
- 26 -Speech e.g. Accent/grammar/tone
- 27 -Leadership
- 28 -Extroversion
- 28 -Introversion

## The Relevance of Hobbies or Interests to Radiography



**Note:** The mean response for each question was calculated using the number of respondents to each scale category as a percentage of the total respondents to each question.

Figure 5-4

### Hobbies and Interests

Although respondents did not think that hobbies and interests should strongly influence the selection of future students, the following were rated as **most relevant** to radiography: Community service, socialising, audio-visual interests and reading (Figure 5–4 and Appendix G).

### Sport

The preference of 993 respondents divided into 62,7% **positive** and 37,3% negative replies. Of the 713 who felt strongly enough about sport, 65,2% were **not committed to social or competitive** participation. However, 31,7% preferred social contact through sport. Of those who expressed an opinion, most **did not feel strongly about individual or team** sport but 30,7% did in fact think that team sport was preferable to individual participation. One respondent was adamant that individual sport could create selfishness.

The relevance of the **type of sport** was given as being **immaterial** (score of 3), although some respondents indicated that participating in some physical pursuit could be useful to maintain a well-balanced body and mind.

Those sports which required **stamina** were rated highest, followed by ones needing speed and those involving a ball, with sports requiring balance being rated as least important.

**Additional suggestions on sport** included hiking, walking, aerobics, attending a gymnasium, climbing, rafting, dancing and yoga—all of which could be included under the relevant sections provided in the questionnaire. The fact is that **hiking, aerobics and walking** were mentioned most frequently.

### Employment

Casual employment during schooling drew a relatively **indifferent** response from 34,9%, as against 34,3% who rated permanent employment prior to training as least important, and 30% who regarded it as of average importance.

## 5.5 SUMMARY

This overview of the responses to the questionnaire serves to help identify problems in the procurement of student radiographers.

*Cognizance is taken of the opinions of radiographers in charge of training centres and of the results of an ideographic study on 25 senior radiographers at Groote Schuur Hospital during August 1991 to rate the importance of various aspects of radiography (Figure 6-3).*

Relevant recommendations for the selection of prospective student radiographers will be based largely on the analysis of the responses to the questionnaire. This analysis will be covered in chapter six.

## CHAPTER 6

### IDENTIFICATION OF QUALITIES REQUIRED FOR PROSPECTIVE STUDENT RADIOGRAPHERS

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## CHAPTER 6

### IDENTIFICATION OF QUALITIES REQUIRED FOR PROSPECTIVE STUDENT RADIOGRAPHERS

#### 6.1 INTRODUCTION

This chapter features conclusions constituting the basis for recommendations on the compilation of an objective selection battery applicable to prospective radiography students.

The effect of school education and recruitment on the procurement of student radiographers will be addressed and the significance of induction/orientation on the reduction of attrition rates will also be pointed out.

Some of the reasons for attrition given by radiographers during interviews were:

- inability to cope with sick people
- unwillingness to work unsocial hours
- pregnancy
- accidents
- physical (back, legs)
- lack of finances.

#### 6.2 INFORMATION ON RESPONDENT (Section A)

##### 6.2.1 Language

Bilingualism in the official languages of the Republic of South Africa seems to be important in the profession, as 43% more of the radiographers completed the questionnaire in English. The **origin of prospective students**, with reference to the language primarily used at the training centre, should also be considered.



### 6.2.2 Rank and Conditions of Service

There are usually more basic grade than senior radiographers in any profession, but it is recommended that **conditions of service and promotion prospects** be improved to encourage radiographers to stay in the profession and to attract breadwinners.

Part-time jobs, creche facilities and refresher courses are necessary to **accommodate married women or those with dependants** to stay in or return to radiography. Flexi-time and job sharing, as also recommended by Carmody (1991) in Australia and Lock (1990) in Great Britain should be considered for the same reasons where feasible.

### 6.2.3 Employers

It is suggested that all employees be kept *au fait* with changes that affect them, e.g. autonomy of state hospitals. However it will be difficult to privatise tertiary and teaching institutions, as agreed with by Candy (Hospital and Nursing Year Book of Southern Africa, 1990: 47). More **private radiology practices** should consider assisting with **training radiographers**, in order to relieve the financial burden on the State and to contribute to the number of professional radiographers..

### 6.2.4 Knowledge of Radiography Prior to Radiography Training

Most radiographers indicated that they only knew “more or less” what radiography entailed before admission to their course of study. **Promotion of the image of radiography** as a career should improve recruitment, which needs to be more aggressive. Johnson (1990: 71) also recommends that to enhance the image of the radiography profession, consideration needs to be given to the implementation of public relations strategies.

## 6.3 SCHOLASTIC INFORMATION (Section B)

The number of combinations of matriculation subjects which may be studied depends on availability at the school/college attended, as well as the aptitude and ability of the scholar.

According to the data obtained from the questionnaires in chapter five, the **ten most popular choices** were the following subjects:

- Biology
- English
- Physiology
- Mathematics
- Physical Science
- Afrikaans
- *Black African language*
- Computer literacy
- “European” language
- Typing

(Refer figure 5–1 and Appendix D).

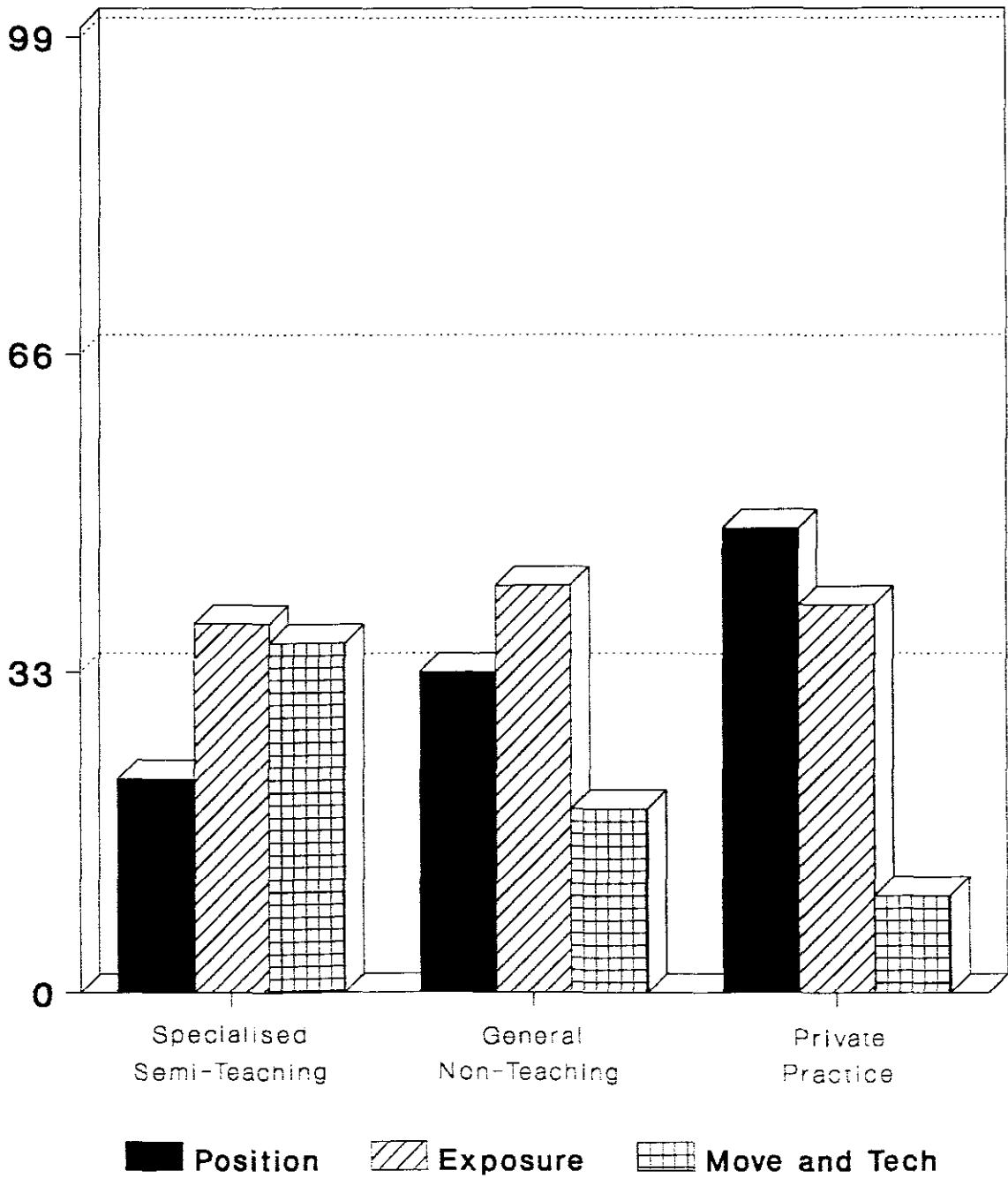
### 6.3.1 Biology and Physiology

The above-mentioned subjects were rated amongst the three most popular choices and form the basis of present majors in the radiography course, i.e. anatomy, physiology and pathology. These are necessary to appreciate the reason for radiographic examinations, improve patient care and understand the effects of radiation on the body. This recommendation is supported by Frank (1969), the professional scope for radiographers (Appendix C), the Human Sciences Research Council Report No. MM-84 (1981), the College of Radiographers (1991) and an analysis of reject film undertaken by the author (figure 6–1 and figure 6–2).

However, secondary schools do not usually cater for both biology and physiology, while private tutorial colleges often only offer physiology—as is demonstrated by the applications received from both types of institution at e.g. School of Radiography, Groote Schuur Hospital.

Figure 6-1

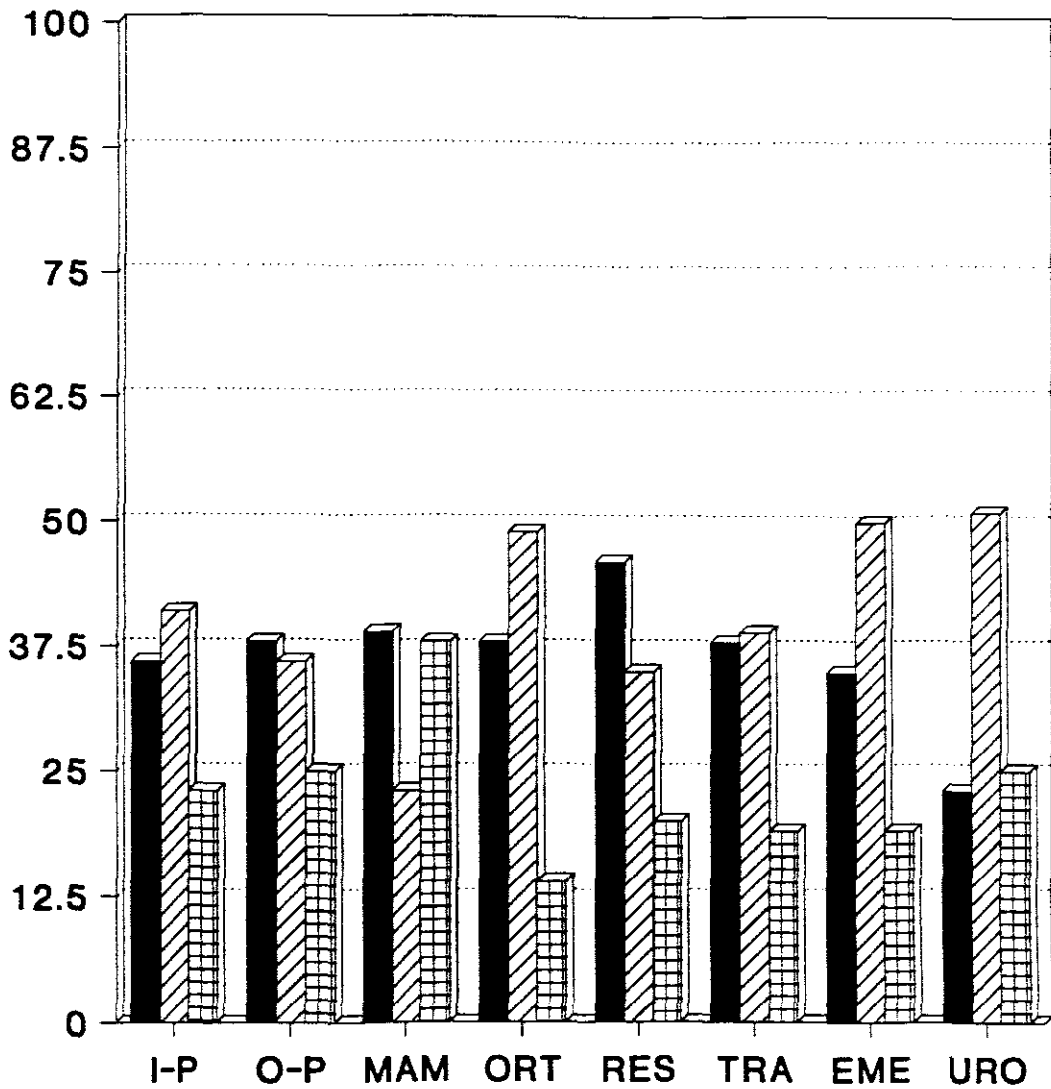
# WASTED FILM - 2 MONTHS



TYPE OF PRACTICE

Figure 6-2

## WASTED FILM - 2 MONTHS



I-P In-Patients  
 O-P Out-Patients  
 Mam Mammography  
 Ort Orthopaedic  
 Res Respiratory  
 Tra Trauma  
 Eme Emergency  
 Uro Urology

■ Position    ▨ Exposure    ▩ Move and Tech

TEACHING HOSPITAL: DEPARTMENT

It would be recommended for **schools** which only offer biology to **emphasise the human aspects for prospective paramedical students** and/or to incorporate more **physiology** in the biology syllabus.

**More physiology** should also be incorporated in the curriculum for the **National Diploma in Radiography**, particularly under the present system where some students may not have studied matric level biology or physiology. It is recommended that **anatomy** be accentuated in the **first**, **physiology** in the **second** and **pathology** in the **third** year of radiography training so as to didactically and logically reinforce and build on previous knowledge.

### 6.3.2 Language

English was rated as the second most important matriculation subject required, followed by Afrikaans in sixth place and a Black African language in seventh place (Figure 5–1).

If students are to receive lectures, take notes, express themselves, write examinations and communicate with people, they must be able to **cope with these tasks in both official languages**, and be fluent in the one used at the centre where they will receive their radiography training. To be able to communicate with all patients and the public, it is fitting for all radiographers to have a working knowledge of the **main Black language** in their area. It is, therefore, strongly recommended that all **schools** offer such a **local African language**. This is especially relevant to the future dispensation to be practised in South Africa.

Black students who received their education in their mother tongue up to standard 3, were disadvantaged in secondary and tertiary education (De Lange, 1981). This report also admitted that the present educational system does not serve a multiracial society. Care must be taken not to introduce another generation of inadequately trained personnel (Van Wyk de Vries, 1974).

It is thus recommended that scholars are educated in the **language that will best serve them for their future** and specifically for vocational training. Gaydon (1987: 53) actually advocates one official language plus another language.

### 6.3.3 Mathematics and Science

Mathematics and science were rated as 4th and 5th most important for students to be able to study/train for radiography (figure 5-1). These subjects need to be **taught in a more applied manner**, including estimation skills, the ability to work with numbers, problem-solving and logic. It is recommended that **all schools offer science** as a subject so that scholars can have a choice by being able to study human biology and/or physiology as well as, and not instead of, science.

The **basics** of both mathematics and science also need to be **introduced earlier** in the curriculum, especially for **Black children**. Fewer than 10% of pupils choose these subjects and Blacks, in particular, do not fare very well e.g. in 1988 only 15,1% studied mathematics and 32,4% science and the highest pass rate was 15% for the former and 10% for the latter (Education Renewal Strategy, 1991).

Mathematics is regarded as a powerful tool of technology (Arora & Duncan, 1986: 117) and, therefore, should be made **available to all** students, but should be taught with a more **practical bias**.

### 6.3.4 Computer literacy

Computer literacy, ranked as 8th most popular subject, is already incorporated into the school curriculum in countries such as Germany, Sweden and Scotland (International Encyclopaedia of Education, 1985).

However, literacy and numeracy are both prerequisites for computer literacy/language. One respondent rated “computer exercises” important enough to be mentioned as a hobby/interest.

Computers are used in many aspects of radiography—including radiation production, radiographic processing and quality control. It is also applied in specialised areas viz. tomography, magnetic resonance imaging, digital subtraction, mobile x-ray units, nuclear medicine, ultrasound and radiotherapy planning. Patient data e.g. results of diagnostic tests, records and bookings rely on computerisation and students can be exposed to computer assisted education during their training. According to an ideographic study done on senior radiographers, using computers was considered amongst the ten most highly rated aspects of those met in radiography (refer figure 6–3).

It is, therefore, recommended that all **schools** offer this subject **and** that an **introduction to computers in radiography** be included in an **orientation programme** for students. The manifest need for today’s children to know more about computers is also agreed with by Elton (1987: 169).

#### 6.3.5 Typing (Keyboarding)

Although typing was considered less important according to the questionnaire results, keyboarding techniques and/or skills are necessary for more productive use of a computer—particularly as the keyboard is rapidly becoming standard hardware in education and radiography (Rumney, 1989: 51).

#### Other proposals

**Physical education and sport** were also mentioned by some respondents as necessary for radiography applicants to be exposed to. However, these are dealt with by most schools either as part of the curriculum or as **extramural activities**. **General knowledge** is similarly covered by certain schools e.g. those in the southern suburbs of Cape Town.

**Figure 6-3****Importance of Various Aspects of Radiography as Rated by Senior Radiographers  
at Groote Schuur Hospital**

<b>ASPECT OF WORK</b>	<b>RATE OF IMPORTANCE</b>
Patient Care	1
Human/public Relations	2
Communication	3
Ethics	4
Medico-legal Aspects	5
Radiation Protection	6
Equipment	7
Computers (Equipment)	8
Administration	9
Computers (Administration)	10



### 6.3.6 University Exemption

As the majority of respondents to the questionnaire considered a university exemption necessary, it is recommended that this be made a **prerequisite**. However, potentially suitable applicants should not be lost to the profession solely on academic grounds. Applicants are human beings and should be considered as individuals.

Fourie (1990b) agrees that a reliable criterion for the prediction of academic success or failure could eliminate the “drop out” problem to a large extent.

### 6.3.7 Study methods

Ineffective study habits influence many failures at tertiary level as referred to by e.g. Van Wyk de Vries (1974), Coetzer (1981), and Fourie (1990a)—an example being those students who only study the night before a test. A publication on study methods proves a need for improving this aspect of a student’s life (*The Argus*, 1991c).

Most respondents to the questionnaire were convinced of the importance of effective study habits. Training for radiography is physically and mentally demanding. Having to attend lectures, study for tests plus in-service training during unsocial hours require self-discipline to be able to study as well. (Reference should also be made to 6.4.6.4 and 6.4.6.8). Some students do not live in an environment conducive to study e.g. Black students who live in cramped conditions (1-19 occupants per dwelling), with insufficient light or ventilation (Coetzer, 1981: 121). The number of children and the position of the student in the family are also factors to be considered. **Studying facilities**, such as libraries **need to be provided** at schools, in the community and at training institutions.

Although rote learning (memorising) can be “successfully” utilised, it is said to lose its edge in the early twenties (Lockhart, 1981: 548) and does not guarantee understanding of

the subject. With the prospect of having to cater for a greater proportion of mature students who matriculate later in life, it poses a problem which requires serious consideration.

The cultivation of effective **study techniques** should be **incorporated into** the teaching of **“life skills” at school**. Vocationally oriented education is already practised in Germany, Denmark, Canada, Scotland and Sweden, e.g. Levine (1987), Owen and Taljaard (1988) and Education Renewal Strategy (1991). It is also recommended that **guidelines** on effective study methods be **included in an orientation programme** for student radiographers.

Toffler (1971: 375) intimated that students must learn how to learn because “tomorrow’s illiterate are those who did not do so”.

#### 6.3.8 Positions of Responsibility at School

Although most respondents to the questionnaire indicated that they did not consider it important for prospective students to have held positions of responsibility, almost 27% responded positively to this item. This response prompts the perception that to hold such offices engenders **responsibility, maturity and leadership**. Having held such offices should, therefore, **be credited as beneficial to practitioners in the field of radiography**.

#### 6.3.9 Membership of Clubs and Societies

Most radiographers did not deem it important for scholars to belong to clubs and societies, although just over 22% rated it as desirable.

It is, therefore, recommended that this aspect be recognised as helping to form interested, well-balanced personalities. Applicants should particularly be assessed in community oriented interests as radiography provides a caring service to the public.

## 6.4 PERSONAL INFORMATION (Section C)

### 6.4.1 Age

Although approximately one-third of all respondents to the questionnaire thought that students should commence training at the average post-school age of 18, there was a pronounced percentage who considered it acceptable to embark on training for students up to the age of 40. This corresponds to the world trend of accommodating mature students, who are classified as being at least 21 but usually older than 24 (Deaville, 1988). Older students are also often more motivated as is endorsed by Knowles (1984) in reference to the principles of adult learning.

In South Africa the question of the age of trainees will become increasingly relevant, as more (predominantly Black) matriculants apply for vocational training. Approximately 24% of these are at least 19 years of age (Educational Renewal Strategy, 1991). Bell (1986: 12) suggests that, although “serious” mature students did well at university, they were less successful in science and technology. However, they performed significantly better at polytechnics.

**The risk-benefit ratio in respect of accepting older students needs to be addressed before selection of candidates e.g. adjustments due to diverse academic backgrounds, resentment of orders from younger colleagues versus life experience, understanding human conditions and overall benefits to the class (Beswick, 1987: 13).**

**Confidential reports** from former education institutional heads and employers should be insisted upon. It is recommended that each case be considered **on merit** in conjunction with all other relevant factors. The physical nature of the work, unsocial hours and family commitments should also be taken into account. **Mature students should be accepted if they have met all other criteria.**

#### 6.4.2 Choice of Sexes

Data from questionnaires indicated the need for an average of 50% of staff to be male. Although the minority of respondents indicated the need for a **higher percentage of males on Black establishments**, this need should be considered.

Males can provide a certain amount of protection on late duty, strength and assistance at personal male radiographic examinations. However, objective selection should be aimed at finding the **best person for the job** and any other consideration should take second place.

#### 6.4.3 Marital Status and Children

Most radiographers considered the **marital status** of students **irrelevant**, but indicated that it would be preferable not to have children, or have young ones in the family during the period of training. Depending largely on the discipline in which they are registered and at which stage of training they are, pregnant student radiographers cannot readily be accommodated as they have to be exposed to all aspects of work involving radiation. Radiotherapy, nuclear medicine and ultrasound can more easily provide radiation-free areas. The nearer the end of the training period, the easier it becomes for pregnant students to complete their course.

Once qualified, both **maternity and paternity leaves** should form part of the conditions of service. Lectures on **family planning** and **sexually transmitted diseases** should be incorporated in the student **orientation programme**—although, in fact, these should have been introduced at **school level** already.

Objectively, the **best person for the job** should be selected with due consideration of the comments and constraints mentioned in chapter 5.

#### 6.4.4 Physical qualities

##### Health

Impaired health could prevent a student from being able to cope with a **mentally and physically demanding** job such as radiography. It is, therefore, recommended that only applicants who comply with these **attributes** be accepted. Initial information can be obtained from a **biographical questionnaire** and followed up by a **medical report**, if necessary. **Pre-selection** should be practised to prevent undue expense and waste of time.

##### Mass

Being “overweight” can impede **movement, agility** and can undermine **health**, while the converse could impair strength and stamina. All these qualities are **necessary** to be able to practise radiography. **Biographical questionnaires and medical reports** would aid **pre-selection**.

##### Height

Although the majority of respondents decided that **height** was unimportant, it could give rise to **difficulties** if the applicant was **too short**, i.e. less than 1,5 metres e.g. when the work requires using equipment located at some height thereby reducing reaching ability and diminishing strength.

##### Strength

Strength is **closely related** to all of the above because of the **physical aspects** of the work involved, such as assisting patients, carrying heavy loads, wearing lead rubber aprons, walking and standing for long periods.

##### Fitness

**Fitness** was regarded as **necessary** for radiography, but being healthy and strong does not necessarily include fitness.

Additional comments received:

- A history of **family health** is important but would only be **beneficial to the prospective employer if totally reliable**.
- As **physical disabilities or handicaps** are not always mentioned on paper, it is particularly important to **interview** candidates.
- The necessity for a **strong constitution** bears out the physically demanding nature of radiography. Correct **lifting techniques** need to be taught during **orientation**, preferably by the **physiotherapy department**.
- Bad **eyesight** could prevent **reading and studying** with ease, as well as affecting interpretation of scales on equipment or symptoms of patients.
- Smoking is detrimental to health and reduces stamina. A **no-smoking policy** is to be encouraged and should be printed in any **prospectus** on a radiography training course.
- The inability to move and act quickly can be caused by pathology or by being “overweight”, as was previously mentioned. **Speed and rapid mobility** are particularly **necessary**, not only in emergencies, but in day-to-day practice. **Biographical questionnaires** and **personal interviews** are necessary to practise legitimate **pre-selection**.
- An **alert, well-adjusted, emotionally stable** person is essential to be able to cope with the type of work—including **stress**—involved in radiography. It is recommended that **psychometric testing** be performed to identify major problems.

Appointment of students should be arranged subject to an acceptable medical examination.

6.4.5 Background

Most radiographers did not think that the background of a candidate should be considered. However, according to Jencks et al (1979), background is the **largest single factor** to be considered, particularly in **less-developed countries**. Mashaba (1986), who studied the influence of socio-economic background on nursing students, found that it did affect the

academic and general progress and Lewin in Bentley (1983: 167) refers to the BPE factor, which represents behaviour as a function of the person and the environment.

### Socio-cultural factors

In a heterogeneous society with diverse cultures, such as exists in South Africa, **education** should engender a basis of **mutual understanding**. This would help to appreciate the various cultures, values, beliefs and customs existing at the time of writing e.g. different views on pain, illness, healing and death. It would improve communication and interpersonal relationships.

The effects of acculturation on persons originating from a rural background, another culture or tribe need addressing. Sudden introduction to urban agglomerations, modern and Westernised surroundings can cause a culture shock that may be detrimental to both student and patient.

Tutors and employers should endeavour to **understand the life of the learner**.

If necessary, early incorporation of “**social graces**” in an **orientation programme** should be considered. **Intercultural talks** by community representatives could also be arranged, thereby introducing students to the “**macroculture of a multicultural society**” (Claasen, 1989: 432). To help understand these different paradigms would require a **sound basis** originating at **school level** and involving both **teachers and the curriculum**. Teachers should also be educated for insight into various cultures. This is supported by Goodey (1989), Collier (1989) and Richardson & Skinner (1990).

### Socio-economic factors

The quality of the domestic milieu helps determine the stimulation received by children. If books, periodicals, educational toys, radio and television cannot be afforded or are not encouraged, it is more difficult to broaden their education, vocabulary, perspective and insight. This is also supported by Fraser in Bentley (1983: 162). **Better education and**

**employment** would improve **educational stimulation** in the long term, as unemployment in S.A. could rise to 9,8 million by the end of the century (*Cape Times*, 1989). The need to raise the standard of living of black Africans is also referred to by Leistner (1989: 21).

**Prospective candidates who cannot afford to travel to be interviewed** could be seen by the tutor in charge of the school/college of radiography **nearer home**. It would be more cost effective for students to **train** at the institution **closest to their homes**.

The profession could lose potentially good candidates through economic problems that deter students from applying for training in radiography. Should they be unable to complete their studies due to financial considerations, this would increase the attrition rate, with its consequent waste of money, manpower and time. It is, therefore, recommended that **bursaries and loans** be made available to those students who have been found acceptable by objective selection procedures.

**Contracts with employer bodies** could also be considered to enable students to work after qualification or without salary during training, in lieu of repayment. Not only could this guarantee a full establishment but could also assure newly qualified radiographers of employment. It could also help **solve** the problem of **vacancies** due to emigration (SAM&DC Bulletin, 1991: 2).

All details on finances should be published in a **prospectus** for radiography training.

#### Other factors

Number of children, position of student in **family**, status of parents and occupation of parents and siblings were not considered important by respondents (Figure 5-2). It is, therefore, recommended that their **relevance** and any **effects** be investigated by **comparative research**.



#### 6.4.6 Personal Characteristics

Personal qualities comprise a significant indication of whether potential candidates are capable of making a success of their chosen career. Identification of problem areas and recommendations will revolve around those qualities considered most relevant from questionnaires and interviews (Chapter 5).

##### Responsibility, Conscientiousness and Integrity

Persons who have integrity can usually be considered to be honest, conscientious and responsible. As radiographers deal with human beings in various contexts, they take responsibility for those persons during the period of contact. This includes patient care, safety (personal and possessions) and radiation protection. It is maintained that 1 gramme of brain may provide better (radiation) protection than 1 tonne of lead, thus also indicating the need for intelligence (Le Roux, 1976). Privacy and confidentiality is especially significant with regard to records, telephones and computer access.

Medico-legal and ethical considerations need to be included in the need for conscientiousness, as the above-mentioned qualities reinforce the importance of professional obligations to practise professionalism on the part of the radiographer. Ethical responsibility is imperative in the light of increasing numbers of infective conditions, such as hepatitis-B, tuberculosis and AIDS—considering that 30 people die from T.B. daily in South Africa (SATV News, 1991).

Radiographers must have the integrity to admit immediately to mistakes that could affect the patient and all concerned.

Although difficult to assess these qualities, it is recommended that:

- i) **confidential references** on specially designed forms be obtained from responsible citizens (although these references do not always prove reliable)
- ii) **professional psychological testing** be performed if possible, and

iii) an introduction to **medico-legal and ethical responsibilities** be included in an **orientation programme**.

A number of additional qualities mentioned by radiographers comprise those ascribed to leaders e.g. imagination, clear thinking, emotional stability, communication, initiative, perseverance (Friel, 1967: 6). As not everyone possesses **leadership qualities**, it is **difficult to insist on** these as necessary in all radiographers. **Positions** such as prefect or house captain **could give an indication** of the leadership qualities

### Co-operation

Co-operation is necessary for working with people and for team work within the hospital milieu—be it in an x-ray room, a theatre or on inter-departmental, inter-professional level or with the public. It also needs to transcend rank e.g. assistance to medical staff (Appendix C). Diplomacy, courtesy and persuasion are part of the art of social skills (Needham in Rumney, 1989: 51).

**Confidential references** are the major source of assessment.

### Punctuality and Regular Attendance

Without these attributes, students will not become reliable co-members of staff. Not only will they miss valuable training time but will also inconvenience patients and colleagues. These qualities are also related to responsibility and can only be determined by **confidential reports** from educational institutions or former employers.

It is recommended that students be **informed of responsibilities** and consequences of irregular attendance or unpunctuality **prior to appointment** and that these aspects to be dealt with during **orientation**. The frequency of **absenteeism** and the reasons for it should form part of **comparative research**.

### Discipline and Ability to Take Orders

The questionnaire divided discipline into:

- i) ability to accept discipline and
- ii) self-discipline.

In a hospital environment, it is necessary to accept orders from persons in authority. Students or staff members who find it difficult to accept this hierarchical discipline can upset human relations and the workload. This aspect is covered in the radiographer's **professional scope**.

It is suggested that student radiographers be **informed of and issued** with a list of the **hierarchy** of the situations of the department, to enable identification of all those in authority—that it is included in an **orientation programme**.

These values need to be assessed by **references** and by **relevant tests** before selection. **Comparative research**, with the aid of **progress reports**, should be undertaken during training or after its completion.

### Attitude to Colleagues of all Ranks

The disposition of radiographers affects many aspects of working life, including the ability to practice good human relations and communication—which could affect efficiency and morale.

**Attitudes** are usually **difficult to ascertain** prior to selection and employment. **Confidential reports, personal interviews and relevant psychological testing** are advocated. **Student reports** needs to be studied and compared during training.

### Human/Public Relations and Psychology

Communication interlinked with psychology is required when dealing with patients, the public, colleagues and other professionals. As dealing with individuals of all ages and types is especially important in hospital work, **self-knowledge** is a key factor (Williamson, 1990:

27). According to Greek mythology, Apollo, the god of light, was advised by the oracle of wisdom at Delphi to “Know thyself”.

As the hospital is a microcosm of greater society, which it serves, so South Africa is a microcosm of the whole world (South Africa: Official Year Book, 1989/1990: 79).

These disciplines were thought particularly important by all radiographers, and **psychology** was rated by most respondents as an extra **subject**. If secondary schools cannot offer this, then serious consideration should be given to its inclusion in an **orientation programme** for student radiographers or it should be **included** in the **curriculum** for the National Diploma in **Radiography**. This was supported by meetings held in Port Elizabeth (May, 1991) and Durban (September, 1991).

#### Communication and Listening Skills

Any human communication relies heavily on language whether spoken or written, as well as the other factors involving the human body. These verbal and non-verbal elements are basic to public and human relations. All the above qualities were ranked as **priorities** by radiographers (Chapter 5). The “barrier of silence” towards patients as described by Hughes (1991: 18) only adds to their stress level, while Kabler (1986: 19) emphasises the need for good communication skills to help gain the patient’s co-operation in order to perform a more effective x-ray examination.

Communication and listening skills are best assessed during **interview**, but in addition **confidential references** could be useful. They should be included in an **orientation programme** until **incorporated** in the **radiography syllabus** as part of the subject of **psychology**.

#### Perseverance and Ability to Work without Supervision

Students have to study, be exposed to the practicum and help provide a 24-hour service under supervision, but are expected to gain experience by gradually doing more work on their own.

Perseverance, self-discipline and motivation are required to complete such a demanding vocational training—as are confidence and assertiveness (Johnson, 1990: 73). Students who are well motivated and who persevere in **rewriting matric subjects** in order to improve their chances of acceptance on the radiography course, deserve due consideration.

**Confidential reports and references** as well as **scientific testing** should be utilised to assist in identifying the required qualities. These desirable and required qualities can also be included in a guide to study methods during **orientation**. **Comparative research** needs to be carried out amongst various groups of students to determine the results of different methods of selection.

#### Ability to cope with Stress

Stress can affect people both psychologically and physically. It is, therefore, necessary for the professional to be able to identify the effects in themselves (**self-knowledge**), colleagues and patients and to be able to cope accordingly.

Jallade (1989: 108) refers to different indices of job stress: including role ambiguity, under-utilisation, overload, resource inadequacy, insecurity and non-participation. This is supported by Polworth (1985: 335). Thompson (1991) also maintains that stress is experienced more by persons in **lower ranks** and, as confidence increases with time and experience, senior staff should be able to endure stress more readily. A calm, level-headed, adaptable and resilient **disposition** is more likely to cope with situations perceived as threatening. The need for **physical exercise** to biochemically reduce stress levels should also be referred to (Van Niekerk and Teggin, 1983: 11).

It is recommended that students should be **systematically trained in theory and practice** of radiographic techniques. **Synchronisation** of these aspects of training needs to be improved—necessitating the employment of **more clinical tutors**. Halliday (1987: 60) warns that students are vulnerable because of the fear of the unknown, the mystery of the practicum and that one teacher should not have to cope with more than 20 students at a

time. **Professional counselling** should be available for staff, patients and their families who succumb to the effects of stress e.g. coping with bad news, shock, terminal disease and death. Prior identification of the ability to cope with stress can be assisted by **references, interviews and psychometric testing**, followed by **comparison of progress reports**. How to avoid and cope with stress should be dealt with as part of **orientation**.

### Empathy

Sympathy is being able to feel like the other person, while empathy is defined as understanding but not knowing how that person feels (Flexner, 1981).

An attempt to understand fellow human beings in suffering is a sign of a compassionate radiographer. If professionals are not motivated and socialised due to altruism (Anderson, 1974: 3 and 37) and are not capable of coping with the conundrum of proper concern for the patient without losing adequate detachment (Halliday, 1987: 60), they could be in danger of succumbing to stress.

**Community work** prior to selection needs to be **recognised**. **Confidential reports, references, interviews and professional psychological testing** could help to identify the type of person required.

### Neatness

Radiographers preferred a professional image of neatness which should not only **include** appearance but also **speech and work habits**. Speaking manner, accent and vocabulary influence communication and affect the overall image of radiography as a profession (Rawlings, 1967: 5). Uniforms equate people socially and professionally and indicate rank—representing the image of the profession.

Before their appointment, prospective students should be informed of the **rules** governing dress by publishing these regulations in a prospectus. Disregard of regulations should be interpreted as failure to comply with orders. It is recommended that **confidential reports, references and interviews** be utilised primarily to assess dress code.

#### 6.4.7 Hobbies and Interests

Students who have outside interests are often more balanced personalities. Service to the community should be recommended for admission to the course, as radiographers are committed to serving the public. However, socio-cultural and economic considerations can influence the availability and nature of recreational facilities and amenities.

The type and culture of the community, safety, distance and finances could make it difficult for young people to be able to render a service or to socialise, beyond visiting friends in the neighbourhood. Similarly, attending cinemas, recording or hiring video programmes—even if a television set is owned—could prove difficult. Introduction to **local recreational facilities and amenities** should be included in an **orientation programme**, particularly for **students new to the area**.

**Photography**, as another hobby, was most often mentioned by respondents to the questionnaire. Some also suggested it as a possible extra matriculation subject. A knowledge of photographic principles would help students to understand radiographic imaging and should, therefore, be recommended as a relevant hobby or as an extramural school activity.

**Confidential reports, references, interviews and psychological testing** are suggested to localise individual interests.

#### 6.4.8 Sport

Sport not only promotes a **healthy body and mind** but can also cultivate **team spirit**, which enhances co-operation among colleagues working together closely in a hospital situation.

Ismail (1991) observed that the Indian community placed little emphasis on sport, while Van Niekerk (1983) suggested that there were biochemical reasons for exercise, which improved the ability to **cope with stress**.

It is recommended that **consideration** be given to applicants who pursue **physical interests** with **due regard to their academic, social, cultural and economic interests**.

**References, confidential reports, interviews and psychometric tests** to identify interests and aptitudes need to be studied.

#### 6.4.9 Previous Employment

Casual employment e.g. weekends and vacations, could indicate initiative and/or a need for earning extra money. Unless it occurred over a long period and for a responsible employer, references are not always available. It is suggested that those should always be on confidential forms. **References** should always be requested **if** the applicant was **permanently employed prior to training**.

As a probable decline in earnings and being classified as a mature student could give rise to **financial and status problems**, this must be **discussed** with the prospective student.

The recommendations made in this chapter and in chapter four will be used on which to compile a more objective approach for procurement of prospective student radiographers. This will be developed in chapter seven.



## CHAPTER 7

### RECOMMENDATIONS FOR PROCUREMENT AND SELECTION PROCEDURE FOR RADIOGRAPHY STUDENTS

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## CHAPTER 7

### RECOMMENDATIONS FOR PROCUREMENT AND SELECTION PROCEDURE FOR RADIOGRAPHY STUDENTS

#### 7.1 INTRODUCTION

Recommendations for the procurement and selection of students for radiography will be made in this chapter. These proposals will be formulated on the conclusions reached on the basis of information collected in the process of investigating and identifying the requirements for a competent radiographer as covered in chapters five and six.

The compilation of the proposed procurement and selection procedure as set out here will take cognizance of the internationally acknowledged principles of procurement and will follow the discussion and illustration of these in chapter four and figure 4-1.

#### 7.2 JOB ANALYSIS

An investigation of the job analysis of a radiographer serves as the foundation for developing recommendations for procurement and selection in the profession.

##### 7.2.1 Job Description

The description of the job to be performed by radiographers must conform to the legal requirements laid down by the SAM&DC and the Professional Board for Radiography. These are published in the Regulations Defining the Scope of the Profession of Radiography (Appendix C). This document forms the basis for a job description.

Ideographic interviews with senior radiographers provided the details for rating the importance of the various aspects of radiography as referred to by the SAM&DC and in which radiographers have to be competent in order to be able to practise professionally (Figure 6-3).

### 7.2.2 Job Specification

The qualities required for prospective student radiographers were detailed by the responses to the questionnaires (Chapter 6) and by the ratings obtained from the interviews with senior radiographers (Figure 6–3).

## 7.3 RECRUITMENT

Based on the job analysis for radiography, an **aggressive recruitment programme** needs to be devised to attract prospective applicants who possess the correct qualifications to the job.

The following are recommendations for the procurement of radiographers. It is recommended that the **public relations** and the **graphics department** of both the training and the employer institutions be used to ensure a professional approach when adopting any of the following suggestions:

- publish attractive **brochures**, emphasising the diversity of radiography, including ultrasound and distribute these to potential sources of radiography trainees
- use the **media** e.g. press, television and radio to positively promote the profession
- start a regular **in-house newsletter** with relevant title
- **contribute to** both the hospital and the training **institution newsletters**
- make a **video** recording to support radiography, which can be used during **open days** at the employer and the training institutions. Information should preferably be targeted to **small groups** in the hospital situation, as they are easier to accommodate and the privacy of the patient will accordingly be protected. Beal & Noel (1979:9) found that the most negative characteristic influencing student retention was that of inadequate academic vocational counselling

- host **vocational guidance teachers** on visits to the training school and hospital department and issue them with relevant literature, as it is easier to deal with individuals and the teachers can convey the information to large numbers of scholars
- participate in **career exhibitions**— employing **reusable concertina type advertisement**
- attend **career sessions** for a few schools together to save time
- address **special interest community groups** e.g. science or youth.

Additional recommendations include:

- serve on **committees in the community**
- design and distribute **bumper stickers** with relevant slogan
- design and distribute **stickers** with relevant slogan to be used on **correspondence and envelopes**
- design a **postage stamp** e.g. to commemorate Röntgen's discovery of x-rays (1995 is the centenary)
- promote radiography by setting an **example**, showing **enthusiasm** and being an **ambassador** for the profession.

Those who are interested in knowing more about radiography should be advised to approach persons who are accurately informed on the present state of the profession.

### 7.3.1 The Prospectus

A prospectus is an example of literature containing information on radiography for dissemination to

- those who need to inform others of the nature and requirements of the profession e.g. vocational guidance teachers or tutors, and to
- prospective applicants who individually enquire about radiography or who visit career exhibitions or who attend open days hosted by x-ray departments.

Pamphlets richly illustrated with colour photographs and printed on glossy paper creates a good image of the radiography profession but may not warrant the expense for large print orders when compared to the relatively small number of eventual applications.

Whatever form a prospectus takes, the following is the minimum information that should be supplied and **regularly updated** (each edition should be dated):

- **Nature of the work** involved in each of the **4 subdisciplines** incorporated into radiography viz. diagnostic radiography
  - radiotherapy
  - nuclear medicine
  - ultrasound.
- **Aspects of work** which are **common to all 4 disciplines**:
  - care of patients**
  - general departmental administration**
  - the need to be compassionate/empathetic**
  - ability to communicate**
  - ability to deal with the public** and with **patients** of all types, conditions and ages.
- **Scholastic requirements** necessary for acceptance to the radiography course:
  - matriculation exemption**
  - matriculation subjects** and grades (as recorded in chapter six)
  - bilingualism** in the official languages should be mentioned and that a knowledge of a **Black African Language** and of computer literacy (**keyboarding**) would be a recommendation.
- **Health requirements** necessary for acceptance on the radiography course—attributes needed to be able to deal with **physical and mental demands** of radiography viz. nature of **in-service work and study** and the need for **medical examinations** before appointment and during training. The problems related to **pregnancy** and employment

in a **radiation** area must also be mentioned. Preference to non-smokers should be considered, as is already done in some other countries e.g. Canada, and the **policy** of the employer regarding **smoking** should be included e.g. prohibiting of smoking on hospital premises.

- **Conditions of service and regulations** relevant to student radiographers as salaried employees including the need to comply with these e.g. **registration** with professional bodies, regular **attendance**, **punctuality**, hours of duty (including reference to a **24 hour service** throughout the year) and the amount of **vacational leave** and when this may be taken. Late and night duty accommodation arrangements must be mentioned. Reference should also be made to the policy affecting religious holidays e.g. being allowed to take **vacational leave** for the main days if amenable to the appropriate departments.

The policy on simultaneous registration with other academic institutions and of outside employment should be recorded.

- **Financial rewards and obligations** must be explained, with reference to **salary**, possible **contracts** and allowances e.g. **uniforms versus compulsory outlays**, such as registration fees with educational and professional bodies, textbooks, stationery, photocopies and extra courses, such as first aid. A separate enclosure on salaries makes it easier to update without having to alter the prospectus.

Advice on sources of **bursaries and loans** should also be included.

- **Accommodation** facilities, sources and approximate costs need to be mentioned.
- Addresses and telephone numbers of all training centres from where **further information** can be obtained and application forms should be supplied.
- The **date** of commencement for the **course** and the **closing date** for **applications** are necessary. The latter date should allow sufficient time to conduct an initial screening

and pre-selection process, as well as for interviews and psychometric testing to be done before final selection.

An application form and an example of all pertinent aspects to a prospectus are included in Appendix H.

#### **7.4 APPLICATION FORM AND BIOGRAPHICAL QUESTIONNAIRE**

A form that includes biographical information is necessary to obtain pertinent details from prospective students who apply for the course in radiography. This questionnaire may form **part of an application form** (Appendix I) and should be completed, signed and dated by the applicant. All accompanying documentation requested must be originals or certified copies to prevent fraudulent acts. Information required can be divided into **relevant sections** viz. personal, health, scholastic, post-school, employment, background, general and motivation for radiography application.

- **Personal information** should cover language preference for future correspondence; surname; first (not “Christian” in deference to other religions) names; address; telephone number/s; date of birth; sex; nationality; identity/passport number; former and present marital status; number of children and their ages and whether ever convicted of a criminal offence.
- Questions pertaining to **health** need to cover mass; height; condition of back, legs, feet, eyes, ears and whether there are any hereditary or familial conditions present. Any accidents suffered, operations or x-ray examinations undergone, together with the reasons, dates and medical institution are valuable in tracing physical or mental problems not volunteered by or known to the applicant. This is particularly important in the light of the responses to the questionnaire circulated.
- **Scholastic details** required from all applicants are particulars regarding secondary education, i.e. school(s) attended and dates; year of writing matriculation examination;

matriculation subjects and grades; matriculation results and whether exemption obtained or June and September marks if matriculation examination is still to be written.

- **Post-school details** should include courses enrolled for or completed; the institutions for which registered; the dates of commencement, discontinuing or completing courses; subjects studied with results and/or reasons for terminating course/s.
- A record of **previous employment** is advisable. Questions to be asked include place of employment; post/position held; periods of employment; reasons for leaving and name, address and telephone number of person in charge.
- **Previous applications for radiography** courses gives an indication of reasons for being unsuccessful before. Name of training centre applied to and dates applied are necessary.

Other categories which provide an idea of the **holistic view** of the applicant are:

- **Positions of responsibility** held and membership of clubs and societies—all at school, post-school, during employment or at community level.
- Participation in **sport** may be ascertained as well as whether this applies to team or individual effort at social or competitive level.
- **Hobbies and interests** serve as an indication of the type and variety of interests, sociability and skills, whether relevant to the profession or not. However, it provides a perspective on the person as a whole.
- **Background** information should **only help to provide as complete a picture** of the applicant as possible **and to identify any obvious problems** that might affect the prospective student e.g. parents divorced, separated, deceased, unknown or unemployed. Large families might also be the cause of financial or study problems.



- Space should be provided for applicants to **motivate their applications** for radiography by writing at least one paragraph. However, there is no guarantee that it will be their own thoughts and language. Ideally this **should be written at the training institution.**

Initial screening for selection of applications will at this stage exclude any candidates who are obviously not suitable prospective students, and hence save a great deal of further effort and expense on the part of both the unsuccessful candidate and the employer.

### 7.5 CONFIDENTIAL REPORTS/REFERENCES

Reports or references are more likely to be meaningful if they are **confidential**, as this encourages candid opinion and reliability of information. To ensure direct, confidential information, it is recommended that stamped, self-addressed envelopes, marked “confidential”, be supplied to the applicant or, preferably, be sent directly to the referee concerned. Reports need to be obtained from the **heads of secondary or post-school institutions recently attended** by the applicant and as many **previous employers** as possible. The reports should be signed and dated by the referee whose rank and address should be included.

- **Scholastic and post-school reports** should provide information on positions of responsibility; membership of clubs (community service); responsibility, conscientiousness and integrity; co-operation; punctuality; attendance; acceptance of discipline and exercise of self-discipline; attitude to colleagues of all ranks (human relations); communication; perseverance; ability to work without supervision; ability to cope with stress; neatness of work and on person; interests; hobbies and participation in sport and, if possible, with a reference to the degree of manual dexterity that may be expected.
- **Employer’s reports** need to provide similar information but should also indicate how long the employees have been known to them and in what capacity they are/were employed.

It is also very important to ascertain whether the applicant's previous employer would be prepared to re-employ the person concerned, if faced with the choice and to establish the reason(s) for the decision.

- Space for **extra comments** should be left on all reference forms.

Once references and reports have been perused, it affords a second opportunity to screen the applicants and eliminate those who do not possess the necessary attributes for radiography.

## 7.6 INTERVIEWS

Only **those applicants who** qualify are then invited to attend a structured interview appointment. Those **applicants** who live at a remote distance and are **unable to attend** an interview because of financial reasons, should, if possible, be **accommodated** in centres **nearer their homes**. This means that such interviews must be arranged with the help and co-operation of similarly ranked radiography colleagues in other training centres using identical interview patterns. It is therefore suggested that structured interviews, using numerical ratings be used for easier comparison. The numerical rating must then be converted to a percentage of the total evaluation of the student. The cut-off percentage for the interview was determined from the significance with which training centres throughout the country regarded such a selection tool. (Interviews with tutors in charge of centres during 1990 and 1991).

The **object** of the interview should be **to cover those aspects not identifiable on paper** and on the biographical questionnaire. Generally, it is valuable to **ensure** that the interviewee understands **what radiography entails** and to **identify potential problems** concerning family, studying facilities, finance, accommodation or previous employment.

However, the main reason for seeing the **applicant** is to assess the following:

- physical appearance
- deportment
- grooming
- neatness of dress
- physical disabilities/handicaps
- communication
- speech
- listening skills
- mannerisms
- ability to cope with stress of interview
- attitude to interviewer/s
- courtesy
- confidence.

It is recommended that interviews with applicants for the radiography course be **conducted** by a **cross-section of senior representatives** from the profession. This should include both the **training** and the **x-ray department**, although the total number of people involved should be limited in order to **avoid intimidation** of the candidate.

The **final assessment** should be based on an **average** of the total scores given by each interviewer under each category mentioned. An example of such an approach is demonstrated in Appendix J. This will provide as **objective** an assessment as possible.

This provides the **third opportunity to screen** the applicants and so **eliminate** the ones who now do not qualify to progress further.

## **7.7 PSYCHOLOGICAL TESTING**

As was mentioned in chapter four, psychometric testing is both **expensive** and **time-consuming**. Therefore, only those candidates who graduate to this point need to be tested.

It is recommended that a **clinical psychologist** be asked to assist and that the tests and norms be identified. Care should be taken to avoid bogus “testers” (*The Argus*, 1991a). The qualities that need to be tested were identified by analysing the responses to the questionnaires. These qualities are:

- **intelligence** (to cope academically and for adaptability)
- responsibility
- conscientiousness
- integrity
- ability to accept discipline
- self-discipline
- attitudes to others
- communication
- perseverance
- ability to work without suspension
- ability to cope with stress
- empathy
- hobbies
- interests
- aptitudes and
- motivation to do radiography.

However, a number of the above-mentioned traits have to be combined to facilitate measurement by appropriate tests. Relevant aspects of the **16-Personality Factor (16-PF)** test, the **Senior Aptitude Test (SAT)** and the **19-Field Interest test** are recommended by the Human Sciences Research Council as the psychological tests **most suitable** for use with prospective student radiographers. Even when using only certain sections of these tests, it is necessary to allow at least 4-5 hours. The analysis of the results of these tests can take one person a few days. Hence, the **testees** must be carefully **chosen** and invited to attend well in advance. If used, the **results** of the tests must be **rated** and **converted to**

a **percentage** to form part of the **total evaluation**. A penultimate selection screening process can be affected at this stage.

## 7.8 SELECTION

Selection of student radiographers needs to take all the aforementioned factors into consideration if a just approach is to be employed. This means referring to:

- (i) the biographical questionnaire and application form
- (ii) reports and references
- (iii) the interview assessment and
- (iv) the results of the psychological tests.

### 7.8.1 Matriculation Results

The final screening for pre-selection can only take place after the matriculation results have been published, which would eliminate unsuitable applicants.

The results of matriculation subjects should be rated as a priority when selecting prospective student radiographers. Although it has been admitted that **matriculation results** are not the only factors to be considered when selecting students, it has nevertheless been acknowledged that these results play a particularly **important role** in the selection process. A number of studies have found that matriculation results generally **correlate** accurately **with post-school academic achievement**. These have been included in Gouws (1961: 69), Astin (1971: 51) and (Van der Vyver, 1984: 53 & 119).

Matriculation results should be **weighed according** to the **rating of their importance** by the respondents to the questionnaire. The **Swedish formula** has been internationally accepted for this purpose (Appendix K). **Matriculation exemption does not then apply**.

Applicants must always be informed as soon as possible after final selection whether they have been eliminated at any stage, or whether they have been placed on a reserve list.

Those candidates who still qualify for consideration at that stage should be short listed for final selection by a committee, the members of which should be given the evaluation selection schedule at least two days before the meeting. The selection committee should consist of a cross-section of senior staff representing both the training and the clinical sectors.

It is advised to award a **numerical equivalent** to each of the following aspects i.e. **matriculation results, interview, personal qualities and psychometric tests**; although it must be emphasised that the latter tests should be considered relative to the other sections of the evaluation process (Figure 7-1 and Appendix L).

7.8.2 The necessity to **weigh the most important aspects** required for student radiographers must be considered. Based on the responses of the questionnaires and also on the opinions of tutors in charge of training centres, indicated during interviews held during 1990 and 1991, the academic/scholastic achievements, personal qualities and impression made at the interview were rated most appropriate.

The **weighting** must be included in the **final selection process** undertaken by a panel as previously mentioned.

As **academic/scholastic achievements** were considered the most important aspects affecting the success of a student, they should therefore **constitute the major portion of the final total for evaluation**. It is recommended that it be between **50% and 60%**, but preferably at least **55%**.

## 7.9 ORIENTATION/INDUCTION

The responsibilities of procurement of student radiographers do not end at the selection process. If the **students** are to be encouraged to stay on the course, they need to be **welcomed** and given due **induction**.

FIGURE 7-1

**PERCENTAGE RATINGS OF MAIN ASPECTS TO BE CONSIDERED FOR SELECTION OF RADIOGRAPHY STUDENTS**

**1. SCHOLASTIC ACHIEVEMENT**

(In terms of subjects considered most pertinent from responses to questionnaire and as rated by Swedish formula) (Chapter six and Appendix K).

55%

(Students have to pass all subjects on radiography course with at least 50%)

**2. PERSONAL QUALITIES**

(In terms of responses to questionnaire in chapter six and rated in order of importance). If assessed by psychological tests, the rating of the tests would also have to be included as a percentage.

25%

(Type of person must correlate with nature of work involved in radiography).

**3. INTERVIEW**

(In terms of interviews with heads of training centres in 1991 and 1992 and responses to questionnaire). Aspects to be assessed during interview as seen in Appendix J. (2 and 3 are complementary).

20%

Recommendations are again based on the results of the questionnaire sent to a cross-section of radiographers. An **induction programme** must be well **planned and organised** so as to be of any value to the student radiographers in general.

It is recommended that the students be inducted during the **first two weeks of the course**, starting from the **middle of January from 1993**. This would give them time to complete their orientation before they commence lectures on 1 February.

The aspects which need to be covered are:

- **Bridging/revision course** for mathematics, science, English and the local **Black African language**—until such time as the school system has been adapted to provide an education for coping with **life skills**. Some hospitals e.g. Groote Schuur offer Afrikaans and Xhosa classes out of work hours. **Mathematics and science revision** might also have to be included in the present **physics programme**.
- **Professionalism**—including uniform and regulations, neatness and grooming.
- **Conditions of service**—including attendance and punctuality and general responsibility.
- Hospital hierarchy and acceptance of **discipline**.
- **Medico-legal and ethical responsibilities**.
- **Holistic health care**—including back, legs and feet and general hygiene.
- **Back care** and lifting techniques by physiotherapy department.
- **Family planning** and sexually transmitted diseases.
- **Intercultural talks** by community representatives.
- Avoidance of and coping with **stress**—availability of professional counselling service.



- **Effective study methods**—including self-discipline, perseverance and ability to work without supervision.
- Effective use of **library** and learning aids.
- Introduction to **computers** in radiography.
- **First aid** course.
- **Local recreational facilities**.
- Visits to **radiography departments** of all 4 disciplines.
- Video/35mm slides on **hospital and surroundings**.

The procurement and selection procedure and the orientation programme outlined in this chapter have been designed as objectively as possible, taking into account the variables due to the human factor. In order to arrive at the recommendations outlined here, cognizance was taken of all those aspects highlighted as crucial in the opinions drawn from a body of 1020 radiographers of all ranks who collectively represent a great many years of practical experience in the profession of radiography. Experts' opinions in the fields of student counselling, research, data analysis and statistics were called in to assist in analysing the available data.

In conclusion, chapter eight will present the conclusions arrived at while also indicating some areas for possible future research related to the topic under discussion.

The essence of this research effort was aimed at what can be summed up in the words of Mark Twain: "Plan for the future, as that is where you will spend the rest of your life".

## CHAPTER 8

### RECOMMENDATIONS FOR FUTURE RESEARCH

On the information gained from the research undertaken into procurement and selection of students for radiography, the following recommendations are made for areas where future research should prove valuable:

1. The **task analysis** of the radiographer needs to be studied and a **more complete one** compiled.
2. **Comparative longitudinal research over a specific period of time** should be considered on:
  - Academic achievements/progress and adaptability between **school leavers of normal age and mature students**.
  - Achievement/progress between students who **have and those who have not held responsible positions** prior to commencing the radiography course.
  - Achievement/progress between students who **have not played sport and students who have**.
  - Achievement/progress/attendance/punctuality between **married and unmarried** students.
  - Achievement/progress/attendance/punctuality between students **with children and those without** any children.
  - Achievement/progress between students from **large families and** students from **small families**.
  - Achievement/progress between students of various **positions/ages** in a family e.g. youngest/middle/oldest.
  - Achievement/progress/attendance/sick leave between students who are subject to **health problems** such as being overweight/having back problems **and those who do not have** physical problems.

- Achievement/progress between students who have undergone **psychometric testing and those who have not.**
3. The National Diploma in Radiography or equivalent **syllabi** should be **investigated with a view to revision** in order to meet the needs of the profession as outlined after analysis of the opinions of 1020 respondents, with particular reference to:
- Anatomy, Physiology and Pathology
  - Applied Physics
  - Basic psychology
  - Synchronisation of theoretical and practical (clinical) or experiential training
  - The need for more clinical tutors.

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# APPENDIX A



## Department of Radiology

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Telephone: 404-4184/5 · 47-1250 ext. 426. Res (021) 64-3501

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Head: Professor R.E. Kottler, M.Med (Rad) (UCT), FRCR (Eng)

### MASTERS DIPLOMA IN TECHNOLOGY POST SCHOOL EDUCATION (CAPE TECHNIKON)

MRS V MACKENZIE - CONTROL RADIOGRAPHER - SCHOOL OF  
RADIOGRAPHY, GROOTE SCHUUR HOSPITAL.

**TITLE:** DESIGNING A VALID SELECTION PROCEDURE FOR  
PROSPECTIVE STUDENTS FOR THE NATIONAL DIPLOMA IN  
RADIOGRAPHY COURSE.

Mrs MacKenzie is currently busy with research concerning the above in order to try and improve the selection of future radiographers.

As it is regarded as a most important study, it would be particularly appreciated if you would please support this investigation by completing the enclosed questionnaire.

Your co-operation, opinion and time will be highly valued.

A handwritten signature in black ink, appearing to read 'R.E. Kottler', with a horizontal line drawn underneath it.

PROF R ~~E~~ KOTTLER

HEAD : DIVISION OF RADIATION MEDICINE

December 10, 1990

C A P E   T E C H N I K O N  
S C H O O L   O F   T E A C H E R   E D U C A T I O N

---

**MASTER'S DIPLOMA IN TECHNOLOGY : POST-SCHOOL EDUCATION**

**TITLE:**        DESIGNING A VALID SELECTION PROCEDURE FOR PROSPECTIVE STUDENTS  
                 FOR THE NATIONAL DIPLOMA IN RADIOGRAPHY

**NAME:**        Mrs V MacKenzie  
                 CONTROL RADIOGRAPHER (TRAINING)

*As part of research being done to improve the selection of radiographers, an attempt is being made to compile a CAREER PROFILE of the IDEAL RADIOGRAPHER.*

*To achieve this, the objective opinion of qualified radiographers is essential. Your experience in the field is highly valued.*

*It would be most appreciated if you would please give half an hour of your time to help mould the future of our profession.*

*Kindly return the enclosed questionnaire to me in the envelope provided by 1 March 1991.*

*Thank you very much for your co-operation.*

*The questionnaire consists of 3 sections, dealing with specific aspects of the radiographer. Mark the appropriate block with an X.*

*Please comment objectively on each section.*

K A A P S E   T E C H N I K O N  
S K O O L   V I R   O N D E R W Y S E R S O P L E I D I N G

---

**MEESTERSDIPLOMA IN TEGNOLOGIE : NA-SKOOOLSE ONDERWYS**

ONDERWERP:        DIE ONTWERP VAN 'N GELDIGE KEURINGSPROSEDURE VIR  
                      VOORNEMENDE STUDENTE VIR DIE NASIONALE DIPLOMA IN  
                      RADIOGRAFIE

NAAM:            Mev V MacKenzie  
                      BEHEER RADIOGRAAF (OPLEIDING)

*As deel van die navorsing wat gedoen word om die keuring van radiograwe word daar gepoog om 'n LOOPBAAN PROFIEL van die IDEALE RADIOGRAAF saam te stel.*

*Ten einde dit te doen, is die objektiewe mening van gekwalifiseerde radiograwe noodsaaklik. U ervaring op hierdie terrein word hoog aangeslaan.*

*Dit sal hoog gewaardeer word indien u so vriendelik sal wees om 'n halfuur van u tyd op te offer om die toekoms van die professie te help vorm.*

*Stuur die ingeslote vraelys asseblief teen 1 Maart 1991 aan my terug.*

*Baie dankie vir u samewerking.*

*Die vraelys bestaan uit 3 afdelings, wat elkeen oor bepaalde aspekte van radiografie gaan. Merk die toepaslike blok met 'n X.*

*Lewer asseblief op elke afdeling objektief kommentaar.*

1. SECTION A  
(INFORMATION ON RESPONDENT)

1.1 RANK:.....

1.2 INSTITUTION WHERE EMPLOYED:.....  
e.g. Hospital/Private Practice.etc.

1.3 IF NOT EMPLOYED AS A RADIOGRAPHER AT PRESENT:

1.4 Did you know what radiography entailed when you applied for admission to the course :

YES	NO	MORE OR LESS
-----	----	--------------

1. AFDELING A  
(INLIGTING OOR RESPONDENT)

1.1 RANG:.....

1.2 INRIGTING WAAR WERKSAAM: .....  
(bv. Hospitaal/Privaatpraktyk, ens.)

1.3 INDIEN NIE TANS AS RADIOGRAAF WERKSAAM NIE:

1.4 Het u geweet wat radiografie behels toe u om toelating tot die kursus aansoek gedoen het?

JA	NEE	MIN OF MEER
----	-----	-------------





2.3 - 2.6 Indicate on scale of 1 to 5 how important you rate the following :  
 (1=Least important 5=Very important)

2.4 Effective study habits.

5	4	3	2	1
---	---	---	---	---

2.5 Holding positions of responsibility at school, e.g. prefect/house captain/team captain, etc.

5	4	3	2	1
---	---	---	---	---

2.6 Belonging to clubs/societies, e.g. science/ interact/religious, etc.

5	4	3	2	1
---	---	---	---	---

2.3 - 2.6 Dui op 'n skaal van 1 tot 5 aan watter belangrikheid u heg aan die volgende :  
(1=Mins belangrik 5=Uiters belangrik)

2.4 Doeltreffende studiegewoontes 

5	4	3	2	1
---	---	---	---	---

2.5 Verantwoordelike posisies op skool beklee, bv. prefek/huiskaptein/spankaptein, ens.

5	4	3	2	1
---	---	---	---	---

2.6 Om aan klubs/verenigings te behoort, bv. wetenskap/interaksie/godsdienstig, ens.

5	4	3	2	1
---	---	---	---	---

3. SECTION C  
(PERSONAL)

3.1 AGE

Indicate on a scale of 1 to 5 how important you rate the following.

(1=Least important 5=Most important).

3.1.1 A student radiographer should start training straight after matric (average age 18 years)

5	4	3	2	1
---	---	---	---	---

3.1.2 When is someone too old to train for radiography:

30	40	50
----	----	----

3.2 SEX

3.2.1 Do you think it is preferable to select males, females or both:

M	F	BOTH
---	---	------

3.2.2 Do you think males should form a fixed proportion:

YES	NO
-----	----

3.2.3 If yes - what percentage .....

3.3 MARITAL STATUS

3.3.1 Do you think it is preferable to select single or married students :

S	M	EITHER
---	---	--------

3.4 CHILDREN

Do you think it is preferable to select students who have/do not have children:

HAVE	DO NOT HAVE	EITHER
------	-------------	--------

3. AFDELING C  
(PERSOONLIK)

3.1 OUDERDOM

Dui op 'n skaal van 1 tot 5 aan watter belangrikheid u heg aan die volgende:

(1=Mins belangrik 5=Uiters belangrik).

3.1.1 'n Kwekelingradiograaf moet onmiddelik na matriek met opleiding begin (gemiddelde ouderdom 18 jaar)

5	4	3	2	1
---	---	---	---	---

3.1.2 Wanneer is iemand te oud om in radiografie opgelei te word?

30	40	50
----	----	----

3.2 GESLAG

3.2.1 Is dit na u mening verkieslik om mans, vrouens of albei te keur:

M	V	ALBEI
---	---	-------

3.2.2 Meen u dat mans 'n vaste verhouding moet uitmaak?:

JA	NEE
----	-----

3.2.3 Indien ja - watter persentasie.....

3.3 HUWELIKSTAAT

3.3.1 Is dit na u mening beter om ongetroude of getroude studente te keur:

ONGETROUD	GETROUD	OM 'T EWE
-----------	---------	-----------

3.4 KINDERS

Is dit na u mening verkieslik om studente met/sonder kinders te keur:

MET	SONDER	OM 'T EWE
-----	--------	-----------

3.5 **PHYSICAL**  
 Indicate on a scale of 1 to 5 how important you rate the following:  
 (1=Least important 5= Most important)

	5	4	3	2	1
3.5.1 Health					
3.5.2 Overweight					
3.5.3 Height					
3.5.4 Strength					
3.5.5 Fitness					
3.5.6 Other.....					

3.6 **BACKGROUND**  
 Indicate on a scale of 1 to 5 how important you rate the following:  
 (1=Least important 5=Most important)

	5	4	3	2	1
3.6.1 Socio-cultural					
3.6.2 Socio-economic					
3.6.3 Number of children in family					
3.6.4 Position of student in family, e.g. oldest/middle/youngest					
3.6.5 Status of parent/s e.g. not married/divorced/deceased					
3.6.6 Occupation of parents					
3.6.7 Occupation of siblings					
3.6.8 Other.....					

- 3.5 **FISIES**  
 Dui op 'n skaal van 1 tot 5 aan watter belangrikheid u heg aan die volgende:  
 (1=Mins belangrik 5= Uiters belangrik)

	5	4	3	2	1
3.5.1					
3.5.2					
3.5.3					
3.5.4					
3.5.5					
3.5.6					

- 3.6 **AGTERGROND**  
 Dui op 'n skaal van 1 tot 5 aan watter belangrikheid u heg aan die volgende:  
 (1=Mins belangrik 5=Uiters belangrik)

	5	4	3	2	1
3.6.1					
3.6.2					
3.6.3					
3.6.4					
3.6.5					
3.6.6					
3.6.7					
3.6.8					





- 3.7 EIENSKAPPE  
 Dui op 'n skaal van 1 tot 5 aan watter belangrikheid u heg aan die volgende:  
 (1=Mins belangrik 5=Uiters belangrik)

	5	4	3	2	1
3.7.1					
3.7.2					
3.7.3					
3.7.4					
3.7.5					
3.7.6.					
3.7.7					
3.7.8					
3.7.9					
3.7.10					
3.7.11					
3.7.12					
3.7.13					
3.7.14					
3.7.15					
3.7.16					
3.7.17					
3.7.18					
3.7.19					
3.7.20					
3.7.21					
3.7.22					
3.7.23					





3.8 HOBBIES/INTERESTS

Indicate on a scale of 1 to 5 how important you rate the following : (1=Least important 5=Most important)

	5	4	3	2	1
3.8.1 Arts and crafts					
3.8.2 Community service					
3.8.3 Domestic interests, e.g. cooking, baking, etc.					
3.8.4 Games, e.g. bridge/chess, etc					
3.8.5 Gardening/plants					
3.8.6 Music - listening/playing instrument					
3.8.7 Reading/poetry					
3.8.8 Socialising, e.g. visiting, beach, etc					
3.8.9 Theatre/films/TV/radio					
3.8.10 Other.....					

3.9 SPORT

3.9.1 Do you think it is preferable to have played sport.

YES	NO
-----	----

3.9.2 If yes - do you think it is preferable to have played sport on a social or competitive basis:

SOCIAL	COMPETITIVE	EITHER
--------	-------------	--------

3.9.3 Do you think it is preferable to play single or team sport:

SINGLE	TEAM	EITHER
--------	------	--------

3.8 STOKPERDJIES/BELANGSTELLINGS  
 Dui op 'n skaal van 1 tot 5 aan watter belangrikheid u heg aan die volgende:  
 (1=Mins belangrik 5=Uiters belangrik)

- 3.8.1 Kuns en kunsvlyt
- 3.8.2 Gemeenskapsdiens
- 3.8.3 Huislike tydverdrywe, bv. kook, bak, ens
- 3.8.4 Speletjies, bv. brug/skaak, ens
- 3.8.5 Tuinmaak/plante
- 3.8.6 Musiek - luister/speel van instrument
- 3.8.7 Lees/poësie
- 3.8.8 Sosialiseer, bv. besoeke, strand, ens
- 3.8.9 Teater/films/TV/radio
- 3.8.10 Ander .....

5	4	3	2	1

3.9 SPORT

3.9.1 Is dit na u mening verkieslik dat die voornemende student aan sport deelgeneem het.

JA	NEE
----	-----

3.9.2 Indien ja - meen u dit is verkieslik dat sportdeelname op sosiale of mededingende basis moes geskied het

SOSIALE	MEDINGENDE	ENIGEEN
---------	------------	---------

3.9.3 Meen u dit is verkieslik dat die voornemende student as enkeling of as deel van 'n span aan sport deelneem:

ENKEL	SPAN	ENIGEEN
-------	------	---------

3.8 STOKPERDJIES/BELANGSTELLINGS  
 Dui op 'n skaal van 1 tot 5 aan watter belangrikheid u heg aan die volgende:  
 (1=Mins belangrik 5=Uiters belangrik)

- 3.8.1 Kuns en kunsvlyt
- 3.8.2 Gemeenskapsdiens
- 3.8.3 Huislike tydverdrywe, bv. kook, bak, ens
- 3.8.4 Speletjies, bv. brug/skaak, ens
- 3.8.5 Tuinmaak/plante
- 3.8.6 Musiek - luister/speel van instrument
- 3.8.7 Lees/poësie
- 3.8.8 Sosialiseer, bv. besoeke, strand, ens
- 3.8.9 Teater/films/TV/radio
- 3.8.10 Ander .....

5	4	3	2	1

3.9 SPORT

3.9.1 Is dit na u mening verkieslik dat die voonemende student aan sport deelgeneem het.

JA	NEE
----	-----

3.9.2 Indien ja - meen u dit is verkieslik dat sportdeelname op sosiale of mededingende basis moes geskied het

SOSIALE	MEDINGENDE	ENIGEEN
---------	------------	---------

3.9.3 Meen u dit is verkieslik dat die voornemende student as enkeling of as deel van 'n span aan sport deelneem:

ENKEL	SPAN	ENIGEEN
-------	------	---------

3.9.4 Indicate on a scale of 1 to 5 how important you rate the following types of sport: (1 = Least important)  
(5 = Most important)

- 3.9.4.1 Balance, e.g. gymnastics, skating
- 3.9.4.2 Ball, e.g. tennis, soccer
- 3.9.4.3 Speed, e.g. athletics, ice hockey
- 3.9.4.4 Stamina, e.g. long distance running, swimming
- 3.9.4.5 Other.....

5	4	3	2	1

3.10 EMPLOYMENT  
Indicate on a scale of 1 to 5 how important you rate the following: (1=Least important 5=Most important)

- 3.10.1 Any casual employment during schooling, e.g. week-ends, vacation
- 3.10.2 Permanent employment prior to radiography training

5	4	3	2	1

THIS IS THE END OF THE QUESTIONNAIRE.

YOUR INTEREST IS MUCH APPRECIATED.

THANK YOU

3.9.4 Dui op 'n skaal van 1 tot 5 aan watter belangrikheid u heg aan die volgende:  
(1=Mins belangrik 5=Uiters belangrik)

- 3.9.4.1 Ewig, bv. gimnastiek, skaats
- 3.9.4.2 Bal bv. tennis, sokker
- 3.9.4.3 Snelheid, bv. atletiek, yshokkie
- 3.9.4.4 Stamina, bv. langafstandwedlope, swem
- 3.9.4.5 Ander.....

5	4	3	2	1

3.10 WERK  
Dui op 'n skaal van 1 tot 5 aan watter belangrikheid u heg aan die volgende:  
(1=Mins belangrik 5=Uiters belangrik)

- 3.10.1 Enige los werk gedurende skoolopleiding, bv. naweke, vakansies
- 3.10.2 Vaste werk voor radiografie opleiding

5	4	3	2	1

DIT IS DIE EINDE VAN HIERDIE VRAELYS.

U BELANGSTELLING WORD HOOG OP PRYS GESTEL.

DANKIE



# APPENDICES

B – L

**INTERVIEW OF RADIOGRAPHER IN CHARGE OF TRAINING**

Name:

Date:

Institution:

**GENERAL**

Number of enquiries:

Number of application forms received:

Number of firm applications received:

Closing date for applications:

Number finally selected from:

Pre-selection:

Total number of student posts available:

Annual number of student posts available:

Annual number of students who leave courses:

Annual number of students who fail subjects:

Reasons for dismissal:

Contract:

**APPLICANT**

Prospectus sent:

Application form:

Re-application:

Health:

References:

Age:

Sex:

Race:

Nationality:

**Marital Status:**

**Children:**

**Area of origin:**

**ACADEMIC**

**Grade/Symbol**

**Maths**

**Science**

**Biology**

**Languages**

**Results:**

**Std 9**

**June—Std 10**

**Sept—Std 10**

**Matric**

**Exemption**

**INTERVIEW:**

**Single:**

**Questions:**

**Panel:**

No. R. 2326

3 December 1976

THE SOUTH AFRICAN MEDICAL AND  
DENTAL COUNCIL

The Minister of Health, on the recommendation of the South African Medical and Dental Council, hereby makes the following regulations in terms of section 33 (1) of the Medical, Dental and Supplementary Health Service Professions Act, 1974 (Act 56 of 1974):

REGULATIONS DEFINING THE SCOPE OF THE  
PROFESSION OF RADIOGRAPHY

The following acts are hereby specified as acts which shall for the purposes of the Act be deemed to be acts pertaining to the profession of radiography.

1. DIAGNOSTIC.

(1) *Imaging*—by which is understood the production and recording of images of anatomical regions and physiological functions by means of radiation media for diagnostic purposes.

The following diagnostic procedures are considered as falling in this category:

(a) X-rays—i.e. all diagnostic X-ray procedures performed at the request of a registered medical practitioner, dentist or veterinary surgeon.

(b) Gamma and beta rays—i.e. all isotopic imaging procedures performed at the request of a medical practitioner.

(c) Ultrasonic radiation—i.e. all ultrasonic imaging procedures performed at the request of a medical practitioner.

(d) Heat waves—i.e. all thermographic imaging procedures performed at the request of a medical practitioner.

(2) *Radiation protection*—by which is understood the application of radiation protection measures to patients, staff and general public in accordance with rules and recommendations laid down in the S A B S publication "Medical Uses of Ionising Radiation".

(3) *Medicine control*—by which is understood assistance to a radiologist or medical practitioner in the control and administration of contrast media or medicines as required for such diagnostic procedures.

(4) *Patient care*—by which is understood assistance to a medical practitioner in medical procedures associated with the practice of radiography.

(5) *Use of equipment*—by which is understood the use and care of such equipment and accessories as may be required to carry out these diagnostic procedures.

2. THERAPEUTIC.

(1) *Administration of treatment.*

To administer treatment to patients accurately using ionizing radiation, according to the prescription of the radiotherapist.

(2) *Care of patients.*

(a) To assist the radiotherapist or medical practitioner in medical procedures associated with the practice of radiotherapy and to have at hand all such medicines and equipment as are prescribed by the radiotherapist or medical practitioner.

(b) To care for the patient during localisation, planning and therapeutic procedures; to note any adverse change in the patient's condition and to report this to the radiotherapist or medical practitioner immediately; to advise and instruct the patient regarding skin care, diet and general health, in accordance with the instructions of the radiotherapist or medical practitioner.

No. R. 2326

3 Desember 1976

DIE SUID-AFRIKAANSE GENEESKUNDIGE EN  
TANDHEELKUNDIGE RAAD

Die Minister van Gesondheid vaardig hierby, op aanbeveling van die Suid-Afrikaanse Geneeskundige en Tandheelkundige Raad, die volgende regulasies uit kragtens artikel 33 (1) van die Wet op Geneeshere, Tandartse en Aanvullende Gesondheidsdiensberoepse, 1974 (Wet 56 van 1974):

REGULASIES WAT DIE OMVANG VAN DIE  
BEROEP RADIOGRAFIE OMSKRYF

Die volgende handeling word hierby bepaal as handeling wat vir die toepassing van die Wet geag word handeling te wees wat by die beroep radiografie tuis hoort:

1. DIAGNOSTIES.

(1) *Beeldvaslegging*.—Waaronder verstaan word die produsering en vaslegging van beelde van anatomiese areas en fisiologiese funksies deur middel van stralingsmedia vir diagnostiese doeleindes.

Die volgende diagnostiese prosedures word geag onder hierdie kategorie te val:

(a) X-strale—d.i. alle diagnostiese X-straalprosedures uitgevoer op versoek van 'n geregistreerde geneesheer, tandarts of veearts.

(b) Gamma- en beta-strale—d.i. alle isotopiese beeldvasleggingsprosedures uitgevoer op versoek van 'n geneesheer.

(c) Ultrasoniese straling—d.i. alle ultrasoniese beeldvasleggingsprosedures uitgevoer op versoek van 'n geneesheer.

(d) Hittegolwe—d.i. alle termografiese beeldvasleggingsprosedures uitgevoer op versoek van geneeshere.

(2) *Stralingsbeskerming*.—Waaronder verstaan word die toepassing van stralingsbeskermingsmaatreëls op pasiënte, personeel en algemene publiek ooreenkomstig reëls en aanbevelings neergelê in die S.A.B.S.-publikasie: "Mediese Gebruik van Ioniseerstraling".

(3) *Medisynebeheer*.—Waaronder verstaan word die hulp aan 'n radioloog of geneesheer met die beheer en toediening van kontrasmedia of medisyne vereis vir sulke diagnostiese prosedures.

(4) *Pasiëntversorging*.—Waaronder verstaan word die hulp aan 'n geneesheer met geneeskundige prosedures verwant aan die praktyk van radiografie.

(5) *Gebruik van uitrusting*.—Waaronder verstaan word die gebruik en versorging van uitrusting en bykomstigheid wat vereis mag word om hierdie diagnostiese prosedures uit te voer.

2. TERAPEUTIES.

(1) *Toediening van behandeling.*

Om behandeling akkuraat aan pasiënte toe te dien deur gebruikmaking van ioniserende straling volgens voorskrif van die radioterapeut.

(2) *Versorging van die pasiënte.*

(a) Om die radioterapeut of geneesheer behulpzaam te wees met geneeskundige prosedures verwant aan die praktyk van radioterapie en om sodanige medisyne en uitrusting byderhand te hê soos voorgeskryf deur die radioterapeut of geneesheer.

(b) Om die pasiënt te versorg gedurende lokaliserings, bepaling en terapeutiese prosedures; om te let op enige nadelige verandering in die pasiënt se toestand en dit onmiddellik aan die radioterapeut of geneesheer te rapporteer; om die pasiënt te adviseer en voor te lig aangaande versorging, dieet en algemene gesondheid ooreenkomstig die instruksies van die radioterapeut of geneesheer.

(3) *Localisation of tumours and treatment planning.*

To assist the radiotherapist in procedures for the localisation of tumours and surrounding tissues; to carry out planning of patient treatments under the direction of the radiotherapist.

(4) *Therapeutic radioactive isotopes.*

To assist in the storage, handling and administration of therapeutic radioactive isotopes (sealed and unsealed), under the direction of the radiotherapist.

(5) *Radiation protection.*

To ensure that the relevant sections of the National Code of Practice governing the Medical Uses of Ionizing Radiation are observed.

(6) *Equipment.*

(a) To ensure to the best of his/her knowledge that equipment in his/her care is in good mechanical order and to report any suspected malfunction to the holder of the licence or his/her deputy.

(b) To put forward suggestions regarding modifications and additions to existing equipment, the purchase, design or construction of new equipment, and the design or construction of new equipment, and the design and lay-out of new or altered premises.

(7) *Keeping of patients' records.*

To keep accurate records of procedures and treatments for the purpose of medical, statistical and legal requirements.

(8) *Other uses of ionizing radiation.*

To utilise ionizing radiation for irradiating any material for clinical or research purposes, under the direction of the radiotherapist.

### "3. NUCLEAR MEDICINE

(1) *Imaging.*—By which is understood the production and recording of images of anatomical regions and physiological functions by means of radiation media for diagnostic purposes.

The following diagnostic procedures are considered to fall into this category:

(a) *Gamma rays*—i.e. all radionuclide imaging procedures performed at the request of a medical practitioner and carried out under the supervision of the holder of the authority or a local committee authorised by the Atomic Energy Board to use radionuclides in medical practice.

(b) *Ultrasonic radiation*—i.e. diagnostic ultrasound procedures in so far as they are necessary to complement item (a) above.

(c) *Infra-red radiation*—i.e. thermographic procedures in so far as they are necessary to complement item (a) above.

(2) *Non-imaging procedures.*—By which is understood all *in vitro* and *in vivo* techniques which are used for the elucidation of physiological functions or biochemical processes by means of radionuclides and which are not included in category (1).

In this instance, radionuclides include both gamma and beta emitters.

(3) *Radiation protection.*—By which is understood the application of radiation protection measures to patients, staff and the general public in accordance with the rules and recommendations laid down in the SABS publication "Medical Uses of Ionising Radiation" and the regulations of the Atomic Energy Board.

(3) *Lokalisering van gewasse en behandelingsbeplanning.*

Om die radioterapeut behulpsaam te wees met prosedures vir die lokalisering van gewasse en omliggende weefsel; om beplanning van pasiëntbehandelings onder die leiding van die radioterapeut uit te voer.

(4) *Terapeutiese radioaktiewe isotope.*

Om behulpsaam te wees met die hantering en aanwending van terapeutiese radioaktiewe isotope (verseël en onverseël) onder leiding van die radioterapeut.

(5) *Stralingsbeskerming.*

Om te verseker dat die relevante artikels van die Nasionale Praktykkode oor Mediese Gebruik van Ioniseerstraling nagekom word.

(6) *Uitrusting.*

(a) Om na sy/haar beste kennis te verseker dat uitrusting onder sy/haar sorg in goeie meganiese toestand verkeer en enige vermoedelike gebrekkige funksionering aan die lisensiehouer of sy/haar plaasvervanger te rapporteer.

(b) Om voorstelle te doen aangaande veranderings en toevoegings aan bestaande uitrusting, die aankoop, ontwerp of vervaardiging van nuwe uitrusting en die ontwerp en uitlê van nuwe of veranderde geboue.

(7) *Hou van pasiëntrekords.*

Om akkurate rekords te hou van prosedures en behandelings vir doeleindes van geneeskundige, statistiese en wetlike vereistes.

(8) *Ander gebruike van ioniserende straling.*

Om ioniserende straling te gebruik vir die bestraling van materiaal vir kliniese of navorsingsdoeleindes, onder leiding van die radioterapeut.

### "3. KERNGENEESKUNDE

(1) *Beeldvaslegging.*—Waarunder verstaan word die produsering en vaslegging van beelde van anatomiese areas en fisiologiese funksies vir diagnostiese doeleindes deur gebruikmaking van stralingsmedia.

Die volgende diagnostiese prosedures word geag in hierdie kategorie te val:

(a) *Gammastrale*—d.i. alle beeldvasleggingsprosedures met gebruikmaking van radionuklide wat uitgevoer word op versoek van 'n geneesheer en toegepas word onder toesig van die gemagtigde persoon of 'n plaaslike komitee wat deur die Raad op Atoomkrag gemagtig is om radionuklide in die mediese praktyk te gebruik;

(b) *Ultrasoniese straling*—d.i. diagnostiese ultraklankprosedures insoverre dit nodig mag wees om item (a) hierbo aan te vul;

(c) *Infrarooi-straling*—d.i. termografiese prosedures insoverre dit nodig mag wees om item (a) hierbo aan te vul.

(2) *Prosedures wat nie beeldvaslegging behels nie.*—Waarunder verstaan word alle *in vitro*- en *in vivo*-tegnieke wat aangewend word vir die verklaring van fisiologiese funksies of biochemiese prosesse met gebruikmaking van radionuklide en wat nie by kategorie (1) ingesluit is nie.

In hierdie geval sluit radionuklide beide gamma- en beta-uitstralers in.

(3) *Stralingsbeskerming.*—Waarunder verstaan word die toepassing van stralingsbeskermingsmaatreëls op pasiënte, personeel en die algemene publiek ooreenkomstig die reëls en aanbevelings neergelê in die S.A.B.S.-publikasie "Mediese Gebruik van Ioniseerstraling", asook die regulasies van die Raad op Atoomkrag.

(4) *Medicine control.*—By which is understood assistance to medical practitioners in possession of a licence (authority) for the medical use of radionuclides in the control and administration of radionuclides, contrast media or medicines as required for the procedures of nuclear medicine.

(5) *Patient care.*—By which is understood assistance to a medical practitioner in medical procedures associated with the practice of nuclear medicine.

(6) *Use of equipment.*—By which is understood the use and care of such equipment and accessories as may be required to carry out these diagnostic procedures.

(7) *Therapeutic radioactive nuclides.*—To assist in the storage, handling and administration of therapeutic nuclides (sealed and unsealed), under the direction of the radiotherapist.

(8) *Other uses of ionising radiation.* — To utilise ionising radiation from the above sources for irradiating any material for clinical or research purposes under the direction of the holder of the authority or a local committee authorised by the Atomic Energy Board to use radionuclides in medical practice.”.

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(4) *Medisynebeheer.*—Waaronder verstaan word die hulp aan geneeshere wat 'n lisensie (magtiging) het vir die mediese gebruik van radionukliede, met die beheer en toediening van radionukliede, kontrasmiddels of medisynes soos vir kerngeneeskundige prosedures vereis.

(5) *Pasiëntversorging.*—Waaronder verstaan word die hulp aan 'n geneesheer met geneeskundige prosedures verwant aan die praktyk van kerngeneeskunde.

(6) *Gebruik van uitrusting.*—Waaronder verstaan word die gebruik en versorging van uitrusting en bykomstighede wat vereis mag word om hierdie diagnostiese prosedures uit te voer.

(7) *Terapeutiese radioaktiewe nukliede.*—Om behulpsaam te wees met die berging, hantering en toediening van terapeutiese nukliede (verseël en onverseël) onder leiding van 'n radioterapeut.

(8) *Ander gebruike van ioniseerstraling.*—Om ioniseerstraling uit bogenoemde stralingsbronne aan te wend om enige materiaal vir kliniese of navorsingsdoelendes te bestraal onder leiding van die gemagtigde persoon of 'n plaaslike komitee wat deur die Raad op Atoomkrag gemagtig is om radionukliede in die mediese praktyk te gebruik.”.

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SUBJECT	5	4	3	2	1	Total	% 5	Ave	4+5	%4+5	R 1	R 2	R 3
Biology	760	171	51	12	12	1006	0.76	4.65	931	0.93	1	1	1
English	688	184	97	9	18	996	0.69	4.52	872	0.88	2	2	2
Physiology	649	173	100	14	16	952	0.68	4.50	822	0.86	3	3	3
Mathematics	560	246	103	19	32	960	0.58	4.34	806	0.84	5	5	4
Physical Science	648	181	98	38	23	988	0.66	4.41	829	0.84	4	4	5
Afrikaans	463	274	188	40	41	1006	0.46	4.07	737	0.73	6	6	6
Languages e.g. Xhosa	288	307	139	83	45	862	0.33	3.82	595	0.69	7	7	7
Computer Literacy	177	255	335	124	187	1078	0.16	3.10	432	0.40	8	8	8
Languages e.g. French	46	84	277	252	298	957	0.05	2.30	130	0.14	9	9	9
Typing	23	84	299	205	344	955	0.02	2.20	107	0.11	10	12	10
Latin	27	28	93	142	540	830	0.03	1.63	55	0.07	12	10	11
Accountancy	26	31	137	157	585	936	0.03	1.67	57	0.06	11	11	12
Art	22	26	83	133	713	977	0.02	1.48	48	0.05	14	13	13
Geography	7	28	120	176	648	979	0.01	1.54	35	0.04	13	16	14
Criminology	13	20	92	153	663	941	0.01	1.48	33	0.04	14	14	15
Home Economics	9	19	74	177	669	948	0.01	1.44	28	0.03	16	15	16
History	9	12	105	190	946	1262	0.01	1.37	21	0.02	17	17	17
Music	4	8	38	97	694	841	0.00	1.25	12	0.01	18	18	18

R1=sort on ave. R2=sort on %choice 5. R3=sort on %choice 5+4.

BACKGROUND	5	4	3	2	1	Total	% 5	Ave	4+5	%4+5	R 1	R 2	R 3
Socio-cultural	135	241	393	112	160	1041	0.13	3.08	376	0.36	1	1	1
Socio-economic	80	169	422	146	211	1028	0.08	2.77	249	0.24	2	2	2
Number of children	24	39	176	135	609	983	0.02	1.71	63	0.06	4	3	3
Occupatio - parents	14	49	194	159	592	1008	0.01	1.74	63	0.06	3	4	3
Status of parent/s	19	37	128	134	625	943	0.02	1.61	56	0.06	6	3	3
Occupation - siblings	10	36	154	142	561	903	0.01	1.66	46	0.05	5	4	6
Position of student:	18	22	121	125	708	994	0.02	1.51	40	0.04	7	3	7

R1=sort on ave. R2=sort on %choice 5. R3=sort on %choice 5+4.



CHARACTERISTICS	5	4	3	2	1	Total	% 5	Ave	4+5	%4+5	R 1	R 2	R 3
Co-operation	816	167	20	0	1	1004	0.81	4.79	983	0.98	2	2	1
Conscientiousness	801	301	22	2	0	1126	0.71	4.69	1102	0.98	6	7	1
Responsibility	888	108	28	0	1	1025	0.87	4.84	996	0.97	1	1	3
Punctuality	797	185	39	1	0	1022	0.78	4.74	982	0.96	3	3	4
Discipline - self	780	190	46	1	2	1019	0.77	4.71	970	0.95	4	4	5
Superv.-ability - work	671	248	41	4	2	966	0.69	4.64	919	0.95	8	10	5
Discipline-ability to a	797	204	50	3	1	1055	0.76	4.70	1001	0.95	5	5	5
Attitude to juniors	770	271	60	4	2	1107	0.70	4.63	1041	0.94	9	8	8
Attitude to seniors	732	175	52	4	2	965	0.76	4.69	907	0.94	6	5	8
Stress-ability to cope	557	388	56	3	2	1006	0.55	4.49	945	0.94	14	18	8
Attitude to peers	684	274	67	3	6	1034	0.66	4.57	958	0.93	11	12	11
Human relations	654	283	76	2	2	1017	0.64	4.56	937	0.92	12	13	12
Commun. e.g. to express	587	327	94	6	2	1016	0.58	4.47	914	0.90	15	15	13
Perseverance	723	208	100	4	0	1035	0.70	4.59	931	0.90	10	8	13
Attendance-regular	697	204	88	6	12	1007	0.69	4.56	901	0.89	12	10	15
Orders-ability to take	566	327	105	6	4	1008	0.56	4.43	893	0.89	17	17	15
Integrity	627	256	104	14	6	1007	0.62	4.47	883	0.88	15	14	17
Neatness	503	365	133	13	1	1015	0.50	4.34	868	0.86	19	19	18
Empathy	581	280	134	8	5	1008	0.58	4.41	861	0.85	18	16	19
Listening skills	489	344	168	11	8	1020	0.48	4.27	833	0.82	20	20	20
Stamina	436	373	185	17	11	1022	0.43	4.18	809	0.79	21	22	21
Orders-ability to give	427	374	201	18	5	1025	0.42	4.17	801	0.78	22	24	22
Manual dexterity	435	334	198	25	9	1001	0.43	4.16	769	0.77	23	22	23
Blood-ability to deal w	435	237	219	35	14	940	0.46	4.11	672	0.71	24	21	24
Appearance	403	339	250	22	38	1052	0.38	4.00	742	0.71	25	25	24
Speech e.g.Accent/gramm	228	371	326	46	28	999	0.23	3.73	599	0.60	26	26	26
Leadership	186	298	395	53	22	954	0.19	3.60	484	0.51	27	27	27
Extroversion	155	225	465	89	60	994	0.16	3.33	380	0.38	28	28	28
Introversion	133	204	601	145	112	1195	0.11	3.08	337	0.28	29	29	29

R1=sort on ave. R2=sort on %choice 5. R3=sort on %choice 5+4.

HOBBIES/INTERESTS	5	4	3	2	1	Total	% 5	Ave	4+5	%4+5	R 1	R 2	R 3
Socialising	124	220	386	132	137	999	0.12	3.06	344	0.34	2	1	1
Community service	84	260	419	144	107	1014	0.08	3.07	344	0.34	1	3	1
Reading/poetry	83	188	359	166	202	998	0.08	2.78	271	0.27	4	3	3
Theatre/films/tv/radio	94	157	403	171	172	997	0.09	2.83	251	0.25	3	2	4
Music-listening, playing	53	116	319	232	282	1002	0.05	2.43	169	0.17	5	5	5
Arts & crafts	28	93	320	219	326	986	0.03	2.27	121	0.12	6	6	6
Gardening/plants	25	75	302	271	315	988	0.03	2.21	100	0.10	8	6	7
Games, e.g. bridge/chess	16	82	339	239	317	993	0.02	2.24	98	0.10	7	8	7
Domestic interests	23	66	339	233	337	998	0.02	2.20	89	0.09	9	8	9

R1=sort on ave. R2=sort on %choice 5. R3=sort on %choice 5+4.

**INFORMATION TO BE INCLUDED IN PROSPECTUS FOR RADIOGRAPHY**

**(ACCORDING TO POLICY OF TRAINING INSTITUTION)**

Historical Background:

Discovery of x-rays—reference to gamma rays, alpha and beta particles and ultrasound waves.

Brief Description of Nature of Work:

Diagnostic radiographic, radiotherapy, nuclear medicine and ultrasound

Aspects of work common to all 4 subdisciplines

Part of medical team, caring for healing with sick or injured patients and public—all types/ages/conditions. Use of sophisticated equipment—incorporating television and computers.

Administration. 24 hour service.

Qualities Required:

Intelligent, compassionate, responsible, honest, co-operative, self-disciplined, ability to cope with stress, neat, initiative, manual dexterity, mechanical aptitude, patience, mature, ability to communicate, practical, administration (clerical) aptitude. Ability to work quickly and accurately. At least 17.

Scholastic Requirements:

Matriculation or equivalent preferably with exemption. Preference on higher grade subjects: Mathematicss, Science, Biology or Physiology (preferably both), English, Afrikaans and preferably a local Black African language.

Computer literacy/keyboarding a recommendation.

Credits for post-school qualifications in mathematics/science/biology/physiology.

### Course:

Commencing date. 3 years for 1 subdiscipline—areas/times common for theory and clinical practice—Language of lectures. Need for experience in other departments/hospitals.

Location of lectures e.g. hospital/technikon.

Tests written throughout and practical evaluation done—to qualify for examination entry.

Examination rules—pass/fail/distinction/re-write.

### Financial Aspects:

Salary and uniform allowance obtained—Contracts—Contribution to medical aid and pension.

Bonus/travel concessions.

Compulsory fees and dates due.

Uniforms, textbooks and stationery, photocopying and meals—facilities available.

Sources of bursaries/loans

### Residential Accommodation:

Availability—hospital/other—costs.

### Conditions of Service:

Appointment dependent on successful medical exam. Necessary health checks. Smoking policy of hospital/educational institution. Hours of duty—24 hour service—shifts/N.D./week-ends/public holidays. Policy on religious holidays e.g. main days as vacation if amenable to departments. Need to comply with rules/regulations.

Pregnancy and radiation—inform school head.

Policy on simultaneous registration with other medical institutions.

### Leave:

Amount p.a.—taken at discretion of training institution/hospital to fit in with lecture programme—usually June/July and December/January.

Sick: employer policy (e.g. Public Service).

Application Procedure:

Names, addresses and telephone numbers for information/forms—closing dates for applications. Other training centres.

Selection Procedure:

Limited posts. Need for interviews (policy) and when, department visits, and psychometric testing (policy) and when

Recreational Facilities:

e.g. Sport/cultural

Employment Opportunities:

Public Service/Hospitals/Defence/National Health/Council/Municipal.

Further Specialisation:

Additional qualifications—specialisation—teaching—management—overseas.

Promotion Prospects:

Ranks/qualifications/experience.

**INFORMATION TO BE INCLUDED ON APPLICATION FORM (INCLUDING  
BIOGRAPHICAL QUESTIONNAIRE) FOR RADIOGRAPHY**

To be printed by applicant.

CLOSING DATE FOR APPLICATIONS AND ADDRESS TO RETURN FORM TO

PERSONAL

Surname and First Names.

Sex.

Date of Birth.

Identity/Passport Number.

Nationality/Citizenship/Country of birth.

Marital Status—Never married/Married/Divorced.

Children—Number/Ages.

Address/Telephone number and Code—Home/Work.

Language preference for correspondence.

Ability to cope with lectures in English/Afrikaans.

Conviction of criminal offence.

HEALTH

Mass/Height.

Hereditary/familial conditions.

Operations/Accidents—Dates/reasons.

Physical/Mental handicaps.

Previously x-rayed—When/Where/Reason.

Specific/recurrent problems: Back/legs/feet/eyes/ears.

Specific/recurrent conditions/infections: e.g. migraine/asthma/respiratory/spastic colon/gastric/colds/throat/urinary tract/dysmenorrhoea.

Other conditions (Rated on a scale of occasionally/frequently/very frequently) e.g. Irritability/Insomnia/Moodiness/Nightmares/Dizziness/Fits of anger/Sweating hands/Tendency to worry/Nail biting/Motion sickness (Can help to assess type of person if measured against norms and controlled by clinical psychologist).

Any other conditions.

Amount of sick leave taken per year—Reasons.

### SCHOLASTIC

Secondary schools/colleges attended—Periods.

Name and address/telephone number of heads of schools.

Name of school leaving examination/examining body.

Date of writing final matriculation examination/Results and Exemption if already written.

Language medium taught in.

Fail any standards.

Subjects studied/Grades and extra-mural e.g. art/music/ballet.

Standard 9/Standard 10 June and September results.

Favourite subjects—Reasons.

Least favourite subjects—Reasons.

### POST-SCHOOL/TERTIARY

Courses started/completed—Results/Reasons for not completing courses.

Institutions where studied and periods.

Subjects studied/Passes/Failures.

Names/Addresses/Telephone numbers of heads of institutions.

### OTHER QUALIFICATIONS

e.g. Clerical/Social/Community/Service

### PREVIOUS EMPLOYMENT

Places of employment—Positions held/Nature of work—Periods—Reasons for leaving.

Ever dismissed—Where/When/Position/Reasons.

Names/Addresses/Telephone numbers of employers.

Part-time/Vacational employment separate.

### POSITIONS OF RESPONSIBILITY

Secondary school.

Post-school/Tertiary.

Community/Social.

### AWARDS/ACHIEVEMENTS

Secondary school.

Post-school/Tertiary.

Community/Social.

### HOBBIES/INTERESTS

Mention—school/post-school/social/extramural.

### SPORT

Type/Team/Competitive/Social/Position e.g. captain.

Secondary school.

Post-school/Tertiary.

Community/Social.

### BACKGROUND (Not to affect application)

Father's name/address/telephone number/occupation (and/or Guardian).

Mother's name/address/telephone number/occupation (and/or Guardian).

Number/sex/ages/occupations of siblings.

### RE-APPLICATIONS

Application/s to which training centres/when.



IF UNSUCCESSFUL

Which other occupations applied for—first choice.

REASONS FOR RADIOGRAPHY APPLICATION

Source of information on radiography.

Reasons for application (can be written before interview to ensure originality of thought).

What radiography is thought to be.

What type of person required.

How applicant sees self—strong/weak points.

How good friend/enemy sees applicant.

PRINTED NAME/SIGNATURE/DATE

Agree to abide by regulations of employer and training bodies. Application approved by parent/guardian if a minor.

**STRUCTURED INTERVIEW FOR RADIOGRAPHY**

**ASPECTS TO BE ASSESSED**

Each member of panel to complete identical form and rate candidate **numerically** on a scale of 1 to 5 for **each item**. Each member to ask **specific questions**.

NAME AND DATE

Interviewee and date of interview.

PUNCTUALITY

Interview to start punctually and time allowed adhered to.

PHYSICAL

Appearance—Handicaps/Disabilities

Dress—Correct/Neat

Grooming

Eye Contact

COMMUNICATION

Speech—Accent/Tone

Self expression—Vocabulary/Articulate

Language—English/Afrikaans

Listening Skills

MANNER/PERSONALITY

Confidence/Self image

Nervousness

Irritated/Patient

Ability to cope with stress

Mannerisms

Introversion/extroversion

### ATTITUDE

Manners/Courtesy

Attitude to interviewers

### KNOWLEDGE

Radiography

General

Questions asked

Obvious problems to be probed if necessary e.g. health, academic, family, finances, accommodation, knowledge of radiography, qualities required for radiographer and reasons for application.

### Open Ended Questions

Specially formulated questions can be devised with the help of a clinical psychologist to enable a more accurate assessment of the type of person and their interests.

**FINAL TOTAL**

**SWEDISH FORMULA FOR EVALUATION OF MATRICULATION RESULTS  
FOR RADIOGRAPHY**

(Based on responses from questionnaire)

SUBJECTS	SYMBOL		MARKS	x	SCORE
	H.G.	S.G.			
Biology				3	
English				3	
Physiology				3	
Mathematics				3	
Physical Science				3	
Afrikaans				2	
Black African Language				2	
Computer Literacy				1.5	
Typing/Keyboarding				1.5	
“European” Language				1	
Other Subjects				1	
			<b>TOTAL</b>		
			x 7 or 3		
			÷ 4 or 2		

H.G. = Higher Grade

S.G. = Standard Grade

If 6 Subjects Studied  $x 7 \div 4$

If 7 Subjects Studied  $x 3 \div 2$

**P.T.O for mark calculation table.**

**Marks Are Calculated According To This Table:**

Matriculation Subject Symbol	Marks Awarded	
	Higher Grade	Standard Grade
A	8	6
B	6	4
C	5	3
D	4	2
E	3	1
F	2	0
FF	1	0
G	1	0

## APPENDIX L

### INFORMATION TO BE INCLUDED ON EVALUATION FORM FOR FINAL SELECTION OF STUDENTS FOR RADIOGRAPHY

All categories must be given a numerical designation if possible, as this makes selection more objective.

#### GENERAL

Name or Number (to be more objective).

Nationality (if preference given to South African citizens).

Age (if mature student).

Home region (if preference given to local candidates).

#### SCHOLASTIC

Matriculation or equivalent—Year/Name of examination.

Results—**Rated** on Swedish formula/exemption if applicable.

#### POST-SCHOOL

Courses commenced/completed and results.

#### PREVIOUS EMPLOYMENT

Places/Positions held/Track record.

#### HEALTH

Potential problems.

#### INTERVIEW

**Rating** awarded.

#### PSYCHOLOGICAL TESTS

Results **rated**.

#### REPORTS/REFERENCES

These are difficult to rate, as they are subjective but problems can be identified from these.

**A FINAL TOTAL MUST BE AWARDED.**