Has the Pharmacy Curriculum Met the Needs of Practicing Pharmacists?

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of

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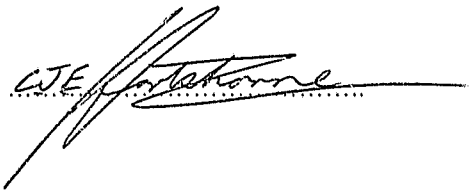
Declaration

I, Charles James Ellison Hartshorne declare that this dissertation is my own work. It is being submitted for the degree of Master of Science in Medicine in the Faculty of Health Sciences in the University of the Witwatersrand, Johannesburg. It has not been submitted before, for any degree or examination at this or any other University.



This 1st Day of June 1998.

Publications arising from this study

Hartshorne, C.J.E., Danckwerts, M.P. and Banoo, S., Increasing profitability through customer satisfaction, *S.A. Pharm. J.*, **64**, (1997), 130-131.

Hartshorne, C.J.E., Danckwerts, M.P. and Banoo, S., The cost of dissatisfied customers, *S.A. Pharm. J.*, **64**, (1997), 162-163.

Hartshorne, C.J.E., Danckwerts, M.P. and Banoo, S., Achieving customer satisfaction through market research, *S.A. Pharm. J.*, **64**, (1997), 198-199.

Hartshorne, C.J.E., Danckwerts, M.P. and Banoo, S., Questionnaire implementation and analysis, *S.A. Pharm. J.*, **64**, (1997), 274-275.

Future Publications

A paper entitled 'A suitable measurement factor to suggest an integrated entry level curriculum for pharmacists in South Africa' by C.J.E. Hartshorne, M.P. Danckwerts and S. Banoo, is being written up and will be submitted to the American Journal of Pharmaceutical Education by the end of 1998.

A paper entitled 'The need to decrease the I-C gap in Pharmaceutical Education in South Africa' by C.J.E. Hartshorne, M.P. Danckwerts and S. Banoo, is being written up and will be submitted to the South African Education Journal by the end of 1998.

Abstract

Concern has been raised about pharmacy education and whether it is lagging behind practice. This concern has come about because of the various factors impacting upon the profession. These factors are: the practice environment, the economic environment, demographical changes and information technology.

Because of the above factors, the role played by pharmacists is likely to change. It is possible that pharmacy education is not adequately preparing students for the practice of pharmacy. The present pharmacy curriculum as prescribed by the Pharmacy Act, No 54 of 1974 was examined to ascertain whether or not it is preparing adaptable and competent entry level pharmacists. In order to develop a new pharmacy curriculum, it was necessary to get a base line of information by evaluating the present pharmacy curriculum. This was achieved by using a practitioner survey to collect information - which is grouped according to sector - from pharmacists regarding the perceived importance of various activities they perform, their competence to perform in these areas and the time spent in these activities.

Regardless of sector, the importance of the major function; management, dispensing and manufacturing, counselling, and public health was always greater than the pharmacists average 'perceived level' of competence to perform the major function. This indicates that none of the pharmacists felt over-qualified. Community pharmacists showed the highest average importance for management, dispensing and manufacturing, counselling and public health activities. Community pharmacy also had the highest average competence rating for management, dispensing and manufacturing and counselling. The highest public health competence rating was shown by hospital pharmacists.

Regarding specific subject areas, community and hospital pharmacists ranked Pharmacology as the subject area that has made the greatest contribution to their competence to function in their jobs. Industrial pharmacists ranked the Pharmaceutics subject area as having made

the greatest contribution to their competence to function in their full-time work. All three pharmacy sectors ranked Biochemistry as having made the least contribution.

A curriculum analysis factor formula was devised by the author to indicate how much emphasis the pharmacy curriculum should place on the major functions for each sector of pharmacy. According to the curriculum analysis factor, the emphasis of the pharmacy curriculum should be placed upon community pharmacy for all four major functions.

Finally, a modified curriculum assessment model is recommended by the author.

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Dedication

This dissertation is dedicated to my Lord and Saviour, Jesus Christ.

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Chapter 1 Introduction

1.1 Background to problem

Various factors, such as the practice environment and information technology, have had an impact on the pharmacy profession, which have markedly influenced the provision of pharmaceutical health care and consequently, pharmaceutical education. Before World War II, most drug products were available only in their bulk form. Therefore, the traditional duties of the pharmacist involved the procurement, storage, compounding and dispensing of drugs. Of these duties, a great deal of time was spent on the preparation of potions, elixirs, tablets and other dosage forms according to a prescription for the patient. As a result, pharmacy curriculums were devoted in particular to those competencies required to perform the above mentioned duties (Nuffield Report, 1986). Today most drugs are supplied by the manufacturers to the pharmacist in patient-ready packs. Consequently, the pharmacist has moved away from the traditional compounding to more of a counselling role.

The education of health care professionals has always attempted to reflect developments in the medical and pharmaceutical fields (Ebert and Shields, 1991). The health care professions have, to a large degree, set the terms for these changes in the health care system. The pharmacy profession is entering a new period, in which major changes are taking place in the way pharmaceutical services are provided. For example, health maintenance organisations and prescription monitoring. More often than not, it will be environmental changes outside the health professions that will dictate how health care is practiced and managed. Pharmacy education should therefore, reflect these changes in health care (Ebert and Shields, 1991; Lowes, 1995).

The major factors which affect the current status of the pharmacy profession, and which are likely to influence the educational needs of the profession include amongst others, (1) practice environment, (2) the economic environment, (3) demographical changes, and (4) information technology.

1.1.1 Practice environment impact

The practice of pharmacy is currently undergoing a period of change, which is likely to continue into the foreseeable future. Procedures, once done in a hospital, ar now being done in day clinics. Consequently, there is a responsibility for the pharmacist to advise the outpatient on the correct use of medications. Increasingly, health care is being managed to make better use of the available health care resources. What care is provided, and at what cost, will be strictly monitored by both private (medical aids) and public (government) payers (Ebert and Shields, 1991).

The government has introduced a macro plan in the form of the National Drug Policy (NDP), for the rational and cost effective use of medicines in South Africa (National Drug Policy for South Africa, 1996). As a consequence, the South African Drug Action Programme (SADAP) was set up within the Department of Health to oversee the implementation of the NDP in the public and private sectors. This implementation which has already begun, is to take place over a period of four years, and in three phases.

1) Phase one comprises those areas for which no regulatory or legislative alterations would be required. For example, the preparation of an essential drugs list.

2) Phase two involves major changes to legislation. For example, Act, No 101 of 1965 (Medicines and Related Substances Control Act, No 101 of 1965).

3) Phase three involves amending all regulations issued in terms of current legislation and for which approval by parliament is not required.

During 1997 the following legislative amendments were submitted to Parliament for approval:

1) The Dental Technicians Bill (Dental Technicians Amendment Bill, 1997).

2) The Medical, Dental and Supplementary Health Services Professions Amendment Bill (Medical, Dental and Supplementary Health Services Professions Amendment Bill, 1997).

3) The Medicines and Related Substances Control Amendment Bill (Medicines and Related Substances Control Amendment Bill, 1997).

4) The Pharmacy Amendment Bill (Pharmacy Amendment Bill, 1997).

Some of the governments legislature changes that affected drug policy included the following;

1) generic substitutions (Medicines and Related Substances Control Amendment Bill, 1997),

2) no dispensing by doctors (except where there is no access to a pharmacy) (Medicines and Related Substances Control Amendment Bill, 1997),

3) lay ownership of pharmacies (Pharmacy Amendment Bill, 1997), and

4) parallel importation of drugs (Medicines and Related Substances Control Amendment Bill, 1997).

Therefore, the role played by the pharmacist in hospital and community pharmacy is likely to change. Group practice, health maintenance organisations, and the effect of managed health care, will all influence the knowledge and competencies required by a pharmacist.

The evolution of pharmaceutical care has also affected pharmacy practice. The Interim Pharmacy Council of South Africa (IPCSA) in the Pharmaciae newsletter (1996) has stated that pharmaceutical care forms the basis of pharmacy practice.

Pharmaceutical care focuses the attitudes, behaviours, commitments, concerns, ethics, functions, knowledge, and skills of the pharmacist, on providing responsible drug therapy, so as to improve a patients quality of life by achieving certain outcomes. These outcomes are:

1) to cure disease,

2) to eliminate or reduce the patients symptoms,

3) to stop or slow down the disease process, or

4) to prevent a disease or symptom (Commission to Implement Change in Pharmaceutical Education, Background Paper 1, 1993; Hepler and Strand, 1989; Martin, 1994).

There are however, various challenges that must be overcome for pharmacists to practice pharmaceutical care. Pharmacists will have to:

1) possess the required knowledge and skills, and

2) develop relationships with the patient, and other health care providers (Hepler and Strand, 1989).

There must also be a sufficient number of pharmacists to provide pharmaceutical care to meet society's needs. In order to practice pharmaceutical care, pharmacists will need to have the knowledge and skills necessary to identify potential and actual drug related problems. Pharmacists must also be able to resolve and prevent drug related problems (Hepler and Strand, 1989).

Pharmacy education must therefore, prepare entry level pharmacists who are knowledgeable, competent and capable of delivering pharmaceutical care. Pharmacy education must, therefore, also evolve as the practice of pharmacy evolves (Commission to Implement Change in Pharmaceutical Education, Background Paper 1, 1993).

1.1.2 Economic environment impact

In South Africa it is estimated that only 20 to 25 % of South Africa's population has regular access to the private health care sector, and yet private health care expenditure exceeds that of the public health care sector (R22.7 billion and R19.2 billion respectively). The private health care sector is responsible for consuming approximately 75 % of all medicine costs in South Africa (South African Health Review, 1997).

How the nation solves this problem of inequitable health care, is not just a matter of investment, economics, budgetary requirements and restraints. It also depends on the public's perceptions of the nations economic stability and what they require and expect from the government. Hudspeth (1972) emphasises that for both economic and political reasons, planning for a profession must be part of a national activity.

Pharmacy is in a unique position to be able to play an important role in primary health care. Unfortunately, community pharmacists in South Africa have not realised their full potential in ensuring optimum drug therapy as members of the health care team (Pharasi and Price, 1993). There are two major reasons for this:

1) The community pharmacist is not integrated into the health care team, and they therefore lack the interaction with the patients and other members of the health care team.

2) The reimbursement mechanism is such that pharmacists devote their time and effort to activities that are profitable and not always patient-oriented.

Pharmacists therefore represent an untapped resource which could be used to alleviate the strain on other health care resources through planning, communication and education on a national level.

1.1.3 Demographical impact

The number of pharmacists needed in a country depends upon the country's health care needs, socioeconomic factors and the governments health care policy (Summers et al, 1994a). According to Summers et al (1994b) there is a declining number of students entering the profession. There is also a gross maldistribution of pharmacists according to race and geography. This has led to distortions in the provision of pharmaceutical services. With the exception of nurses the majority of health professionals practice in the private health care sector (approximately 58 % of general practitioners, 58 % of dentists and 94 % of all pharmacists) (South African Health Review, 1997). The pharmacy profession will therefore, need to engage in research that will enable the profession to develop accurate methods by which future manpower requirements and skills in pharmacy can be determined. These forecasts must then be used to adjust both the intake of students and the curriculum (Hudspeth, 1972).

There are two diseases which are expected to have a dramatic effect on South Africa's demographic pattern and its health care services. These diseases are Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome (HIV/AIDS) and Tuberculosis (TB).

It is estimated that 2.5 million people were infected with the HIV virus in South Africa at the end of 1996 (Seventh national HIV survey, Dec1996/Jan 1997). The number of HIV/AIDS infected people in South Africa is expected to reach approximately 4.5 million people (Williams and Cambell, 1998). Therefore, this will have a major impact on South African society as people move from the asymptomatic infected stage to a symptomatic stage and eventually death. As the epidemic matures it will result in between 500 000 and 1 million deaths a year from AIDS and AIDS-related disease (Williams and Cambell, 1998).

South Africa is also facing one of the worst TB epidemics in the world. Disease rates are more than double those in other developing countries and sixty times higher than in the USA or Western Europe. It is estimated that in 1996 there were 160 000 TB cases in South Africa, with approximately 10 000 people dying from the disease (South African Health Review, 1997). If the current TB disease trend continues there will be 3.5 million new cases by the year 2005 with a minimum of 90 000 deaths per year (Department of Health, 1996).

These two diseases will therefore place a tremendous strain on South Africa's Health care services and its resources.

The ageing of our population and the demographics thereof, also has enormous economic significance. The proportion of elderly in the South African population can be expected to increase in the future. Therefore, the burden of chronic illness will increase as people live longer. The elderly require greater and more specialised attention, and therefore, drug usage has increased as the population has aged. The prevalence of chronic disease has increased, while the range of available medications has broadened (Ebert and Shields, 1991).

1.1.4 Information technology impact

The importance of the processing of information and its impact on technology cannot be over emphasised (Bandaranayake, 1985). The computer has made it possible for greater efficiency in the practice and management of health care. For example, software packages have made it possible for health care providers and payers to control the provision of health care. Most prescriptions are monitored, prepared and recorded with the aid of computers. In industry, automated computer-driven systems are revolutionising the way pharmaceuticals are produced and distributed.

In South Africa health information systems are used to a greater degree in the private health care sector than in the public health care sector. This is mainly due to the need for detailed financial information. As managed care becomes more common place, this information requirement will become even more extensive, which will result in even more sophisticated health information systems (South African Health Review, 1997).

In South Africa's public health care sector, several provinces have partially, or completely, upgraded their existing hospital information systems with a National Health Care/ Management Information System (NHC/MIS) (South African Health Review, 1997). The impact of information technology on private and public health care sectors will therefore necessitate an increasingly computer literate health professional.

There has also been an increase in the quantity of drug information which pharmacists need to know (Lowes, 1995). The increasing information concerning the long-term effects of maintenance drugs, the development of multipurpose medication, and the increasing cost of adverse drug reactions are all issues that affect the pharmacy curriculum (Hudspeth, 1972). This is posing a serious problem to the pharmacy curriculum in the way this knowledge can be included, due to time constraints of the curriculum (Knapp, 1992).

Koschmann (1995) asserts that teaching students to be computer literate will not only enable them to use information technology competently, for example, medicine information systems, but it will also foster an attitude of life-long learning, where the student will come to appreciate, and be competent in the use of information technology. This involves a student having the ability to assess the adequacy of their knowledge, to address these deficiencies, and to direct their learning in a rapidly changing world.

1.2 The future of pharmacy and its effect on pharmacists educational needs

Knapp (1992) states that there are two possible future scenarios for the pharmacy profession. First, community pharmacy can continue as it is, moving towards more sophisticated retailing, where pharmacist interaction with prescribers will become increasingly more difficult. The second scenario is the evolution of an integrated health care system which is patient-oriented. One of the differences between these scenarios is that the first will occur naturally. The second scenario will require a considerable amount of effort. The American Association of Colleges of Pharmacy (AACP) believes that the future of pharmacy as a health care profession, lies in the second scenario, with pharmacy's ability to contribute to the rational use of medication in health care (Commission to Implement Change in Pharmaceutical Education, Background Paper II, 1993). As a result of the above-mentioned factors which includes the practice environment, economic environment, demographical changes and information technology, the pharmacy profession in South Africa has also introduced pharmaceutical care as a pivotal point of pharmacy practice in line with worldwide trends (Van Niekerk, 1993).

For the pharmacist to practice the second scenario of integrated health care certain requirements will have to be met:

1) The necessary legislation will have to be passed allowing the pharmacist to perform these duties and functions.

2) Pharmacists will have to have the necessary knowledge and skills to perform those duties and functions required of them. The knowledge and skills required by pharmacists for their present and future role must be met by the pharmacy curriculum. Therefore, the present and future roles in pharmacy must be analysed so that the necessary material can be included and unnecessary material can be reduced or discarded from the curriculum.

The relevancy and adequacy of pharmaceutical education is always a concern to pharmacists and educators of pharmacists. Defining the necessary competencies and setting clear objectives have been suggested as a possible remedy. (Dobbert, 1975; Nuffield Report, 1986; Hepler, 1987). This has led to the developing of clinical pharmacy education (Hepler, 1987) and the application of competency-based education (CBE) to pharmacy education (Day, 1975; Dobbert, 1975; Koziol et al, 1975; Rosinski, 1975; Lowenthal, 1977; Munson, 1977; Grussing, 1984 and 1987). In Britain and America the pharmacy degree course has been the subject of criticism in that it fails to adequately prepare the student for the practice of pharmacy (Nuffield Report, 1986; Kharbanda et al, 1993; Livingstone et al, 1993). For this reason as well, Lowes (1996) states that pharmacy education in South Africa must be urgently reviewed. Dobbert (1975) speculates that this dissatisfaction with pharmacy education has resulted from an increased concern for the public's protection in areas where a person's training qualifies him for a unique task such as with pharmacists, doctors, lawyers and other professionals.

1.3 The role of pharmacy education in the future needs of pharmacists

In South Africa there is a need to allow access to higher education for people who were previously disadvantaged by virtue of race, gender or financial circumstances (Draft White Paper on Higher Education, 1997). The Health Sciences and Working Group which was appointed by the National Commission on Higher Education (NCHE) suggests that thought should be given to allowing multiple entry and exit points to health education and training (A Future Organisational and Financial Model for the Health Sciences, 1996). The Draft White Paper on Higher Education (1997) recommends that the traditional curriculum model

of discipline-based, sequential courses, and qualifications, be replaced by an open and flexible modular system that is credit-based with multiple entry and exit points in the curriculum.

The Health Science and Working Group has stated that quality assurance of academic standards will be a necessity. This is due to the potentially adverse effects on academic standards, because of increased student enrolment (A Future Organisational and Financial Model for the Health Sciences, 1996). While the Ministry of Education believes that the primary responsibility for quality assurance lies with the higher education institute, it believes that there is also a role for a national authority in the educational sector. The Draft Higher Education Bill (1997) establishes a Council on Higher Education (CHE), which, in turn, establishes a permanent Higher Education Quality Committee. The function of this committee would be to perform the quality promotion and assurance functions of the CHE. The CHE will have to seek authority from the South African Qualifications Authority (SAQA) to be responsible for quality assurance and accreditation in higher education (Draft White Paper on Higher Education, 1997). SAQA is a national statutory body promulgated in terms of the South African Qualifications Act of 1995. It's objectives, amongst others, is to;

1) create an integrated national framework for learning achievements,

2) enhance the quality of education and training, and

3) allow access to, and mobility within, education, training and career paths.

SAQA manages and oversees the National Qualification Framework (NQF). The purpose of the NQF is to unify qualifications based on set standards and assessment procedures, which are then nationally applicable, therefore allowing a national qualification to be achieved through a variety of methods.

Educators have to distinguish between the quality requirements set by the student, the public, the academic world, professional bodies, and the government (Vroeijenstijn, 1995). Educational quality is a complex concept to grasp and define. One cannot speak of quality, but rather of qualities.

Lowes (1996) states that pharmacy education in South Africa must be urgently reviewed. This has in turn initiated research into other related issues. Three of the more important issues include the revision of the minimum curriculum, the incorporation of an externship into the undergraduate curriculum and pharmacy life-long learning. Lowes (1996) further states that a logical starting point is to define the required pharmacist competencies, and the pivotal point of this education review is to obtain information concerning the present and future scope of pharmacy practice.

As attention focuses on the need for curricular revision for the purpose of better preparing graduates to deliver pharmaceutical care, there will be a need to assess the impact of curricular changes on graduate outcomes (Sauer et al, 1994). In order for this to occur it will be necessary to develop methodologies which will allow the pharmacy profession to systematically collect and analyse information concerned with changing roles, manpower needs, and so forth. It will also be necessary to develop a framework within which new pharmacy roles can be forecast with special reference to outside pressures and to develop policy procedures which will allow this information to be linked to curriculum design and to the development of differentiated training programmes (Hudspeth, 1972).

1.4 Statement of problem

The fact that the pharmacy curriculum must equip students for practice in all of the three main areas of the profession, that is community, hospital and industrial pharmacy, makes decisions concerning material to be included, discarded or reduced, particularly problematic (Livingstone et al, 1993).

As the focus of pharmacy education has changed from a product-oriented view to a patient-oriented view, concern has been expressed that pharmaceutical education has not kept pace with these changes in the practice of pharmacy (Nuffield Report, 1986; Kharbanda et al, 1993; Livingstone et al, 1993). In order to design an effective curriculum it is important to be able to ascertain what actual competencies are required by the practising pharmacist. Similarly it is important that the curriculum reflects the many changes that have occurred in the pharmacy business environment.

1.5 The aims and objectives of the research

The previous pharmacy curriculum offered by South African educational institutions must be examined to see if it is suitable for the present role played by the pharmacists, and whether it teaches them the necessary skills and competencies for their present role. It must also be examined for its suitability for the future integrated health care role of pharmacists and whether it will teach them these necessary skills and competencies.

Various methods have been used to determine the value of an educational curriculum. They include amongst others; a subject centred (content knowledge) approach (Dobbert, 1975; Dunn et al, 1985; Harden, 1986), task analysis of established practitioners (Dobbert, 1975; Grussing, 1984; 1987; Dunn et al, 1985; Harden, 1986), the delphi (wise men) technique (Spivey, 1971; Hudspeth, 1972; Green and Tull, 1978; Dunn et al, 1985; Harden, 1986; Dillon et al, 1990; Grussing, 1987), eliciting views of recent graduates (Bergman et al, 1966; Dunn et al, 1985; Harden, 1986; Rupp and Szkudlarek, 1991) and practitioner surveys (Dobbert, 1975; Bandaranayake, 1985; Grussing, 1984; 1987; Smith et al 1990; Muzzin and Hornosty,1993) which was the method used in this research.

This method involves asking graduates to retrospectively assess how well their education prepared them for those aspects of pharmacy that they practice. It might be argued that graduates might not be fully aware of the value of their educational preparation as they might not have utilised it to its full potential in the market place. However, such assessments do provide a good starting point for examining their pharmaceutical education (Muzzin and Hornosty, 1993).

The objectives of this research are:

1) To develop a quantitative instrument that will be capable of directing the university's resources to those areas where the past pharmacy curriculum has not met the pharmacists requirements for their present practice role.

2) To develop an educational model that will indicate which subjects have made a significant contribution towards the pharmacists competence to perform their present full-time work.

3) To suggest a proposed curriculum evaluation model for future curriculum evaluation.

With the above in mind, the aim of this research is to determine if there is a gap between the perceived level of importance of various work activities and the perceived level of competence in performing these activities (how well the respondent believed that they could perform their everyday activities), going back in time, to when the pharmacist graduated. The amount of time spent by pharmacists on various major activities will be measured, as well as the contribution of various subjects or subject areas to their competence when they graduated.

1.6 Scope of study

This research is based on the premise that graduates of an educational programme are reasonably good judges of the extent to which their programme prepared them with particular occupational skills and encouraged or developed within them broad educational outcomes. Obviously the recall of one's perception of competence at the time of graduation is subject to the question of validity. However, for the purpose of this study, this method is adequate (Quiñones and Mason, 1994). The objective is to assess the perceived level of competence produced by the past curriculum. The concepts and principles selected for this study represent as far as possible, the whole of the body of pharmaceutical knowledge.

1.7 Overview of the dissertation

Chapter one of this dissertation consists of the introduction to the research and the reasons for the research. It briefly describes the various forces that have impacted upon the pharmacy profession as well as the response of the pharmacy profession to these forces. It outlines the problem, and gives the aims and objectives of the research.

Chapter two reviews the existing literature and describes the responsibility of pharmacy educators to design a curriculum which results in a competent entry level pharmacist who is capable of adapting to future practice activities. It describes the similarities between a business which must remain close to its customers, and educators who need to remain close to their students. The role of curriculum evaluation is also discussed, with mention being

made of the two opposing views about curriculum development. The various stages in curriculum evaluation are explained and the importance of the assessment of education is emphasised.

In Chapter three, the methodology of the research is presented. In the first part of this chapter the development and implementation of the questionnaire is discussed. The choice of a survey research method is outlined, with emphasis being placed on the accuracy of the information received, the cost per completed interview, the amount of information obtained and the speed of return of the information. A step-by-step process for questionnaire design and implementation is described. The second part of chapter three deals with the methodology used for this research, describing the reasons for using a mail survey, how research bias was reduced and how returned questionnaires were tested for research bias. The development of the questionnaire and it's physical format are also discussed. The method of sampling and sample size calculations are explained, as well as the editing of the questionnaire and the statistical analysis of the information obtained from the returned questionnaires

Chapter four reports the results of the questionnaire. It discusses the response rate achieved, as well as the testing of responses for non-response bias. The breakdown of responses by sector, and questionnaires returned with no response, are given. The improved confidence levels for the questionnaire are given because of a greater-than-calculated response rate. Chapter four also reports the analysis of the responses for the work activities according to the pharmacists perceived importance, competence, and importance minus competence (I-C) difference for major activities, as well as the amount of time spent in each major activity. Chapter four describes the correlation between the importance, competence, I-C difference and time for each major activity, in the three main sectors of pharmacy. It gives the mean values for each sector of pharmacy for the perceived importance, competence, I-C difference and time for each major activity. A breakdown of the time spent by pharmacists in the four major activities is also provided. The contribution of each subject in the pharmacy curriculum to the pharmacists perceived competence is given, and a curriculum is defined for each sector of pharmacy according to the contribution of the subjects, and the pharmacists mean competence to perform in the workplace. Lastly, the use of a curriculum analysis factor (CAF) in curriculum planning is also discussed.

In chapter five the results of the questionnaire are assessed and a curriculum evaluation model is proposed for the continued maintenance of a competency-based education.

Chapter six provides a summary of this dissertation.

Chapter 2 Literature review

The evolution of pharmaceutical care as the mission of pharmacy practice, represents an element that has been missing from previous educational reforms - which were expected to encourage the development of the profession. To develop the pharmacy profession, pharmaceutical education must work with the pharmacy practice and the regulatory sectors of the profession, to combine educational reform with the concept of pharmaceutical care (Newton, 1991). Before putting pharmaceutical care into practice, various questions must be asked. How well have the pharmacy schools prepared graduates for careers spanning 40 to 50 years of practice? Has the pharmacy curriculum evolved as pharmacy practice has evolved, or has it lagged behind?

To answer these questions, educationalists have performed numerous studies in order to evaluate and develop pharmacy curricula. The following studies are not an exhaustive list, but they do show the depth and breadth of curriculum evaluation and the use of the results in curriculum development.

1) Livingstone et al (1993) conducted a survey in the United Kingdom of 600 practicing pharmacists, consisting of 200 pharmacists from community, hospital, and industrial pharmacy. The purpose of the study was to obtain pharmacists views on the value of career oriented specialisation in the undergraduate pharmacy course, and the importance of various subjects in clinical and social pharmacy. They obtained a 55.5 % response rate. Nearly 20 % of the respondents believed that there should be completely separate courses for community, hospital, and industrial pharmacists. Generally, those respondents who did not support completely separate courses, felt that some career-oriented specialisation was required in the last year of study.

It was believed that many of the subjects in clinical and social pharmacy were key areas for all pharmacy students, regardless of which sector of pharmacy they intended to enter. It was the authors opinion that much career flexibility would be lost if separate courses were adapted for the various pharmacy sectors.

2) In another study in the United Kingdom, Patel et al (1991) evaluated the subject content of the pharmacy degree from the perspective of an industrial pharmacist and its relevance for graduates seeking a career in industrial pharmacy. A questionnaire was designed, piloted, and then mailed to all registered industrial pharmacy tutors. The major section of the questionnaire consisted of 36 subjects which were either being taught or proposed to be included in the pharmacy degree. The pharmacists were asked to indicate their agreement or disagreement with the importance of various subject areas.

Of the 44 questionnaires sent out, 33 were returned, giving a 75 % response rate. There was no disagreement with any subject currently being taught. Generally, subjects in the pharmaceutical sciences received a high approval rating, while subjects in the area of pharmacy practice received a much lower approval rating. The one exception to this, was pharmacy law and ethics, which received an approval rating similar to that of the pharmaceutical sciences.

The survey showed that industrial pharmacists were satisfied with the current and proposed subjects to be taught. However, it was observed that the move away from the 'core' pharmaceutical sciences (given a high approval rating) towards more practice related subjects (given a lower approval rating) is not likely to be welcomed by industrial pharmacists. This therefore, has implications on pharmacy graduates who might seek a career in industrial pharmacy.

3) Kharbanda et al (1993) evaluated the subject content of the pharmacy degree from the perspective of a community pharmacist in the United Kingdom. Having designed and successfully pretested a questionnaire, it was then mailed to 100 registered community pharmacy preregistration tutors. The questionnaire mainly concerned those subjects that were taught or proposed to be taught in the pharmacy curriculum. A 70 % response rate was achieved. Community pharmacists were generally in favour of the pharmacy curriculum. However, subjects in the life sciences, for example, pharmacology, and subjects in pharmacy practice,

for example, law and patient counselling received higher approval ratings than subjects in the pharmaceutical sciences, for example, pharmaceutics and pharmaceutical chemistry.

Of the respondents 89 % said that communication skills were important for a pharmacist in community pharmacy. Managerial skills were considered important by 50 % of the respondents. Kharbanda et al (1993), stated that the diverging nature and demands of pharmacy graduates in the three main sectors of pharmacy will make it difficult to accommodate all the requirements in one degree course. It will therefore, be difficult to provide satisfactory training for all three main sectors of pharmacy in the future.

.) Research was done by Wilson et al (1992) on the requirements placed by hospital pharmacists on the pharmacy curriculum in the United Kingdom. A questionnaire was prepared, piloted and then mailed to 100 hospital pharmacy preregistration tutors. The questionnaire involved subjects that were proposed to be or are, included in the pharmacy curriculum. The respondents were also asked which were the most important personnel skills required by a hospital pharmacist.

A 77 % response rate was achieved. There was no disagreement with the present pharmacy degree curriculum. Generally, subjects in the life sciences, for example, pharmacology and clinical pharmacy received higher approval ratings than subjects in the area of pharmacy practice, for example law and ethics, and subjects in the pharmaceutical sciences, such as pharmaceutics and pharmaceutical chemistry. Many aspects of the pharmaceutical sciences and pharmacy practice were considered to be of limited importance in comparison to clinical pharmacy and pharmacotherapy. Communication skills were considered to be important by 87 % of the pharmacists.

5) Sauer et al (1994) evaluated curricular outcomes using a longitudinal alumni survey in the United States of America. The survey was undertaken for two reasons. Firstly, to assess graduate outcomes of the pharmacy curriculum for an accreditation review. Secondly, there was a gender shift in that more women were

graduating than men. It was therefore necessary to determine if this would influence the graduate outcomes of the pharmacy curriculum. The survey consisted of 49 questions, 47 of which were of a quantitative design. A 69 % response rate was achieved from 1 518 graduates surveyed.

The research revealed that the fraction of graduates who would do post graduate training has almost doubled since a survey six years previously. The research also revealed that the pharmacy career path leads to a managerial position, despite a clinical emphasis in the pharmacy curriculum. The pharmacy curriculum at the school of pharmacy, University of California at San Francisco was reviewed as a result of this research, as most graduates had a management component in their jobs or moved into a management position.

6) Quiñones and Mason (1994) developed and pretested a seven page questionnaire in the United States of America which collected information on the respondents personal background, professional education, current practice, general preparation, occupational skills and educational outcomes. This information was collected to determine how well the curriculum had prepared graduates to; demonstrate their occupational skills, acquire educational outcomes and finally, to identify if there are any significant differences between pharmacy graduates to perform various skills when analysed by date of graduation. The survey sample size consisted of 770 potential respondents. A response rate of 68 % was achieved after two follow up mailings.

Generally, newer graduates gave a higher rating for the various items, indicating that they felt they were better prepared than older graduates. Newer graduates also rated communication skills as more important than previous years. Quiñones and Mason (1994) used this assessment to provide a baseline of information for the future refinement of the curriculum.

7) The research conducted in the United States of America by Smith et al (1990), was performed to assess pharmacists views on the importance of major practice activities performed by most pharmacists. The perceived level of competence to

perform the activities upon graduation was also measured. A mail survey of 700 pharmacists resulted in a 60 % response rate. Of the 19 activities included in the survey, 18 were regarded as more important than the pharmacists perceived competence to perform the activity. Compounding was the only activity in which perceived competence exceeded the importance of the activity. Pharmacists spent most of their time in dispensing activities, followed by management and then patient care. Younger pharmacists rated dispensing and patient care activities as more important than older pharmacists. Younger pharmacists also rated their perceived competence in dispensing and patient care as greater than older pharmacists. The greatest difference between the importance of major practice activities and the perceived level of competence to perform the activity, was recorded for management.

The recommendations of the authors, was that greater emphasis should be given to management in the curriculum, followed by patient care, dispensing and then public health functions. Furthermore, it was suggested that computer applications, non-prescription drugs and devices, communication, geriatric pharmacy practice, drug literature evaluation and a general management course should be made part of the curriculum. The curriculum would either need to be extended or existing courses would have to be reduced.

8) Muzzin and Hornosty (1993) used a mail survey in Canada to determine whether changes in pharmacy education had better prepared pharmacy graduates for their new roles. Pharmacy education changes had included; the lengthening of the formal curriculum, placement of the practical training period after the formal training period and an increased emphasis on life-long learning. The net effect of these changes was a move to a patient-oriented role, rather than a product-oriented role.

Respondents were asked to rate how well their curriculum and their practical training had prepared them for ten aspects of the practice of pharmacy. Participants rated the importance of each activity by indicating the amount of time spent on the activity, and its importance for their career.

Older graduates felt that university preparation, except for dispensing, was inadequate. The internship was considered to be more valuable than the university curriculum for the business aspects of pharmacy. Graduates who wanted to own a pharmacy tended to either study for a Masters in Business Administration, or work in a chain store environment to gain experience. Muzzin and Hornosty (1993) state that where formal practical education is not seen as fully effective in preparing pharmacists for life time practice, adequate continuing education needs to be investigated.

The goal of curriculum design has always been to design a curriculum which would result in a competent entry level pharmacist, who is then able to pursue various differentiated roles, including various management roles of increasing complexity (Grussing, 1987). To achieve this, education must be viewed by pharmacy lecturers, not as an activity that consumes time and energy, interfering with more important endeavours, but as an opportunity to shape students minds and cultivate their intellectual curiosity and confidence (Popovich, 1991).

The pharmacy curriculum must;

1) develop a knowledge base which provides the information, knowledge, values, attributes and skills needed to practice pharmacy, and

2) enable the student to keep up with a rapidly changing social and political environment, and knowledge base, through self-learning and active participation in professional affairs (Chalmers et al, 1988).

The pharmacy curriculum should therefore, be responsible for providing for the education of a competent entry level pharmacist, who is capable of further differentiation and adaptation in their chosen career.

2.1 Entry level in pharmacy

A mission statement is a necessity if a strategic plan is to be formulated. In Background Paper I (Commission to Implement Change in Pharmaceutical Education, Background Paper I, 1993), the commission stated that the mission of pharmacy practice is to provide pharmaceutical care. By utilising this mission statement the pharmacy profession will be able to fulfill society's need for professionals who are able to ensure the safe and effective use of medications. It describes a strategy whereby the pharmacy profession can position itself in a dynamic health care system, to address any problems associated with drug therapy (Commission to Implement Change in Pharmaceutical Education, Background Paper II, 1993).The Interim Pharmacy Council of South Africa (IPCSA) stated in the Pharmaciae newsletter (1996) that pharmaceutical care constitutes the foundation of pharmacy practice. Lowes (1995) says that the educational environment must be linked to the pharmacy practice setting, so as to educate an entry level pharmacist who is capable of providing pharmaceutical care and has the necessary knowledge, skills and values required for the professional and practice responsibilities.

Therefore, the role of pharmacy education is not just to educate competent entry level pharmacists, but also to train pharmacists who are able to adapt, so that they are capable of serving in a future professional role (Grussing, 1987).

Entry level in the pharmacy profession involves two concepts (Commission to Implement Change in Pharmaceutical Education, Background Paper II, 1993):

1) The entry level pharmacist is a beginner in the profession.

2) The entry level pharmacist possesses pre-determined knowledge, skills, attitudes and values.

The Commission to Implement Change in Pharmaceutical Education, Background Paper II (1993) asserted that the education of entry level practitioners must ensure that they are adept at problem solving, because the practice of pharmacy involves a process of solving problems for patients. To be capable of problem solving the pharmacist must have a

knowledge base which is applicable to a wide range of problems. They should also be able to identify, locate, maintain and analyse information (Woods, 1987).

Both lecturer and student must learn to persevere with a dynamic world of health care. The knowledge base, technology, and practice environment are constantly changing (Hudspeth, 1972; Bandaranayake, 1985; Ebert and Shields, 1991). While lecturers feel most comfortable teaching what they know, they are not used to talking about the temporary nature of pharmaceutical knowledge (Ebert and Shields, 1991).

Although every health profession has a specific curriculum which is designed to meet the needs of its patients and society, there are general principles that can be used to guide curricular design. Some of these principles relate to education for a dynamic world, while others reflect an underlying educational philosophy (Ebert and Shields, 1991). In general:

1) Education must not be so narrow that it results in a student being as obsolete as the knowledge and skills they were taught before they graduated.

2) While technical competence is essential, the educational experience must include some understanding of how particular technologies evolved and what exists in the future. Attention should also be given to the way in which advances in the sciences may affect the future of a health profession.

3) Students should understand the process by which an advance in pharmaceutical knowledge can suddenly eliminate the need for certain skills, for example, the discovery of the polio vaccine.

4) Advances in pharmacy technology can also open entirely new fields that call for new technology and skills.

It is not always possible to anticipate change, but students and lecturers should be prepared to accept the fact that change is inevitable, some skills will become obsolete, while entirely new skills will be needed, long after the student has graduated.

Educationalists are therefore faced with the problem of how to prepare pharmacy students for the changes in the health care system that will occur during their careers. Areas requiring particular consideration include the need for problem-solving (Jang and Solad, 1990), the development and dissemination of new teaching methods (Lowenthal, 1991), and the need for pharmacy education to have a progressive orientation to assure that graduates can successfully operate in a rapidly evolving system (Dumbleton and Soleau, 1991; Nichol, 1991).

2.2 Education as a business

A university is like a business in many ways. Like a business, a university has a mission, goals and objectives. It must create and deliver products to meet the needs of its consumers. Here the product is not something which is tangible, but rather, increased skills, understanding, appreciation and knowledge. Perhaps the most important of the university's products is its professional curriculum, which educationalists create and deliver to students, the primary consumers (Rupp and Szkudlarek, 1991).

An educational institution, like a business has both internal and external customers. The traditional or external customers are society, regulatory bodies, students and business, and the internal customers are university staff (Chang and Kelly, 1994). All customers, whether internal or external, require a quality education (a product) that satisfies their needs (Macchia, 1992). In the same way that business remains close to its customers, so educationalists must remain close to their customers who are students. Using the techniques of market research, educationalists can assess the unmet needs of their graduates and translate this knowledge into educational programmes which are designed to satisfy these unmet needs (Rupp and Szkudlarek, 1991).

2.3 Curriculum evaluation

Quality control and accountability are integral parts of modern life, affecting education as much as any other service industry. Appraisal of staff and evaluation of courses, which may have been optional and certainly were often informal, are now becoming both formal and essential. Recent considerations of quality have given a high profile to consumer expectations and satisfaction; therefore, the curriculum must be appropriate for the changing demands of pharmacy and for the future. Harden et al (1984) believes that the reason for the increased interest in curriculum evaluation and planning is due to the development of concepts such as problem-based learning, student-centred learning, community-based curricula, and integrated teaching.

2.3.1 The curriculum defined

The term 'curriculum' refers to any programme of planned activities which are intended to bring about specific learning outcomes in the student. Therefore, any curriculum which disregards the students and their methods of learning will be useless (Bandaranayake, 1985). A curriculum is not just a design or set of plans with an expected outcome. Instead it is a dynamic entity, which at present is not getting the attention it deserves. Development of a curriculum should be concerned with people's attitudes, assumptions, values and expectations and the final outcomes envisaged. The purpose therefore, of a curriculum is to bring order, coherence and intellectual discipline to the communication of stored human experience (Harden, 1986).

Curriculum evaluation can be differentiated according to whether it is generic or site-specific, formative or summative, the context in which the evaluation occurs, and whether it is a direct activity or part of a research project.

There are three major aspects to an effective curriculum (Coles and Grant, 1985). With reference to figure 2.3.1.1, circle A represents the documented curriculum. This includes everything that is written about it in course descriptions and documents. It also includes its

purpose, aims and goals. Circle B is the active curriculum. It differs from the documented curriculum, in that in most cases it is what is actually done, and not what is written to be done. There is not a perfect overlap between the two circles. The active curriculum consists of time-tabled events, lectures, tutorials, practicals, clinics, ward rounds and so on. It can also be influenced by the perceptions of the staff. The active curriculum represents how the curricular intentions, reflected in the first circle, are actually implemented. Circle C represents the curriculum experienced by the students. In effect it is the students interaction with the curriculum. It is what the students do, their method of learning, what they feel they should be doing, what learning occurs and the outcome of this learning. Again this circle and the other two do not perfectly correspond (Coles and Grant, 1985).

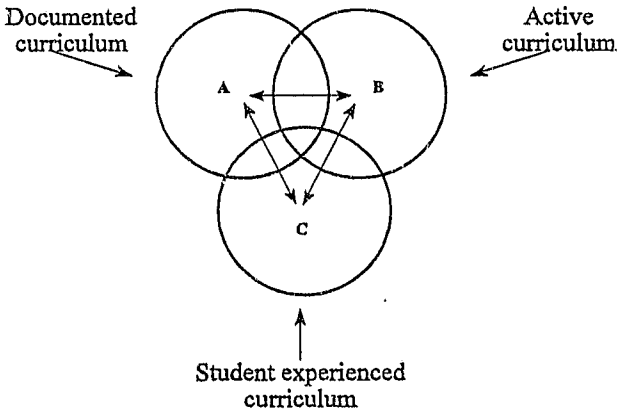


Figure 2.3.1.1 A descriptive modelled curriculum (adapted from Coles and Grant, 1985)

2.3.2 The goal of curriculum evaluation

There are a number of reasons for implementing a curriculum evaluation process:

1) It helps to establish institutional goals.

2) It helps to establish standards.

3) It encourages specialisation amongst educational institutions by encouraging institutional excellence.

4) It allows a profession to define itself.

5) It describes the learning goals (Chalmers et al, 1988).

While student results from a course can provide information about a course, it is only through the use of curriculum evaluation that the educational process of the course is clarified (Green and Heames, 1993). Curriculum evaluation should not be confused with curriculum monitoring. Monitoring involves an observer making pre-specified, non-judgmental observations of students and/or educational events. It stops at detecting the problem. It only describes what is happening in relation to previously defined aspects of an educational programme or process, and does not provide explanations as to why things are happening. Monitoring does not make any judgements about whether incidents are, or are not, desirable.

Curriculum evaluation, involves the gathering of information about part, or all of an educational programme or process. It is a deliberate act of enquiry which sets out with the intention of allowing the people concerned with an educational event, to make rigorous, informed judgements and decisions about it, so that appropriate development may be promoted. Curriculum evaluation involves deliberately and specifically obtaining information about educational events in a tailored and flexible way. Evaluation allows for the interpretation, as well as the description, of curricular events. It reports on its findings, and indicates places for possible action and intervention to improve matters. It is an activity with educational development as its goal. Curriculum evaluation provides information for rational and realistic decisions to be made about an educational event, although it is common to find that people express value judgements (Coles and Grant, 1985). For example, students may say that biochemistry is not useful.

To evaluate a curriculum programme implies that one has to answer at least two questions (Hoeben, 1994). First, are the goals or the intended effects actually being realized? Second, are the actual effects caused by the implemented curricular programme, or can it be explained by influences other than the programme?

Any form of research is done with a single purpose, which is to facilitate decision making by supplying information to the decision maker so that they can make an informed decision about the matter at hand (Rotem and Bandaranayake, 1983, Nel et al, 1988). Evaluation is likewise done with a purpose in mind. Something must be done with the information collected; some judgements and decisions must be made. Curriculum revision is a process involving assessment of practice needs and evaluation of the outcomes of the processes by which the curriculum imparts competence in activities that meet those needs. Such assessments necessarily involve both subjective and objective assessments and interpretation (Parish et al, 1993).

As can be seen by the bold section of figure 2.3.2.1 development of a curriculum can occur without any evaluation (Coles and Grant, 1985). To be effective, curriculum development must include a feedback mechanism. Feedback assists in the motivation of future participation and informs all parties concerned of the strategies implemented. An effective curriculum revision is based on two important processes. One process involves identifying those competencies which future graduates should demonstrate for entry level practice. The other involves the assessment and validation of the current curriculum to identify where its strengths and weaknesses lie (Parish et al, 1993). A decision on whether to study the whole curriculum or part of it (a curricular event) may actually be decided by the resources available. A curricular event is;

1) a particular phase of the course e.g. first year,

2) a specific course e.g. pharmacy practice or,

3) some learning materials e.g. textbooks.

Regardless of whether the whole curriculum or just a curricular event is examined, active, deliberate investigation of the curriculum is required. Each stage of the model (figure 2.3.2.1) represents a set of actions requiring specific attention (Coles and Grant, 1985).

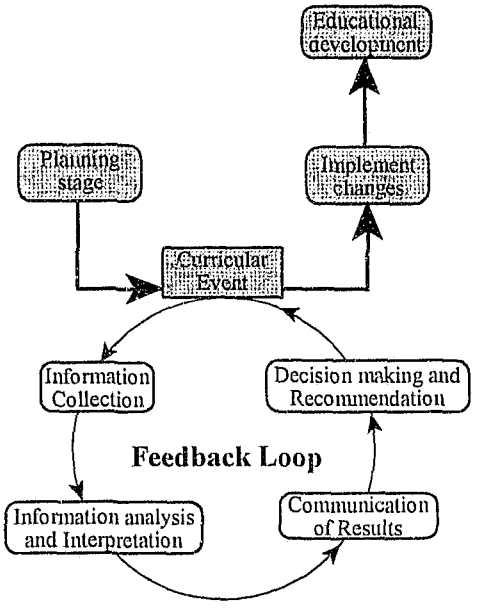


Figure 2.3.2.1 Curriculum evaluation model (Coles and Grant, 1985)

2.3.3 Two opposing views about curriculum development

It is generally acknowledged that there is a logical and progressive structure to a curriculum, requiring students to have pre-requisite knowledge. For example, pharmacy students would require a knowledge of anatomy and physiology before starting to study pharmacology (Chalmers et al, 1994). There are however two different approaches to curriculum development. The first involves a 'bottom up' approach, while the second involves a 'top down' approach (Grussing, 1987).

In the 'bottom up' approach, the curricula is synthesized. It is based upon pre-pharmacy courses which are regarded as the foundations. Layers of instruction are then consecutively superimposed. Each layer is built upon a former layer of instruction, taking into consideration instructional resources and talent. This procedure ensures that traditional subject matter areas are covered, while preserving the content usually assigned to existing departments. It does, however, minimize focus upon the educational end-product, which is to educate a competent entry level professional (Grussing, 1984; 1987).

The 'top down' method requires an analytical approach to curriculum development. It requires curriculum development to focus upon the end product, a competent entry level pharmacist. The competencies that a professional must posses should first be developed and then validated, or proven. The competencies can then be structured in a suitable hierarchical fashion. This is more appropriate for a competency-based curriculum as it produces a pharmacist who can cope with a dynamic, changing profession. (Grussing, 1984; 1987)

2.3.4 The role of aims, goals, needs and objectives in curriculum design

The documented curriculum should include the purpose, aims and objectives of the curriculum. Both competency statements and objectives have been discussed as a remedy for a perceived shortcoming in pharmacy education.

Objectives have attracted a lot of controversy, including the style in which they have been written. Therefore, the ideal of any curricular objective is to make the operative word or action verb as specific, clear and unequivocal as possible. An objective describes what a student should be able to do, in order to demonstrate that he or she has attained the required level of competence (McAvoy, 1985). To meet this ideal a behavioural objective should be realistic, understandable, clearly stated in behavioural terms and it must be measurable (Rosinski, 1975). Engel (1980) gives a word of caution to educators by saying that an objective should be a signpost, not the constant guidance of the educator. Highly integrated objectives have been criticised as being too restrictive and inflexible. Instead an objective should be used as a checklist rather than the precise end to be achieved (McAvoy, 1985). In summary, aims indicate the direction in which to proceed, while goals describe the actual destination. The objective should indicate when this destination has been reached (McAvoy, 1985).

There is not always a perfect overlap between the needs and the objectives of a course or curriculum. Figure 2.3.4.1. highlights the relationship between the needs and objectives of a course or curriculum. Area B represents those needs that are met by the curriculum. Area A represents needs that must be met, but are not met by the curriculum. Area C represents objectives which do not reflect the required needs (Harden, 1986). For a perfect course or curriculum the two circles would overlap and only area B would be present. However, this is not always possible as one course or curriculum will seldom meet all the needs imposed upon it. A "must have" competency (need) for one practice environment may be a "nice to have" competency in another practice environment (Lowenthal, 1977).

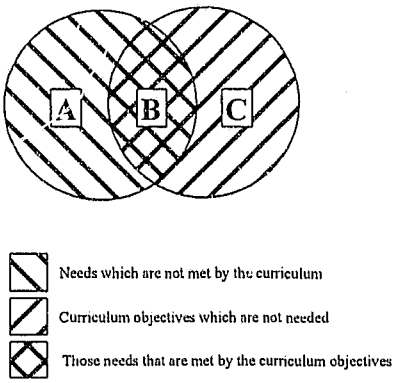


Figure 2.3.4.1 Relationship between needs and curriculum objectives

2.4 The stages in curriculum evaluation

As has already been shown in figure 2.3.2.1, there are seven distinct stages in a curriculum evaluation. They are the;

1) planning stage,

2) information collection stage,

3) information analysis and ıterpretation stage,

4) communication of results stage,

5) decision making and recommendation stage,

6) implementation of changes stage, and

7) the educational development stage.

Each stage consists of a series of actions and each requires attention if the process of evaluation and curriculum improvement is to be both effective and coherent (Coles and Grant, 1985). There are four stages of this model that are of interest to this research. They are the planning stage, the information collection stage, the information analysis and interpretation stage and the communication of results stage. The decision making and recommendation stage, implementation of changes stage and the educational development stage are outside the boundaries of this research.

2.4.1 The planning stage

The planning stage consists of two separate substages, identification of the problem and establishing a research plan.

1) Identification of the problem.

Problems in curriculum evaluation can occur for a number of reasons (Coles and Grant, 1985):

a) Examination results might be worse than expected.

b) The timetable may need to change.

c) Staffing levels may change.

d) The course does not achieve the goals it is expected to.

e) The roles of graduates may change in practice.

2) Establishing the research plan.

Establishing the research plan requires various decisions:

a) Is it necessary to evaluate the whole curriculum or just a particular curricular event, and if so which section is to be evaluated. Where, how and from whom is the required information to be obtained?

b) How should it be analysed and who is responsible for the investigation? This stage should be kept fairly flexible as the nature of the analysis usually evolves. As the analysis progresses a decision must also be made as to whether the process of education and/or the outcomes of the curriculum are also to be evaluated. The various methods of evaluation should also be investigated, but once again planning must be kept flexible so as to anticipate the curriculum evaluation (Rotem and Bandaranayake, 1983; Coles and Grant, 1985).

2.4.2 The information collection stage

This stage consist of three phases. They are:

1) Devising the measurement instruments.

2) Piloting the instruments.

3) Applying the instruments.

The devising of the measurement instrum nts (i.e. questionnaire development) co:.sists of reviewing any available documentation, as well as the collection of some form of data. There are two methods available to the curriculum evaluator to collect information. They are the qualitative and quantitative methods. Obtaining qualitative data is usually the first phase of the curriculum evaluation. This usually involves the observation, or interviewing,

of people associated with the curriculum. Having identified a curricular event in need of further research, a suitable instrument can be devised or obtained. Qualitative information therefore serves as the basis for the next phase, which is to identify curricular issues of importance, by means of quantitative research (Rotem and Bandaranayake, 1983; Coles and Grant, 1985). Lowes (1996) states that the present day activities of pharmacists will serve as a base line for the development of the future entry level pharmacist. Quantitative evaluations are usually used to obtain this sort of information (Coles and Grant, 1985).

Once the instrument of choice has been designed or obtained, it must then be piloted or pretested. This involves the instrument being tested on a small but representative sample of the population being studied. Any information from the pilot study is then used to further improve the instrument.

After the instrument design has been completed and validated by means of the pretesting, it can then be used to collect data concerning the curriculum.

2.4.3 The information analysis and interpretation stage

This stage consists of two substages. They are;

1) data analysis, and

2) data interpretation.

The analysis of quantitative data is usually dictated by the type of information collection methods that have been used. Once the data has been coded and analysed it may reveal further curricular issues that should be investigated. As a result, further evaluation of the curriculum may occur with, if necessary, the devising of new or additional survey instruments. It is the responsibility of the evaluator to not only collect information, but also to make any interpretation, explanation and judgements about this information. Evaluators not only detect problems, for example in the way that the curriculum plan works out in

practice, but also attempt to explain why such problems have arisen and possibly suggest some remedial action (Rotem and Bandaranayake, 1983; Coles and Grant, 1985).

2.4.4 The communication of results stage

Any curriculum evaluation will provide an abundance of data. It is the implementation of these findings that can be complex. Some evaluations will provide information which educationalists will find challenging to implement. The information produced by the evaluation might be uncomfortable, unpalatable and even unacceptable. Other educationalists will acknowledge that change is needed, but will baulk at the amount of work involved in implementing these changes (Coles and Grant, 1985). One of the problems experienced by educational researchers is that it is often safer to present statistical findings of curriculum research, concluding with suggestions for further research. This allows the researcher to avoid generating any controversy. The evaluation may even just result in a cosmetic change of the curriculum, where the educational event's appeal is enhanced without fundamentally addressing its problems (Coles and Grant, 1985). However, if the research is to be useful, possible implications for action must be pointed out by those closest to the data, even though their value judgements may intrude upon their objectivity (Entwistle and Wilson, 1977).

2.5 Adopting an appropriate educational strategy

Once the evaluation of the undergraduate curriculum is completed, an appropriate educational strategy must be adopted. Harden (Harden et al, 1984; Harden, 1986) has identified six educational strategies which are related to a health professional curriculum. Each strategy exists as a continuum with two poles: Student-centred/teacher-centred; Problem-based/information-gathering; Integrated/discipline-based; Community-based/ hospital-based; Elective/uniform and Systematic/opportunistic (SPICES). Table 2.5.1 shows the SPICES model.

This SPICES analytical technique can be used in a number of situations. It can be used to review an existing curriculum. It can be used in order to develop a new curriculum. It can be used to tackle problems relating to the curriculum and to provide guidance relating to teaching methods and examination. It can be used to supply information in order to make decisions about the teaching methods to be used, and finally it can be used in order to make decisions about the method of student examination. In discussing the SPICES model the arguments for and against each strategy will be given.

Table 2.5.1

The SPICES model

Strategy	Continuum	
Focus	*S*tudent-centred ⟷	Teacher-centred
Knowledge Acquired	*P*roblem-based ⟷	Information gathering
Scope	*I*ntegrated ⟷	Discipline-based
Practice Setting	*C*ommunity-based ⟷	Hospital-based
Flexibility	*E*lective ⟷	Uniform
Structure	*S*ystematic ⟷	Opportunistic

2.5.1 Student-centred/teacher-centred

A student-centred approach encourages students to involve themselves in the curriculum, with the emphasis being on the students and what they learn. The students are allowed to choose when to study, their pace of study, their method of study and what they will study. The teacher-centred approach lays greater emphasis on the teacher and what is taught (Harden et al, 1984; Harden, 1986; Strand et al, 1987; Jang and Solad, 1990; Kabat, 1993).

2.5.2 Problem-based/information gathering

The emphasis in many undergraduate pharmacy education programmes has been to teach students a large body of basic science and clinical knowledge. Once the student has qualified, they are expected to be capable of consolidating this body of knowledge and applying it to the care of their patients. The traditional pharmacy curriculum is therefore expected to enable students to have the necessary knowledge to solve problems with clear-cut answers and the capacity to reason and act in situations which do not have only one solution (Benbassat and Cohen, 1982). There is speculation that a traditional undergraduate curriculum does not adequately prepare students for their career (Harden et al, 1984).

A problem-based learning approach is capable of overcoming these deficiencies in the pharmacy curriculum. There are two distinguishing differences between a problem-based curriculum and a traditional curriculum:

1) In a problem-based curriculum the students' learning is problem-centred instead of subject-centred. The students learning starts with a patient problem, health delivery problem, medical science problem or a research problem (Harden, 1984). As work on the problem proceeds, existing knowledge is brought to bear, new knowledge is sought as needed and an answer to the problem is eventually achieved. This knowledge is more rapidly remembered and retrieved when the person is challenged with the same or similar problem. In a traditional information-centred approach, teaching and learning are typically organized around a subject area or field. For example, those based on organ-systems (cardiovascular drugs) would have fields which would include Physiology, Biochemistry and so forth.

2) Problem-based learning is student-centred, rather than teacher-centred. Educationalists who are in favour of problem-based learning argue that clinical problem-solving skills can and should be taught to students in their undergraduate years. At this stage problem-based learning can be used to develop a usable body of integrated knowledge, while simultaneously developing problem-solving skills (Barrows and Tamblyn, 1980; Harden et al, 1984; Bell, 1991; Fisher, 1994).

2.5.3 Integrated (multi-disciplinary)/discipline-based (speciality)

An integrated curriculum is one where the teaching matter has been organised so as to integrate or unite subjects that are normally run as separate courses or by different departments. Curricular integration can be either horizontal or vertical. Horizontal integration exists when there is integration between parallel disciplines, that is, disciplines that would normally be taught in the same period of the curriculum. Vertical integration occurs throughout the curriculum, with the pharmacy and clinical sciences starting together in the beginning of the curriculum and continuing until the end. Integrated courses usually consist of both vertical and horizontal integration. One of the problems in designing a curriculum or course is how to relate the various courses in order to achieve the overall objectives of the curriculum.

The discipline-based curriculum consists of the building block principle in which each subject has its own block of time and is restricted to specific areas of the course. In the discipline-based curriculum the beginning subjects must lay the foundations for subsequent subjects. The students are responsible for assimilating the knowledge gained in each discipline into an overall picture of pharmacy. In the past twenty five years, greater emphasis has been placed on the teacher, where the teacher is responsible for integration and for bringing the subjects together, so that they are presented to the students as a meaningful whole.

2.5.4 Community-based/hospital-based

In a hospital-based education the teaching is centred mainly in an academic hospital. The students therefore only experience a narrow view of medical needs and tertiary level health care problems. This results in students having very little contact, if any with the community in which they are being trained to serve.

In a community-based education, unlike a hospital-based education, pharmacy students receive their training in a community setting. For example, in a health centre, clinic or rural hospital. The student therefore has the opportunity to learn about the social and economic aspects of illness, about the health care services in the community and acquire clinical skills. As a result of this kind of patient contact students generally achieve a better understanding of the community in which they are being trained to serve.

2.5.5 Elective/uniform

In a uniform pharmacy curriculum all students are expected to pass through a prescribed set of courses. The student has very little opportunity to study a subject in greater depth or to study a subject of their own choosing. Recently there has been an attempt to create greater curricular flexibility by offering electives. Electives allow students to select subjects or projects of their own choosing. In an elective curriculum, students have a small core curriculum and for the remainder of the time choose which subjects they wish to study.

2.5.6 Systematic/opportunistic

Traditionally there has always been some clinical teaching that is largely opportunistic and is based on various clinical situations as they arise. There is an increasing acceptance that what students see and do should no longer be left to chance and that teaching and learning experiences, especially in the clinical field, should be planned and recorded systematically. This is due, in part, to the trend for pharmacy education to be more accountable, so that the public, government and business, can be given assurances about the products of the pharmacy schools and their curricula.

There are various factors that promote a move toward the left hand side of the SPICES continuum. It is an ideal basis for competency education, allowing students to use their preferred learning style, and helping them to integrate their knowledge. The pharmacy faculty or school can make use of under-utilised resources in the community, while

introducing students to the health care system. This allows the student to rapidly apply recently gained knowledge and experience a wide range of patient health problems, while instilling in the student the necessary confidence to act upon problems using their acquired knowledge and skills.

There are, however, various factors that promote a move by the pharmacy curriculum to the right hand side of the SPICES model. Many teachers have only experienced a teacher-centred approach and may find it difficult to adapt to a new teaching role. They would also lack experience in planning and implementing a problem-oriented curriculum. This can result in pharmacy teachers feeling uncomfortable in a SPICES oriented curriculum. Electives will also increase the workload on teachers. As for students, they are likely to initially find a student-centred, problem-based curriculum both threatening and demanding.

Thus, it is inherently unlikely that a position at either extreme of the spectrum is appropriate. It is likely that the profile of a school on the SPICES continuum will be unique to that school. The schools position will depend on:

1) The educational advantages of each approach for the school, taking into account the aims of the school. For example, a commitment to meet the health care needs of the local community will influence the decision towards a more community-based approach.

2) Practical and logistical considerations. For example, are sufficient resources available to promote a problem-based course and are there sufficient staff in the school with the necessary experience to implement a problem-based course?

2.6 Maintenance programme for curriculum development

To continue with the traditional curricular approach ignores the changes that are taking place in pharmacy practice and may lead to an increasing discrepancy between the health care delivery system and the pharmacy curriculum (Harden et al, 1984; Harden, 1986).

Since complete revision of a curriculum that spans a number of years is infrequently done, there must be a system of continuous course review by the faculty or department. This is a sensible approach and will result in educational programmes whose graduates will remain competent (Lowenthal and Meth, 1993). In fact, Rupp and Szkudlarek (1991) state that because the pharmacy practice environment is dynamic and likely to change, it is important that an assessment of pharmacy needs is done from time to time. This allows the needs of pharmacy graduates, and the successes or failures of any curricular changes which are designed to meet those needs, to be monitored and evaluated. Therefore, the process of curricular evaluation is of a cyclic nature (Lowenthal, 1977). Because of this cyclic nature, the mission of pharmacy will continue to evolve as the profession adds new responsibilities within the framework of pharmaceutical care. Ongoing evaluation of the curriculum is needed to assess how well the pharmacy curriculum adapts to support the changing practice roles of pharmacy practice (Newton, 1991).

Finally to institute any changes the faculty must be risk takers, they must be willing to experiment. They must be willing to tolerate an initial negative student reaction to the change (Nichol, 1991).

Chapter 3 Methodology

3.1 Theory of questionnaire development and implementation

The development and implementation of an effective research survey questionnaire can be broken down into four distinct phases. Figure 3.1.1 describes the outline of an effective process to follow in planning a questionnaire for market research information retrieval.

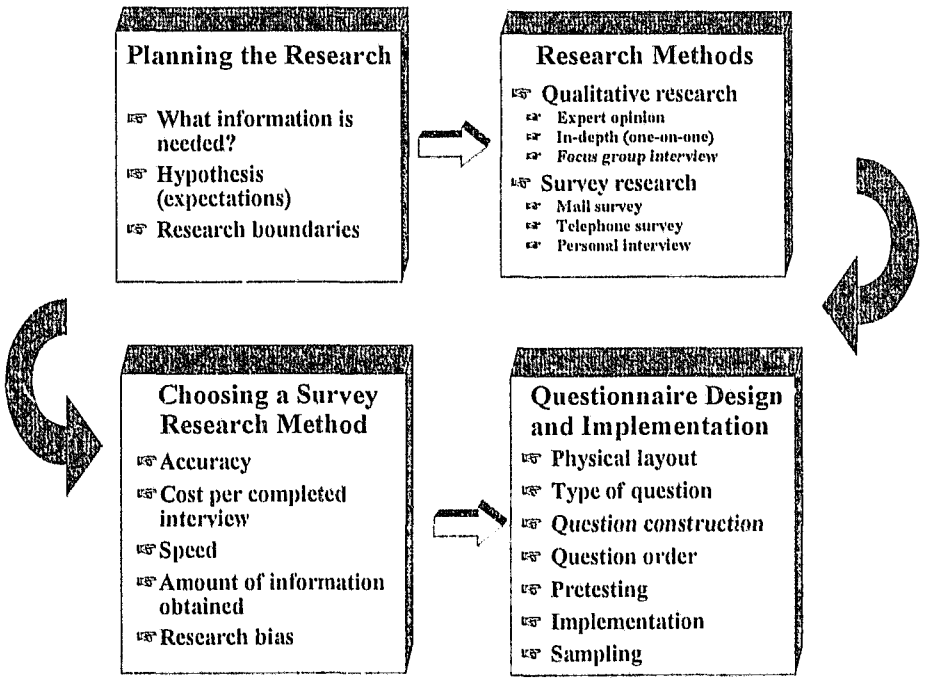


Figure 3.1.1 A stepwise approach to an effective questionnaire design (adapted from Aaker and Day, 1980 and Dillon et al, 1990)

3.1.1 Planning the research

The planning stage of the research survey focuses on the purpose and objectives of the research. The purpose of the research describes what results are expected from the research.

The objectives of the research survey consists of three components:

1) The specific information that is needed to answer a market research purpose.

2) The research hypothesis which states what is expected from a research.

3) The boundaries of the research objective which are drawn up so as to ensure that one can identify the target population that is of interest (Dillon et al, 1990).

Once the purpose of the research is clear and the objective clearly defined, a decision has to be made as to whether marketing research is needed and what form it should take. This should also clarify whether a survey is the best method to collect data for the study (Woodward, 1988; Fitzpatrick, 1991a).

3.1.2 Research methods

There are two main methods by which marketing research can be done.

3.1.2.1 Qualitative research methods

The qualitative research method involves small samples, with an unstructured interview approach. It involves the indirect measurement of the respondents feelings and beliefs by means of direct observation. This information cannot be easily projected onto the population of interest. This method is most commonly associated with exploratory research. There are three methods that are used to collect information (Oppenheim, 1976; Green and Tull, 1978; Aaker and Day, 1980; Dillon et al, 1990):

1) Expert opinion is where information is obtained from someone who has specialised insight into the problem (Reichheld and Sasser, 1990).

2) In-depth (one-on-one) interview, which is used to obtain in-depth information about the problem at hand.

3) The focus group interview consists of a small group of people, who are invited to participate in discussions on the topics of interest, while the interviewer attempts to focus the discussion of the group on the problem being researched.

3.1.2.2 Survey research methods

The survey research method is the most common method of data collection. It is used when detailed information is required. It involves obtaining information directly from a small group of people (the sample) who represent a larger group of people (the population). The person who responds (the respondent) can be interviewed by means of the mail, the telephone, or by a personal interview.

Surveys are widely used in educational research to provide information useful for the formative and summative evaluation of courses and curricula (Woodward, 1988). They are an inexpensive way to collect information in a standardized fashion from a representative group of participants. Surveys can also be used to identify competencies, using population or group opinion (Dobbert, 1975).

3.1.3 Choosing a research method

Quantitative evaluation methods are often used to gain a base line of information (Coles and Grant, 1985). Using this data the characteristics of the population can be inferred by surveying a representative sample of the population (Coles and Grant, 1985; Green and Heames, 1993). To be able to collect data a questionnaire must be designed. The questionnaire must not only gather the appropriate quantitative data in a useful format but it must also be user friendly. There are, a number of challenges that must be overcome in designing and implementing a questionnaire for use in a marketing research survey;

1) the questionnaire must be designed so that it will generate useful results and it must be pretested,

2) the appropriate sample size and a method of contacting the potential respondents must be determined, and

3) the respondent must be encouraged to participate in the survey (Schneider and Johnson, 1995).

Regardless of the survey method that is chosen, the instrument of choice for collecting survey data is the questionnaire. The questionnaire allows for a formalised and structured approach to the gathering of information.

Table 3.1.3 1 lists the different survey research methods and rates them according to accuracy, cost, speed and amount of information required (Dillon et al, 1990).

Table 3.1.3.1

Comparison of survey research methods

	Personal Interview	Telephone interview	Mail survey
Accuracy of data	+ +	+ +	+ + +
Cost per completed interview	+	+ + +	+ + +
Amount of information obtained	+ + +	+ +	+ +
Speed of return	+	+ + +	+ +

+ Poor + + Fair + + + Good

3.1.3.1 Research bias

An important criteria in deciding on an effective survey research method is to choose one which leads to a minimal amount of bias. Mail research bias consists of two main components (Oppenheim, 1976; Green and Tull, 1978; Schneider and Johnson, 1995; Dillon et al, 1990). There is response bias and non-response bias. Response bias occurs when the respondent does not provide accurate answers. It can be intentional or unintentional. There are three types of response bias that can occur in mail questionnaires:

1) Acquiescence bias occurs when the respondent attempts to help the researcher by agreeing or disagreeing with all of the questions.

2) Unintentional bias occurs because of the question format, question content, fatigue or faulty recall by the respondent.

3) Social bias occurs when the respondent is influenced to give socially acceptable answers to sensitive or potentially embarrassing questions (Dillon et al, 1990).

Response bias is reduced by careful questionnaire design and implementation by the researcher. For example, phrasing a question so that is neutral, that is, it does not suggest an answer to the responder.

Non-responders can cause a non-response bias. Non-response occurs when the researcher fails to obtain some information from the members of the sample. This raises the question that these non-responders may be different to those who did respond (Oppenheim, 1976; Green and Tull, 1978; Churchill, 1979; Yu and Cooper, 1983). There are a number of reasons that can explain a low response rate:

1) The potential respondents who receive the questionnaire may be too busy to answer the survey.

2) Some potential respondents may have gatekeepers (e.g. secretaries) who will throw the questionnaire away.

3) Some companies may have a policy limiting or prohibiting employee participation in surveys (London and Dommeyer, 1990).

The questionnaire should also be translated into another language if there is a possibility that by doing so the non-response bias will be reduced. Various procedures have been designed in order to ensure that the translated and original questionnaires are equivalent (Brislin, 1970; Del Greco et al, 1987a). The preliminary translation is done by a translator who is aware of the overall objective, and the intent of every question. A literal translation is always preferred, but is not always meaningful. Evaluation of the preliminary translation can be done by two different methods:

1) An evaluator can be given both the original and translated questionnaire and asked to evaluate each item in terms of its content, meaning, clarity of expression and comparability to the original item.

2) Back translation can be used. Here a translator who has not seen the original questionnaire is asked to translate the questionnaire back into the original language. This back translation is then compared to the original. Any problem areas are then examined and where necessary the questions can be redrafted. From a time and cost point of view, back translation is the preferred method to evaluate a questionnaire (Del Greco et al, 1987a).

There are two methods that can be used to assess the potential threat of non-response bias to the validity of the study's results:

1) Non-response bias can be measured by comparing the demographic details of respondents with those of non-respondents. This is the most accurate method of checking for non-response bias (Haggett and Mitchell, 1994). For example, the distribution of male versus female respondents can be compared to that in the original sample frame.

2) The date of return can be marked on the questionnaire. A two-sample t-test would then be performed to compare the information obtained from early responders to those of very late responders. In this comparison the implicit assumption is that late responders are generally representative of those in the sample who did not respond at all. Significant differences in the ratings of early versus late responders would therefore suggest that non-response bias represents a serious threat to the external validity of the study questionnaire (Simpson, 1984; Rupp and Szkudlarek, 1991; Haggett and Mitchell, 1994).

3.1.4 Questionnaire design and implementation

Mail questionnaires are an important market research tool because of their many advantages. When compared to other methods of data collection, mail questionnaires are cost-effective, geographically flexible, lack interviewer bias and can be administered to a large sample (Kanuk and Berenson, 1975; Diamantopoulos et al, 1991; Greer and Lohtia, 1994; LaGarce and Kuhn, 1995). The information collected tends to be more valid because they permit the respondent to give leisurely and thoughtful responses. Therefore, when designing a questionnaire, the quality of the questions that are asked, how the questionnaire is formatted and what information is given to the potential respondent are all crucial factors in determining the quality of research that is produced (Woodward, 1988; Green and Heames, 1993).

While there is no established method that will result in a perfectly designed questionnaire, there are certain rules that can be followed, together with some common sense. In designing a questionnaire, consideration must be paid to the layout of the questionnaire, the type of question and the order of the questions (Simpson, 1984). A market research survey consists of two distinct phases. The questionnaire design phase concerns the physical layout, type of questions, question construction, question order and pretesting of the questionnaire. The second phase is the implementation stage and concerns the questionnaire package, the mailing of the questionnaire and analysis of the data. Figure 3.1.4.1 describes the process of questionnaire design and implementation.

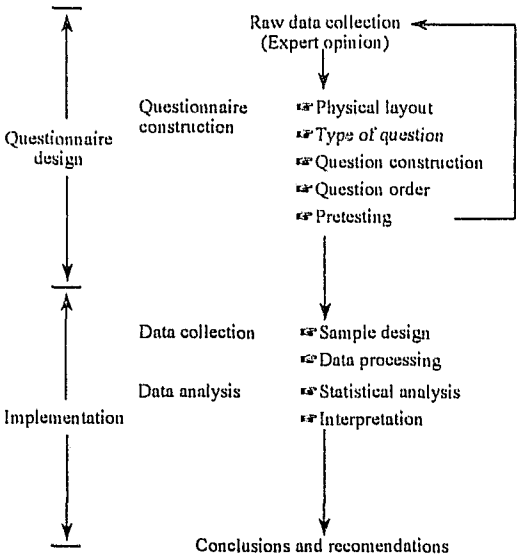


Figure 3.1.4.1 Flow diagram for questionnaire design and implementation

3.1.4.1 The physical layout of the questionnaire

There are two distinct sections in a questionnaire;

1) the cover letter, and

2) the question section itself.

In a mail survey a cover letter is used to introduce the potential respondents to the research, obtain their support for the research and encourage the respondent to promptly return the questionnaire. This is achieved by:

1) Explaining the purpose of the research.

2) Convincing the potential respondent of the usefulness of the research.

3) Making the respondents feel that they are important to the success of the research.

4) Including information about the confidentiality of the responses and the anonymity of the respondent.

5) Thanking the respondent for the time and effort involved in completing the questionnaire.

The cover letter should not exhibit any bias on behalf of the researcher and should anticipate any questions by the respondent concerning the survey. The cover letter should be signed by the researcher and should not be longer than a page in length (Pressley, 1980; Simpson, 1984; Woodward, 1988).

The questionnaire itself should appear professionally done (e.g. carefully chosen paper, well layed out on the page) and designed so that it looks neat, and is easy for the respondent to complete (e.g. good paper, binding, short). For the researcher it should be easy to identify, code and store the information obtained. There are a number of rules and common sense applications that can be followed when designing a questionnaire (Tinker and Paterson, 1928; Oppenheim, 1976; Pressley, 1980; Simpson, 1984; Del Greco et al, 1987b; Dillon et al, 1990; Woodward, 1988):

1) The researcher should always use a clear and legible type face for the questionnaire, with enough spacing between the lines. Instructions should be clearly distinguishable from questions and response alternatives. The easiest method is to use different type sizes. Underlining can be used to emphasize the most salient parts of the question. Upper case sentences should not be used, as the respondents read these sentences slower and find them more difficult to read.

2) Heavy paper should be used to withstand handling by many people. Ballpoint pens should not penetrate or easily tear the paper. Varied colours enhance readability and make it possible to easily distinguish between questionnaires. The type of paper used and printing costs should always be weighed against the quality of information obtained.

3) Each questionnaire should contain an identifying number, if follow .:p of the respondent will be required. An identification number is included only in a confidential questionnaire, where the cover letter would usually contain a statement that the information is confidential. In an anonymous questionnaire there is no means of associating the respondent with the returned questionnaire, this is done so as to obtain a sincere expression of the respondents views. This is problematic if follow up of non-responders is required.

4) Sufficient, but not excessive space should be left for all likely answers. Respondents will always comment on the topic. The researchers only option is to provide space for these comments. By making this space available there is an increased likelihood that the respondents will answer the questions.

5) Questions should not be split between pages. Do not crowd questions, include plenty of white space which will typically result in a better response. A questionnaire is usually limited to between two and four pages, however, postal questionnaires of up to fourteen pages have been successfully used.

6) Each question should be numbered consecutively, this helps the researcher to accurately transcribe the data for research purposes. Similarly by assigning codes for specific responses to specific questions the researcher saves a processing step and thereby a potential source of error before data analysis (Woodward, 1988).

7) The format of a questionnaire can affect response rate and the accuracy of the responses given. Formats that are easy to follow and pleasing to the eye make completing the questionnaire less of a chore. A booklet format makes it easy to read and turn pages, it also prevents lost pages and allows both sides of the paper to be

used. Mechanical devices such as arrows, boxes, asterisks and other symbols can be used to simplify questionnaires (Pressley, 1980; Woodward, 1988).

The questionnaire and cover letter should be pretested together (Pressley, 1980; Simpson, 1984; Woodward, 1988).

3.1.4.2 Type of question

Most questionnaires contain a variety of question types, depending upon the information required. There are two general types of questions. The questions can be either open-ended or closed-ended. The open-ended question is used to introduce the person to the subject of the survey, or to obtain personal opinions about the topic. The respondent is expected to give an answer in their own words. Open-ended questions have a number of advantages. They are able to:

1) Bring out the respondents personal opinion.

2) Stimulate free association.

3) Solicit suggestions from the respondent.

4) Probe the respondents memory.

As such, open-ended questions are typically used in exploratory research, enabling the researcher to discover the most salient points of the topic under examination. This information can then be used by the researcher to develop closed-ended questions for a survey (Woodward, 1988).

There are a number of disadvantages which are associated with open-ended questions:

1) They require the respondent to express themselves. This creates a burden on the respondent who has to create and articulate a response for the question. This makes

them unsuitable for self-administered questionnaires, e.g. mail surveys, as most respondents will not elaborate on their answers without further prompting or probing by an interviewer.

2) They are far more difficult to statistically analyse than closed-ended questions. All the responses must first be read and categories must then be developed based upon these answers.

3) The handwriting of the respondent may pose problems if poorly written or illegible (Del Greco and Walop, 1987a; Woodward, 1988).

Closed-ended questions present the respondent with a list of specific responses. The responses can be ordered or unordered. Ordered responses are used when the respondent is asked about a behaviour, attitude, attribute or belief. The respondent must then organise the responses according to an implied continuum. An unordered closed-ended question supplies the respondent with various responses. The respondent must then choose and select a response that best reflects their situation. There are three advantages to closed-ended questions:

1) A closed-ended question requires less effort by the interviewer and takes less time to answer than open-ended questions.

2) The answers to closed-ended questions can be compared between respondents.

3) A questionnaire using closed-ended questions will usually result in a better response rate than one using open-ended questions (Jobber, 1986).

The disadvantages of closed-ended questions are that the questions are harder to develop, as they have to cover all possible responses.

The Likert scaling procedure which is used in closed-ended questions presents the respondent with an attitude continuum. The reliability of the Likert scale is good, partly

because of the range of responses (Oppenheim, 1976). Figure 3.1.4.2.1 provides an example of closed-ended questions with Likert scaling.

A questionnaire may also contain partly closed-ended questions. In this type of question although some answer choices are given, the respondent can create their own response, or expand on their answer.

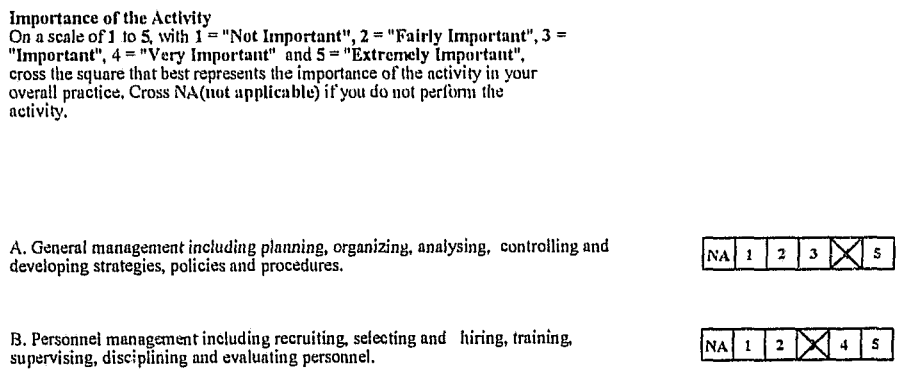


Figure 3.1.4.2.1 An example of closed-ended questions with Likert scaling

3.1.4.3 Question construction

A researcher has a number of problems concerning the respondent in a survey (Simpson, 1984):

1) The respondents typically have less knowledge about the subject and purpose of the research than the researcher.

2) Often the respondents do not know what the researcher expects them to know.

3) The respondents may also not be aware that they have the information that is required.

4) The respondents may be asked for opinions on matters that they have never thought about.

5) The respondents may be asked for facts about themselves that they have never considered.

In writing a question an attempt should be made to reduce response bias. As such there are a number of 'rules' that should be borne in mind when designing questions for a questionnaire (Schuman and Presser, 1981; Simpson, 1984; Del Greco and Walop, 1987a; Woodward, 1988):

1) Keep the wording as simple as possible.

2) The questions should be as clear and as specific as possible.

3) The question should not cover two or more issues at once.

4) The question must not contain a double negative, as this tends to be confusing.

5) The question must not request too much information from the respondent in one question.

6) The questions must not be leading or biased.

7) All the questions must be applicable to all the respondents.

8) The questions should not be objectionable.

9) The questions should not be biased by the response set.

10) The questions should be examined to determine that they do not have several possible meanings.

11) Some researchers exclude a neutral response in order to force the respondent to one or other side even though research has shown that including a neutral category does not affect the ratio of pro to con, or the size of the group that says 'I do not know' in response to the question.

12) If the responses are to be compared against other responses or existing data, the questions must be similarly phrased.

13) Use the smallest number of questions that are needed to obtain the information .

14) All possible responses should be given.

3.1.4.4 Question order

The questionnaire should start with easy, non-threatening questions, allowing the respondent to build up confidence in their ability to answer the questions. Questions should flow smoothly from one to another without any sudden changes in topic. Difficult or sensitive questions should be left until later in the questionnaire, when the respondent feels more at ease and has developed some trust and confidence in the interviewer or questionnaire (Simpson, 1984; Del Greco and Walop, 1987b).

3.1.4.5 Pretesting

Once the questionnaire and cover letter have been completed they must be pretested so as to detect any problems before sending the questionnaire out to the target population. The pretest is used to evaluate the cover letter and questionnaire in respect of the physical layout, type of question, question order, instructions and so forth. It is used to obtain a general impression of the cover letter and questionnaire, as well as to obtain comment about the questions, their wording and any problems that occur. The pretest is therefore used to;

1) determine that each question is measuring what it was intended to,

2) ensure that all the questions are clearly understood by the respondent,

3) check that the questions are interpreted in a similar manner by the respondents,

4) ensure that closed-ended questions have an answer which applies to each respondent,

5) test that the questionnaire and covering letter motivate respondents to reply,

6) check that the respondent answers all questions correctly and does not leave some out,

7) ensure that no part of the questionnaire indicates bias by the researcher,

8) ensure that there is sufficient space for the respondent to record the answer for each question, and

9) ensure that the questionnaire and cover letter have been accurately translated.

To ensure that there are no problems with the questionnaire three groups of people are used to pretest a questionnaire (Simpson, 1984; Del Greco and Walop, 1987b; Woodward, 1988; Fitzpatrick, 1991b; Parish et al, 1993):

1) Other researchers are used to evaluate how well the questionnaire achieves the research objectives.

2) The questionnaire is checked for accuracy and a lack of bias, by people with knowledge concerning the survey topic.

3) The questionnaire is pretested by a small sample of potential respondents, who fill out the questionnaire in the presence of the researcher.

If necessary the required changes are made to the questionnaire and it can then be retested. If necessary further expert opinion can be obtained.

At the end of the questionnaire construction phase, the questionnaire is checked to ensure that questions are asked about each of the survey topics and that no extraneous questions, irrelevant to the research objectives, are included. Careful matching of the questions on the questionnaire with the research objective will often identify gaps in question coverage and/or areas in which the number of questions posed can be reduced (Woodward, 1988).

In summary, the design of the questionnaire comprises the cover letter and the physical layout of the questionnaire as well as the format of the questions and their wording. Once this has been completed, the data can be collected by implementation of the questionnaire.

3.1.4.6 Questionnaire implementation

The main weakness of mail questionnaires is that of non-response (Diamantopoulos et al, 1991; Greer and Lohtia, 1994; Haggett and Mitchell, 1994; LaGarce and Kuhn, 1995). Response rate is the number of questionnaires that are returned by the respondents expressed as a percentage of those that were actually delivered (number of questionnaires mailed less those returned as undeliverable) (Wiseman and Billington, 1984).

$$\text{Response Rate} = \frac{\text{No of Questionnaires returned}}{\text{No of Questionnaires mailed - No of Undeliverable Questionnaires}} \times 100 \quad \text{Equation 3.1.4.6}$$

According to Simpson (1984) the response rate for mail surveys is usually between 40 and 60 %. Kanuk and Berenson (1975) found that response rates vary from 20 to 100 %. Yu and Cooper (1983) in a review of the mail survey literature found the average response rate to be 47.3 %. Haggett and Mitchell (1994) in their review of mail survey literature found the average response rate to be 46.1 %. This potentially low response rate results in a problem which does not just concern sample size, but non-response bias as well.

Non-response bias can create doubts about the research as it can affect the validity of the statistical analysis. The larger the response to a mail survey, the smaller the non-response bias. Consequently any technique that will reduce non-response will decrease non-response bias and also reduce the cost of the research (Kanuk and Berenson, 1975; Walker et al, 1987; Haggett and Mitchell, 1994; Kalafatis and Tsogas, 1994; LaGarce and Kuhn, 1995; Schneider and Johnson, 1995).

There are two strategies for dealing with the non-response problem:

1) An attempt can be made to either estimate the non-response bias, or attempt to sample non-responders (confidential questionnaire).

2) An attempt can be made to reduce non-response bias by careful questionnaire design and implementation by the researcher (Kanuk and Berenson, 1975; Diamantopoulos et al, 1991).

Yu and Cooper (1983) feel that the second approach is better, as it attempts to completely eliminate non-response bias, therefore avoiding the assumptions that must be made in the first approach. Researchers have studied the effects of various methods in order to improve speed and quality of response as well as reduce non-response bias and cost of the research. These methods include, amongst others; anonymity, the type of appeal used in the cover letter, questionnaire colour, monetary and non-monetary incentives, user friendly questionnaires, the type of envelope and postage used, source and sponsor of the research, open versus closed-questions, follow up, deadlines and pre-notification (Kanuk and Berenson, 1975; Jobber, 1986; Albaum, 1987; Walker et al, 1987; London and Dommeyer, 1990; Diamantopoulos et al, 1991; Greer and Lohtia, 1994; Haggett and Mitchell, 1994; Kalafatis and Tsogas, 1994; LaGarce and Kuhn, 1995). These methods are usually classified by timing (i.e. pre-notification) or technique (i.e. questionnaire length) (Kanuk and Berenson, 1975).

1) Anonymity

Kanuk and Berenson (1975) state that the evidence available shows that offering anonymity to the respondents has no effect on response rate. Albaum (1987) states that the questionnaire that was coded for identification resulted in a better quality of data than an anonymous questionnaire, although it was not significantly better. Jobber (1986) reports that anonymity increased response rates among respondents and it also prevents the responses from being distorted.

2) Type of appeal used in the cover letter

Gendall et al (1995) states that an appeal for the respondents help by means of the cover letter can increase the response rate by as much as 5 %. An altruistic (help-the-sponsor) appeal emphasizes the importance of a response in order to assist the researcher in their research. An egotistic appeal emphasises the response due to the respondents knowledge and contribution to the research (Jobber, 1986). Jobber (1986) reported that an altruistic appeal resulted in increased response rates. Schneider and Johnson (1995) reported that an altruistic appeal was more effective than an ego appeal, specifically under university sponsorship.

Both Jobber (1986), and Greer and Lohtia (1994) found that response rate was not improved by addressing the respondent by name. A 'Dear Sir' cover letter was just as effective.

3) Questionnaire colour

The concept behind using a coloured questionnaire is that the coloured paper is more noticeable and therefore more likely to be returned than a plain white questionnaire that would be lost in a pile of similar looking papers. LaGarce and Kuhn (1995) state that colour can significantly increase response rates. Other research into questionnaire colour has shown that there is no significant difference between using coloured or white paper for the questionnaire. (Gullahorn and

Gullahorn, 1963; Jobber, 1986; Greer and Lohtia, 1994). Pressley (1980) states that coloured paper should not be used, as it tends to be confused with junk mail, which results in a reduced response.

4) Monetary incentives

One of the most effective, but unfortunately a fairly expensive incentive to increase response rate is the prepaid monetary incentive. Here a token amount of money is enclosed in the questionnaire packet which is then sent to the potential respondent. The prepaid incentive works on the principle of reciprocity. Taking the money without doing something for the researcher (responding) creates dissonance which violates the concept of reciprocity (Kanuk and Berenson, 1975; Pressley, 1980; Jobber, 1986; London and Dommeyer, 1990; Armstrong and Yokum, 1994; Schneider and Johnson, 1995).

5) Non-monetary incentives

Research has shown that including a trade or academic article in the questionnaire package or promising respondents a free survey report reduces response rate (Jobber, 1986; Greer and Lohtia, 1994; Kalafatis and Tsogas, 1994).

6) User friendly questionnaires

A user friendly questionnaire can significantly increase response rate (Simpson, 1984; Del Greco et al, 1987b; LaGarce and Kuhn, 1995).

7) Type of envelope and postage used

According to Pressley (1980), a yellow coloured envelope resulted in an increased response, while other colours either reduced the response or had no significant effect. A stamped self return envelope increases response rate as it facilitates the ease of return of the questionnaire (Kanuk and Berenson, 1975; Pressley, 1980;

Jobber, 1986). Using a normal stamp also produces better response rates compared to a business reply stamp.

8) Source and sponsor of the research

The source of a survey is the research supplier, whereas a sponsor is for whom the research is being done. A university usually obtains higher response rates and better quality data regardless of any other factors (Kanuk and Berenson, 1975; Pressley, 1980; Albaum, 1987; Schneider and Johnson, 1995). This may be due to the credibility and prestige of the university doing the research (Greer and Lohtia, 1994). A university also has a faster response time than other organisations that might be interested in research, such as a research firm (Albaum, 1987).

9) Open versus closed-ended questions

Jobber (1986) reported that closed-ended questions increased response rates.

10) Follow up

Jobber (1986) having reviewed various methods of inducing increased response rates among respondents reported that follow up letters do increase response rates.

11) Deadlines

Although a deadline does not increase response rate, it does not add to the cost of the questionnaire and can improve the response speed.

12) Pre-notification

The purpose of pre-notification is fourfold; it is used to identify the researcher, discuss the purpose of the study, request cooperation or commitment by the respondent and screen or qualify the respondent (Schlegelmilch and Diamantopoulos, 1991).

In fact, though there was no significant difference between those who were pre-notified and those who were not, there was an increased response in those who were not pre-notified. Haggett and Mitchell (1994) indicate that pre-notification only increased response rates by an average of 6 %. Using the telephone resulted in a 16 % increase, a letter resulted in a 6 % increase and a postcard resulted in a 2 ½ % increase. However, the time and cost of making telephone calls increases the cost per return of questionnaire, effectively reducing its usage. Pressley (1980) states that pre-notification, particularly telephone pre-notification increases the response rate. Pressley (1980) also states that the telephone can also be used to obtain co-operation from non-responders when the response is especially low. Jobber (1986) also reported that pre-notification by mail of the respondent did not seem to increase response rates, although it does still have a purpose. Therefore while pre-notification increases response speed, there was no effect on response quality.

3.1.4.7 Sample design

Once the questionnaire has been drawn up and tested, sampling can take place. The sample should be representative of the population and reproduce all the characteristics of the target population. A census of each individual in the entire population can be conducted, or the views of a sample of the population can be obtained, thereby avoiding the cost of a census (Fitzpatrick, 1991b). Due to cost and time constraints, it is not feasible to survey everybody in the sampling frame. Importantly, a sample is more accurate than a census, because a census has a greater potential for non-sampling error (Churchill, 1979).

There are three basic methods for choosing a sample (Dobbert, 1975; Allan, 1982; Fitzpatrick, 1991b; Vogt, 1993):

1) The convenience method essentially involves the sampling of members of the population that are convenient, i.e. friends, colleagues, etc. This can lead to inaccurate results because it is not representative of the population. This method should be avoided although it is usually sufficient for the purpose of exploratory research (Andreasen, 1983).

2) The systematic method draws a sample by choosing potential respondents at regular intervals, e.g. choosing every tenth account customer. This method assumes that the population is randomly dispersed, i.e. that it has not been organised according to any specific characteristics. Systematic sampling is relatively easy and effective as long as the population is randomly dispersed.

3) The random probability method is the safest method of obtaining an accurate sample. Every member of the population stands an equal chance of being included in the sample. In this method numbers are drawn from a table or from a computer that can generate a list of random numbers. The respondents are then chosen according to these numbers.

According to Allan (1982) the minimum sample size should be between 30 and 50 people. The larger the sample, the less likely that an error exists in the estimates made of the population. Ideally the sample should be as large as possible and yet the size of the sample is not nearly as important as the quality of the sample, i.e. that it is representative of the entire population (McDaniel and Parasuraman, 1986).

The α and β errors are associated with sample size;

1) α error (type I) occurs when the researcher rejects the Null hypothesis when it is actually true,

2) β error (type II) occurs when the researcher does not reject the Null hypothesis when it is actually false.

3.1.5 Editing and coding the questionnaire

Once the information has been collected, it must be edited. The information is edited in order to identify any omissions, ambiguities or mistakes in the responses received. Three different methods can be used if any of these problems are identified:

1) The respondent can be re-contacted to determine the correct response (for a confidential questionnaire).

2) The whole questionnaire can be disregarded.

3) Only the problem questions can be disregarded by coding them as 'do not know' (Aaker and Day, 1980; Dillon et al, 1990).

Once the questionnaire has been edited, it can then be coded. Coding involves assigning a number for a specific response to a specific question. For closed-ended questions the coding is fairly straightforward and is usually done before implementing the questionnaire. This is known as pre-coding, here the codes are included on the questionnaire. This reduces the likelihood of transcription errors. Open-ended questions cannot be pre-coded as the researcher cannot determine all the possible answers. Coding for open-ended questions is therefore more difficult as decisions must be made about what category the response should fall into. Due to this difficulty an attempt should be made to avoid open-ended questions as much as possible (Aaker and Day, 1980; Dillon et al, 1990; Walop et al, 1987).

3.2 The methodology of this research

3.2.1 Planning the research

There are three main sectors of pharmacy practice - community, hospital and industrial pharmacy. (Smith et al, 1990; Patel et al, 1991; Wilson et al, 1992; Kharbanda et al, 1993; Livingstone et al, 1993). In South Africa 53.08 %, 15.80 % and 5.69 % of all registered pharmacists are employed in community, hospital and industrial pharmacy respectively (IPCSA, 1998). Therefore, 74.57 % of all registered pharmacists practice in these three main sectors. Table 3.2.1.1 shows the breakdown of the figures.

Table 3.2.1.1

Breakdown of pharmacists according to sector as at February, 1998 (IPCSA, 1998)

PHARMACY SECTOR	NUMBER OF REGISTERED PHARMACISTS IN R.S.A.	PERCENTAGE OF REGISTERED PHARMACISTS
COMMUNITY	5 411	53.08 %
HOSPITAL (STATE)	1 611	15.80 %
MANUFACTURING	580	5.69 %
WHOLESALE	285	2.80 %
TRANSMED	148	1.45 %
EDUCATION	123	1.21 %
ADMINISTRATION	164	1.61 %
NON-PRACTISING	402	3.94 %
RETIRED	364	3.57 %
OUTSIDE R.S.A.	250	2.45 %
LOCUM	511	5.01 %
MAIL ORDER	30	0.30 %
OTHER	316	3.10 %
TOTAL	10 195	100.00 %

The subject areas of the pharmacy curriculum must therefore be considered from the perspective of these three sectors (Patel et al, 1991; William et al, 1992; Kharbanda et al, 1993; Livingstone et al, 1993). The relevance of various subjects in the pharmacy curriculum must be determined for the pharmacists in each particular sector.

In South Africa all practicing pharmacists must register with the Interim Pharmacy Council of South Africa (IPCSA) thereby providing a convenient source of pharmacists addresses. For this research the sampling frame consisted of three lists of pharmacists who were registered with the IPCSA as community, hospital and industrial pharmacists.

3.2.2 Research methods

The focus of this dissertation is on the use of survey methods, specifically mail surveys, as the preferred means of conducting marketing research. Mail surveys are the most widely used marketing research technique because of the accuracy of the data collected, the relatively low cost per completed interview, the acceptable amount of information obtained and the speed of return (see Table 3.1.3.1) (LaGarce and Kuhn, 1995). For these reasons a mail survey was chosen as the preferred instrument to gather the data required for the research.

3.2.3 Research bias

In order to reduce the likelihood of non-response bias, the questionnaire was also translated into Afrikaans because the medium of education in South African pharmacy schools is more often either English or Afrikaans. The back translation method was used in the development of the questionnaire.

Once the questionnaires had been returned they were assessed for any non-response error bias. There are two methods that can be used to assess the potential threat of non-response to the study's validity. Firstly, non-response can be measured by comparing the demographic details of respondents with those of non-responders. While this is the most accurate of the two methods it could not be used in this research, as the list of pharmacist addresses was obtained from the IPCSA and contained no demographic data that could be used in this manner. The second method involves marking the date of return on the questionnaires. This last method was used in this research. A two-sample t-test was performed to compare the mean importance and competence ratings of early responders to those of very late responders.

3.2.4 Questionnaire design

The cover letter of the questionnaire was used to:

1) Explain the purpose of the research, by informing the potential respondent that it forms part of a masters degree and that it will help educationalists to realise what skills and competencies are required by the present day pharmacist.

2) Convince the potential respondent of the usefulness of the research. For instance, the last paragraph in the cover letter states that the information gained from the research would be used to restructure the curriculum to make it more relevant for the present day pharmacist.

3) Make the respondents feel that they are important to the success of the research. This was achieved by statements such as, "This is your opportunity as a pharmacist to contribute towards the future of pharmacy and it's direction.

While not included on the actual cover letter, the potential respondent was informed on the first page of the questionnaire that all information supplied by the respondent was confidential. The respondent was then thanked for completing the questionnaire on the last page.

As concerns the physical layout of the questionnaire, the Times New Roman, 12pt font was used with single line spacing as standard. Instructions and other important information was emphasized with bold, underlining or both. Upper case sentences were not used.

The paper used for the questionnaire was $80g/m^2$ bond, because of its durability and quality. Various colours were not used for different questionnaires due to the cost of the coloured paper and therefore, the cost implications on the research.

As this questionnaire was confidential, an identifying number was included. It was stamped on the last page of the questionnaire by a self advancing hand help stamp. This would then allow the respondent to be contacted if follow-up was required.

Sufficient space was left for the respondent to indicate their choice for each question by means of a cross. There were only two questions that would require individual comment and sufficient space was left for these questions.

By careful wording, use of space and ordering of questions, no questions were split across pages. The layout of the questions were spacious and the questionnaire was restricted to 7 pages in each language, specifically English and Afrikaans.

All questions were consecutively numbered, with each question having pre-assigned codes covering all possible responses. This allowed for the quick and accurate capture of the responses into a statistical package. (Statgraphics® programme, version 5. Statistical Graphics Corporation, U.S.A., 1991).

Mainly closed-ended questions were used for the following two reasons;

1) By using closed-ended questions the answers can be compared between respondents. That is, a comparison can be made between community, hospital and industrial pharmacists. Closed-ended questions allow for quantitative evaluation and comparison. The answers from future research can then also be compared against the answers from this research, therefore using the information from this research to set a base line or benchmark against which future curricular changes can be measured.

2) The use of closed-ended questions generates a better response than open-ended questions (Jobber, 1986).

The use of closed-ended questions allows the determination of a base line for pharmacist related activities according to the importance of the various work activities and the pharmacists competence to perform these activities upon graduation. This information can then be compared against future research to determine the effect of the changing environment on the importance of various activities, as well as the effect of curricular changes on the pharmacists competence to perform these activities.

The majority of questions used were in a closed-ended format. Only two questions were partially closed-ended. The first related to the present work of the pharmacist. Here the respondent was given the option of indicating that they were employed full-time, part-time or in another capacity. This 'other' category helps to decide, whether or not to exclude the respondent from the study, for example, if the respondent had retired, or was no longer involved in pharmacy related activities. The second partially closed-ended question related to the amount of time spent in various pharmacy related activities. The 'other' category in this question allowed the researchers to determine if pharmacists spent any major part of their time in any other activity

than the four major functions included in the questionnaire. Very few pharmacists were involved in any other time consuming activity, and the time and reason given for the other activities indicated that they were actually activities which supported the four major functions. This 'other' time was therefore proportionally subsumed under the four major functions. The rest of the questions in the questionnaire were closed-ended using a Likert scale.

The questionnaire was divided into the four major practice functions under which the practice activities that pharmacists perform, can be subsumed (Smith et al, 1990). These are management, dispensing and manufacturing, counselling and public health functions. The three main sectors of pharmacy and the four major practice functions were taken into consideration when developing the questionnaire. The various questions were compiled and then sorted out into the four major functions. Table 3.2.4.1. shows the breakdown of the questionnaire into its various dimensions.

Table 3.2.4.1

Breakdown of questions

Dimensions	Number of Items
Management activities	Fourteen questions, questions 1 to14 on pages 151-152, Appendix A; pages 158-159, Appendix B
Dispensing and Manufacturing activities	Ten questions, questions 15 to 24 on page152, Appendix A; page 159, Appendix B
Counselling activities	Fourteen questions, questions 25 to 38 on page153, Appendix A; page 160, Appendix B
Public Health activities	Ten questions, questions 39 to 48 on page154, Appendix A; page 161, Appendix B
Percentage of time spent in major activities	Five questions, questions 49 to 53 on page 154, Appendix A; page 161, Appendix B
Subject areas	Twelve questions, questions 54 to 65 on page 155, Appendix A; page 162, Appendix B

A questionnaire (Appendix A) was developed, which is based upon those successfully used by researchers in other curricular assessment studies (Smith et al, 1990; Patel et al, 1991; Rupp and Szkudlarek, 1991; Wilson et al, 1992; Kharbanda et al, 1993; Livingstone et al, 1993; Quiñones and Mason, 1994).

Smith et al (1990) assessed the views of pharmacists on the importance of the major practice activities performed by most pharmacists and their perceived level of competence to perform these activities upon graduation. While attempting to include most activities that pharmacists perform, its length was limited to encourage a good response rate.

Rupp and Szkudlarek (1991) used a more business like approach to curricular assessment, comparing a pharmacy school to a business. Using the techniques of marketing research they could identify the current needs of their post graduates. Unmet needs were defined as being of importance to the graduate in order to fulfil career goals, but with which they were dissatisfied with during their undergraduate preparation. Rupp and Szkudlarek constructed the questions in the survey to represent specific areas of the curriculum. The terms which were used whose meaning was not clear were further defined.

Wilson et al (1992) considered the subject content of the pharmacy degree from the perspective of the practicing pharmacist in order to determine its relevance for graduates. Once the questionnaire was prepared, it underwent a small pilot study and was then mailed.

Quiñones and Mason (1994) based their research on the premise that graduates are reasonably good judges of the extent to which their curriculum has prepared them with needed occupational skills. The practice functions and curricular outcomes, of the American Association of College of Pharmacy Commission to Implement Change in Pharmacy education constituted the framework for the development of the survey instrument. A survey pretest was done and the responses resulted in minor modifications in wording.

The questionnaire used, therefore, is a validated questionnaire as its format and content is similar to previous questionnaires. In designing the questionnaire, various grammatical changes were made to the questions so that South African pharmacists would be familiar with the terms and concepts. This was done to include most activities that a pharmacist could be called upon to perform in the three main sectors of pharmacy, but at the same time to limit the number of questions so as to encourage a good response rate.

To further validate the questionnaire and cover letter it was firstly, pretested by staff members at the Department of Pharmacy, University of the Witwatersrand and secondly it was pretested by a small sample of pharmacists. The staff pretest was used to evaluate how well the questionnaire achieved the research objectives and to check for accuracy, bias, clarity of writing an ' instructions, and style of questioning.

The recommended changes were then made and the questionnaire was then pretested by a small sample of pharmacists. There were seventeen pharmacists involved in this part of the pretesting. The pharmacists represented six groups, representing both English and Afrikaans speaking pharmacists who were involved in either community, hospital or industrial pharmacy.

All of the responses resulted in minor modifications of wording or minor additions or deletions as the questions evolved. See Appendix A (English) and B (Afrikaans) for the final questionnaire used in the research.

3.2.5 Questionnaire implementation

Due to the main weakness of mail questionnaires being non-response, particular attention was paid to reducing non-response bias by means of the design and implementation of the questionnaire.

1) Anonymity

Due to the contradictory evidence between anonymity and confidentiality of questionnaires, on the number of responses, a confidential questionnaire with the identifying number indicated on the front cover for purpose of recontact, if necessary, was used.

2) Type of appeal

Taking into consideration the use of an altruistic versus an egotistic appeal, an altruistic appeal was used, with the universities name being prominent on the cover letter. The altruistic appeal consisted of two sections. Firstly, there was an appeal that the

information was required for the development of the pharmacist and the future of pharmacy and secondly, that the information was required for the completion of this degree. It was decided that the cover letter would not be personalised, thereby saving both time and money

3) Questionnaire colour

Due to the extra cost of using coloured paper for the questionnaire and the contradictory evidence of its effectiveness, it was decided to use plain white paper with black printing for the questionnaire.

4) Monetary and non-monetary incentives

A prepaid monetary incentive was not used, as a monetary incentive when used in conjunction with an altruistic appeal in university sponsored research, can do more harm than good (Schneider and Johnson, 1995). A non-monetary incentive was not used, also because of budget constraints.

5) User friendly questionnaires

The questionnaire was designed to be as user friendly as possible, especially since it was a mail survey and there was no interviewer to elaborate on any difficult points. This user friendly questionnaire was achieved through questionnaire layout, question design and ordering, translation and so forth.

6) Type of envelope and postage used

Buff coloured envelopes for both the outgoing questionnaire package and the return envelope were used. The buff coloured outgoing envelope would show less dirt from handling, therefore appearing to be neater and cleaner than a similar white envelope would be.

7) Source and sponsor

As a university usually obtains a better response rate, better data and a faster response time than a research firm, it was decided to make it clear to the potential respondent that the university was involved both as the source and sponsor of the research. This was achieved by means of the cover letter.

8) Open versus closed-ended questions

Closed-ended or partially closed-ended questions were used throughout the questionnaire so as to improve the response rate.

9) Follow up

While Jobber (1986) did report that follow up letters increase the response rate, it was felt that this was impractical due to the cost of sending out a follow up mailing. A follow up usually involves at least a post card being sent to the non responder and then a new questionnaire being sent out later. This would therefore have involved increased money and labour costs due to the questionnaires, postcards and three sets of address labels, envelopes and stamps. Questionnaire design and interest by the potential respondent in the topic was thought to be sufficient.

10) Deadlines

A deadline was placed on the questionnaire, if for no other reason than that it would help to prevent questionnaires arriving sporadically over the time period. The deadline could have unfortunately reduced the response rate as late responders might have realised that the deadline was very near and therefore decided not to return the questionnaire.

11) Pre-notification

While pre-notification does increase response speed it does not affect the quality of the data collected. Telephonic pre-notification could not be used as the IPCSA lists did not contain telephone numbers and the costs of telephone pre-notification were prohibitive. Mail pre-notification would also not be cost effective.

3.2.6 Sample design

In order to determine if there was any difference between pharmacists in the various sectors it was necessary to stratify the sample. A stratified sample consists of members who are similar to each other. In this case the registered pharmacists were stratified according to whether they worked in a community, hospital or industrial pharmacy setting. Three separate lists of pharmacists were requested from the IPCSA. In order to ensure that a sufficient sample was obtained for each strata, disproportionate sampling was used i.e., sample size did not correspond to the size of the population (Vogt, 1993). The general pharmacy group is all of the respondents combined. This is done as pharmacy educators are responsible for all pharmacy education, regardless of sector (Smith et al, 1990; Patel et al, 1991; Wilson et al, 1992; Kharbanda et al, 1993; Livingstone et al, 1993).

Of the three basic methods of choosing a sample (Dobbert, 1975; Allan, 1982; Fitzpatrick, 1991b; Vogt, 1993), the random probability method was used to select the sample for this research. A random number generator was used in the Statgraphics® programme, version 5, Statistical Graphics Corporation, U.S.A.. This random number was then used to match potential respondents to their registration number with the IPCSA, resulting in three randomly selected samples representing community, hospital and industrial pharmacy. These three samples should therefore be a fair representation of their respective populations.

The actual required sample size was calculated by means of the Statgraphics® programme, version 5, Statistical Graphics Corporation, U.S.A.. In order to calculate the sample size, certain decisions must be made concerning; the acceptable error for the research, the degree of confidence associated with the estimate, and the anticipated response rate for the questionnaire. For this research a 90% confidence level was deemed appropriate and accurate. Therefore the α and β errors were set at 0.1000 (therefore the probability that an α or β error can occur is less than 10 %).

The assumed standard deviation (assumed sigma) was set at 2.00 with the Alternate hypothesis being not equal to the Null hypothesis. The standard deviation shows the average

amount of variation around the mean. The greater the average variation, the larger the standard deviation. It was assumed that the responses could vary quite dramatically between respondents. The standard deviation therefore needed to be fairly high, resulting in a large sample size requirement. The Null Hypothesis (H_O) is that there is no difference between the samples. The Alternate Hypothesis (H_A) is that there is a difference. It is not possible to predict beforehand which way the difference would lie between the samples and therefore H_O is not equal to H_A.

The Statgraphics computer programme (Statgraphics® programme, version 5, Statistical Graphics Corporation, U.S.A., 1991) calculated that the sample size required to meet the above criteria was thirty five respondents in each pharmacy sector.

Taking into consideration that a sample size of thirty five respondents was required for each of three sectors (Community, Hospital, Industrial), it was decided that a potential response size of one hundred and seventy five respondents was needed for each sector. One concern was that private hospital pharmacists are included in the community pharmacy list by the IPCSA. To overcome this, two hundred pharmacists where chosen from each sector. It was felt that the potential size of the sample was large enough that sufficient community pharmacists would respond to ensure a viable sample size.

The questionnaire, cover letter and a return, addressed, postage-paid envelope was then mailed. The respondents were allowed a period of six weeks in which to respond.

3.2.7 Statistical analysis of results

In a statistical test using case-wise deletion, if a respondent has any missing responses the respondent is removed from the statistical test. The obvious problem with case-wise deletion is that a large amount of useable information is discarded. This is of particular relevance in the Multivariate Analysis used to determine an ideal curriculum. Pair-wise deletion uses all the available information provided by the respondent so that the

respondents data is included in all tests except where the missing variable occurs (Dillon et al, 1990; Statgraphics® programme, version 5, Statistical Graphics Corporation, U.S.A., 1991; Vogt, 1993).

Therefore, all statistical testing was done by the use of pair-wise deletion and not case-wise deletion. Both the NA and # response categories were treated as missing data in order to prevent an artifact in the data set (Vogt, 1993). All statistical tests were done at a 90 % level of confidence. For this research the consistency of editing and coding is very high, as only a single researcher was involved (Dillon et al, 1990).

The following methods were used to present and calculate the results from this research.

3.2.7.1 Frequency distribution graphs

There are a number of methods by which the range of responses to a question can be presented. The results can be averaged to obtain a single number, which describes the average response to a question. Although this is easier to work with than a frequency distribution, the frequency distribution yields more information. For example, in figure 3.2.7.1.1 the average value is 3.17. In effect this means that the respondents have a neutral response, while in actual fact, the frequency distribution shows that there are two opposing opinions that average out to create a neutral response.

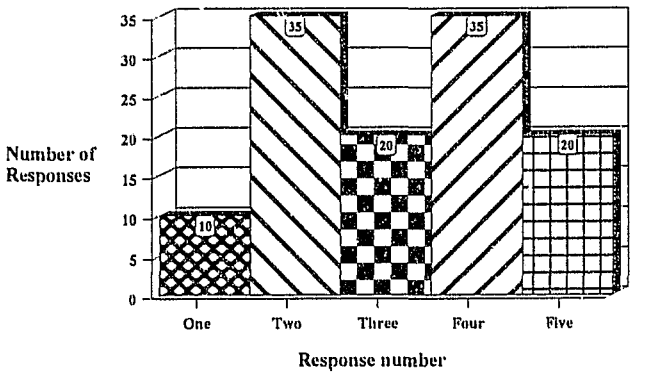


Figure 3.2.7.1.1 Example of a frequency distribution

3.2.7.2 Box-and-Whisker plots

Box-and-Whisker plots were used to compare the responses between pharmacists in the various pharmacy sectors according to the importance, competence, I-C difference and time spent by the pharmacists on the major functions.

If there is a lot of data, a summary plot may be a better method for analysing the data. The box-and-whisker plot introduced by J.W. Tukey (Tukey, 1977) is such a plot. It is a convenient method for comparing distributions (Dillon et al, 1990; Clarke and Cooke, 1993; Vogt, 1993). The information is arranged (ranked) in order of smallest to largest value. The median is then calculated. The median is the middle value of the ranked observations. The most simple method of finding the median is to rank the data and then use the formula $(n \cdot 1)/2$ where n is the number of items in the data.

Once the median has been obtained, the ranked data is divided into four quarters containing an equal number of items in each quarter. The quartiles then, are those values below which 25 %, 50 % (median) and 75 % of the observations fall. Using a linear scale, we make a mark at the lower (or 1st) quartile, median, upper (or 3rd) quartile and maximum observation. The lines from the lower and upper quartiles are then joined to make a box that encloses the middle 50 % of the observations. A whisker is then taken from the box to the minimum and maximum values. The diagrams can be drawn next to each other for easier visual comparison. The box-and-whisker plot provides information about the data's central tendency, variability and shape of distribution. This facilitates a comparison between the medians, ranges, and extreme values of the Community, Hospital and Industrial pharmacists responses. Outliers are plotted as dots on the relevant plots. An outlier is an extreme value, which can distort the data. The median is more resistant to the effects of an outlier. Hence its benefit in statistical analysis (Vogt, 1993). Figure 3.2.7.2.1 is a graphical example of such a box-and-whisker plot.

Once the information has been edited and coded, it can be graphically portrayed and a comparison can be done, if necessary, between plots. For example, having measured the importance of a practice activity for Community and Hospital pharmacists, a comparison

can be done between the plots. There are other more sophisticated methods to analyse data, but a graph is the best method to obtain an overview of the data.

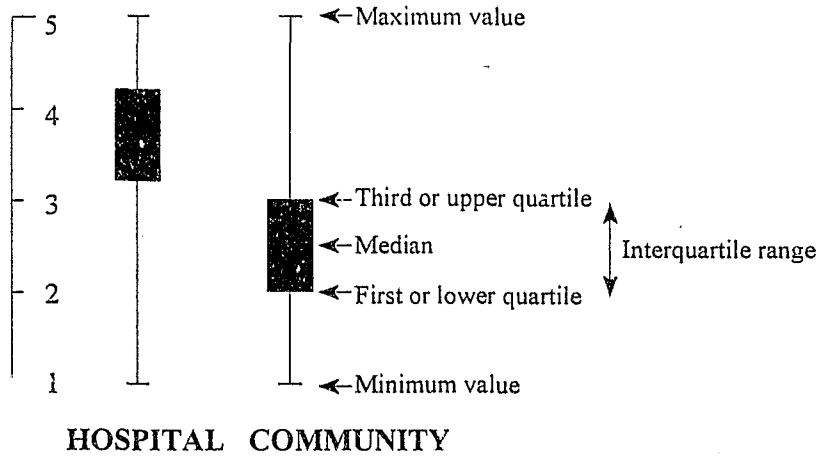


Figure 3.2.7.2.1 Comparison between two Box-and-Whisker plots

3.2.7.3 Correlation analysis

Correlation analysis was used to detect if there was any significant relationship between the importance, competence, I-C difference and time spent by pharmacists in the various sectors on the four major functions.

A correlation analysis can be used to show whether or not there is a consistent relationship between various measurements. When the association is such that when one variable increases, the other also increases, it is a positive correlation. This is indicated by a '+' on the correlation matrix. When the association occurs that when one variable increases and the other one decreases, it is known as a negative correlation, which is indicated by a '-' on the correlation matrix. This therefore allows one to predict the value of one variable from the value of another (Vogt, 1993; Allan, 1982).

3.2.7.4 Stepwise regression analysis

Stepwise regression analysis is a method of explaining or predicting the value of a dependent variable (the presumed effect of other variables) by using information about a number of independent variables (this is the presumed cause of the dependent variable).

There are two methods used in a stepwise regression analysis. They are forward selection and backward elimination.

1) The forward selection method involves choosing which variables should be included, and in what order, in a model. The computer chooses the independent variable that best explains the variance in the dependent variable. It continues to add variables until adding a variable leads to no significant increase in the significance of the model.

2) In backward elimination the computer procedure starts with all the variables in the equation. The independent variables are then removed one at a time according to their level of significance. The least significant is removed first so as to find those that best explain the resultant dependent variable.

The R^2 value explains the percentage of variation in the dependent variable that can be explained by the proposed model. Backward elimination was used for this research. The stepwise regression was used to determine a curriculum model that best explained the mean competence of the pharmacist. This was determined for each pharmacy sector and then for pharmacy as a whole.

Having obtained the regression equation the researcher must do further checks in order to ensure that the curriculum model actually fits the data. This is done by examining the data and the residuals. The data is examined to ensure that it is uniformly distributed. If the model is correct the residuals should form a random pattern when plotted against their predicted values. Any trend or pattern indicates that the model does not fit the data. Residuals are the portion of the dependent variable that can not be explained by the model. The residual is therefore the observed value.

3.2.7.5 Curriculum analysis factor

In order to summarise the results in a form that would point towards a suitable entry level curriculum for pharmacists, it was decided to devise a factor that would indicate how much emphasis should be placed on each of the major functions.

This factor, the curriculum analysis factor (CAF), was calculated by multiplying the I-C difference by the fraction of time spent performing the major function, and then multiplying that by the percentage of pharmacists employed in that sector. See equation 3.2.7.5.

The curriculum analysis factors enable pharmacy educators to most successfully market their product, which is their curriculum. They achieve this by meeting the perceived needs of practising pharmacists. The curriculum analysis factor value also provides an ideal method for determining where the pharmacy curriculum has failed to adequately prepare pharmacists for practice. The survey can be repeated in four years time allowing the new curriculum analysis factor values to again act as a signpost for directing the curriculum to best satisfy the pharmacy practitioners needs.

Equation 3.2.7.5

$$CAF = \text{Mean I-C Difference} \times \frac{\text{Time spent on the Major Function}}{100} \times \%\ \text{of Population}$$

The reason for the inclusion of the time spent performing the major functions into the curriculum analysis factor equation is that it would seem to be a waste of time focussing the curriculum on an activity if pharmacists are not willing or capable of spending time on the performance of the activity. Similarly the I-C difference must be included as this shows the failing of the curriculum to adequately prepare pharmacists for their future role. The percentage of pharmacists is included as it shows where the pharmacists are utilised and that the pharmacy curriculum must be directed towards meeting the greatest need for qualified pharmacists.

Chapter 4 Results and discussion

4.1 Verification of questionnaire

4.1.1 Full-time versus part-time respondents

Two hundred questionnaires were mailed to each pharmacy sector, that is, to community, hospital and industrial pharmacists, comprising 600 questionnaires in total. Figure 4.1.1.1 shows the number of respondents who work as full-time and part-time pharmacists. The graph indicates that the majority of respondents are involved in full-time practice and that the sample can be used to interpret the required needs of the practicing pharmacist.

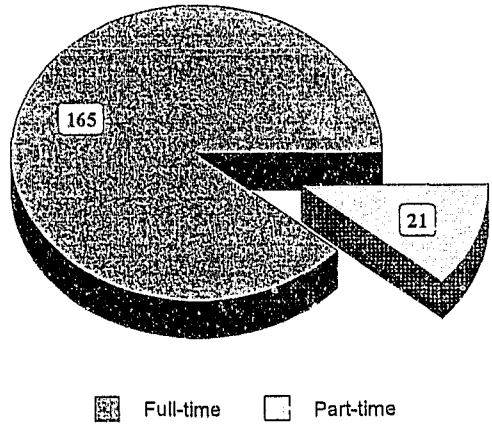


Figure 4.1.1.1 *Full-time versus part-time respondents*

4.1.2 Comparison of respondents to sample size

Figure 4.1.2.1 shows the number of responses obtained from each sector of pharmacy. These figures are not fully representative, as the IPCSA register includes private hospital pharmacists in the community pharmacy register. Private hospital pharmacists were placed with public hospital pharmacists, as it was believed that their responses would be similar to public hospital pharmacists.

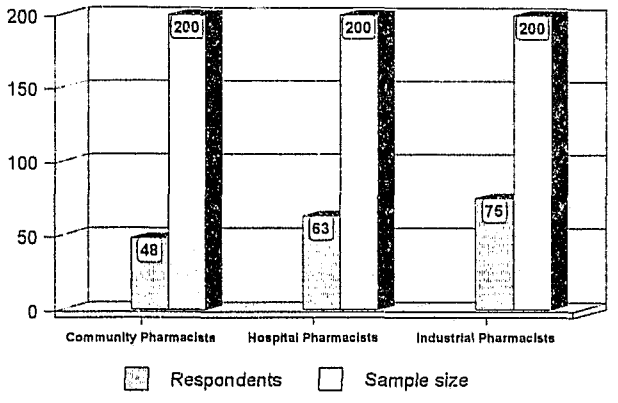
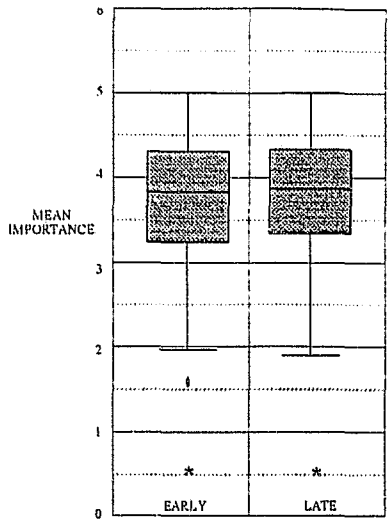


Figure 4.1.2.1 Comparison of respondents to sample size

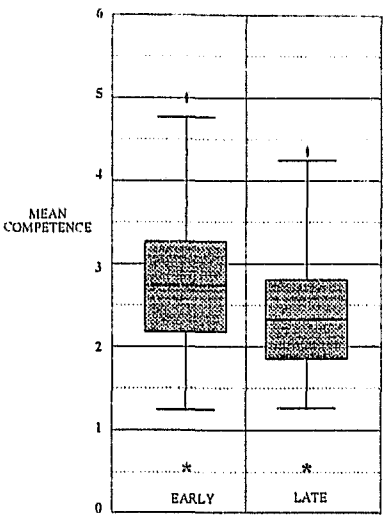
The 75 questionnaires returned by industrial pharmacists constitute 40.32 % of the respondents. The 63 questionnaires returned by hospital pharmacists constitute 33.87 % of the respondents and the 48 questionnaires returned by community pharmacists constitute 25.81 % of the respondents.

4.1.3 Bias

A two-sample t-test was performed to compare the mean importance and competence ratings of early responders to those of very late responders. In this comparison the implicit assumption is that late responders are generally representative of those in the sample who did not respond at all. Significant differences in the ratings of early versus late responders would therefore suggest that non-response bias represents a serious threat to the external validity of the study questionnaire (Simpson, 1984; Rupp and Szkudlarek, 1991; Haggett and Mitchell, 1994). Figure 4.1.3.1 shows that there is no significant difference between early and late responders for either management importance or competence. Therefore no bias arose due to non-response.



(a) Importance



(b) Competence

Figure 4.1.3.1 Box-and-Whisker plots of mean (a) importance and (b) competence versus early and late responders. (There is no significant difference between those plots marked with an asterisk. Results are presented as medians, and the whiskers represent the upper and lower quartiles. The box represents the second and third quartiles. Dots are outliers.)

Of the six hundred questionnaires that were mailed out, twenty six were returned uncompleted for various reasons. Figure 4.1.3.2 shows the reasons for the uncompleted questionnaire returns.

The response rate according to equation 3.1.4.6 was therefore:

$$\text{Response Rate} = \frac{48 + 63 + 75}{600 - (7 + 10 + 9)} \times 100 = 32.40\ \% \qquad \text{Equation 3.1.4.6}$$

Those questionnaires that were returned as address unknown, pharmacist retired and pharmacist no longer involved in pharmacy practice, were regarded as undelivered questionnaires and they could not be used in this research.

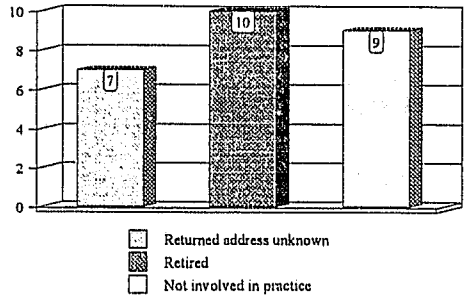


Figure 4.1.3.2 Returned but no response

All statistical testing was done with a 90 % level of confidence even though the increased sample size would have allowed the results to be tested at a higher level of confidence. The α and β values obtained are 0.1000 and 0.0344 respectively. This means that the likelihood of falsely rejecting H_0 when it is true is less than 10 %. The likelihood of not rejecting H_0 when it is actually false is less than 3.4 %.

4.1.4 Breakdown of responses for community pharmacists

Figure 4.1.4.1 shows the breakdown of responses by pharmacists involved in community pharmacy. While managers/owners form the majority of the respondents, it was felt that this forms a representative sample, as it is quite likely that pharmacists by nature of their profession would be involved in some form of managerial activity.

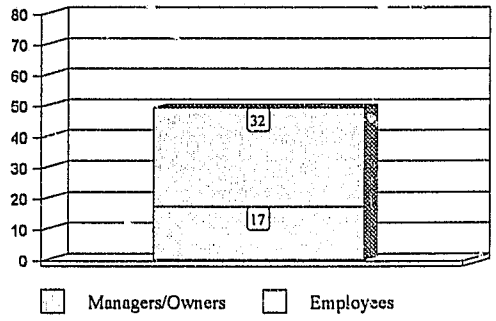


Figure 4.1.4.1 Breakdown of responses for community pharmacists

4.1.5 Breakdown of responses for hospital pharmacists

Figure 4.1.5.1 shows the breakdown of responses by pharmacists involved in hospital pharmacy. As previously mentioned in 4.1.2 the six private hospital pharmacists were part of the community pharmacists register kept by the IPCSA.

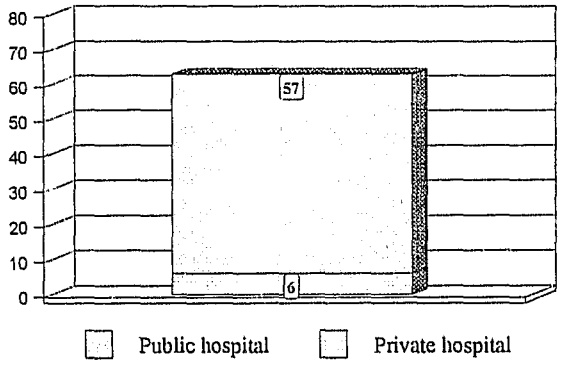


Figure 4.1.5.1 Breakdown of responses for hospital pharmacists

4.1.6 Breakdown of responses for industrial pharmacists

Figure 4.1.6.1 shows the breakdown of responses by pharmacists involved in industrial pharmacy. The majority of respondents are production pharmacists.

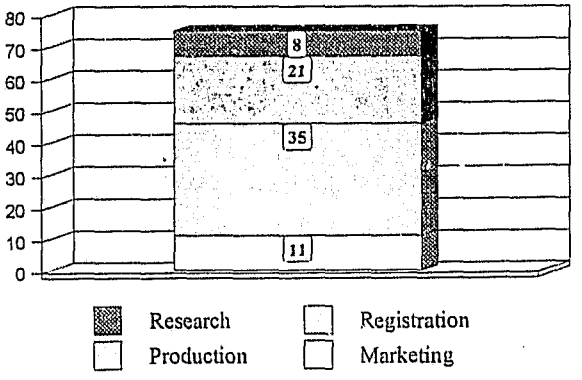


Figure 4.1.6.1 Breakdown of responses for industrial pharmacists

Thus, the majority of respondents are involved in full-time pharmacy practice. All pharmacists who are no longer practicing, or are retired were removed from the study in order to preserve the studies statistical integrity. The response rate of the questionnaire is good and within the average of a good return. The sample of pharmacists obtained is representative of the population as the responses obtained are uniformly distributed. Therefore, no bias was observed in the sample, suggesting that it can be used to investigate the required needs of practicing pharmacists.

4.2 Results of responses according to sector

Table 4.2.1 is a broad summary of the results of the survey in tabular form. The table records the mean value of all the respondents Likert scores $\pm$ the standard deviation of the values. Refer to the questionnaire (Appendix A (English) or Appendix B (Afrikaans)) for a list of the various functions, activities and subjects or subject areas covered in the questionnaire.

4.2.1 Box-and-Whisker plots for management

Figures 4.2.1.1 shows the Box-and-Whisker plots from the results of the management sector values.

From figure 4.2.1.1 (a) it can be seen that community pharmacists feel that management is more important in their jobs than either industrial or hospital pharmacists. Except for the one outlier community pharmacists rate management activities as either very important or extremely important. The mean management importance value for community pharmacy is equal to 4.15, while that for industry and hospital is 3.92 and 3.82 respectively. Hospital pharmacists show the greatest difference of opinion concerning the importance of management to the practice of hospital pharmacy. This is shown by the wide spread of the values.

Table 4.2.1

Mean values for importance, competence, I-C difference and time by major activity per sector

FUNCTIONS OF PHARMACISTS PER SECTOR	MEAN LIKERT SCALE VALUES ± S.D.			
	IMPORTANCE	COMPETENCE	I-C DIFFRENCE	TIME
MANAGEMENT				
COMMUNITY	4.15 ± 0.64	2.46 ± 1.01	1.71 ± 1.05	25.15 ± 19.55
INDUSTRY	3.92 ± 0.71	1.92 ± 0.87	2.02 ± 1.09	86.17 ± 23.70
HOSPITAL	3.82 ± 1.03	2.38 ± 1.04	1.47 ± 1.34	36.89 ± 37.27
GENERAL	3.95 ± 0.82	2.21 ± 0.99	1.76 ± 1.19	53.04 ± 38.98
DISPENSING AND MANUFACTURING				
COMMUNITY	4.18 ±0.69	3.48 ±0.97	0.71 ±0.92	43.45 ±19.83
INDUSTRY	3.47 ±1.11	2.63 ±0.84	0.80 ±1.53	5.83 ±16.67
HOSPITAL	3.95 ±0.76	3.16 ±1.00	0.82 ±1.09	46.31 ±32.18
GENERAL	3.86 ±0.92	3.05 ±1.00	0.80 ±1.20	29.87 ±30.55
COUNSELLING				
COMMUNITY	4.18 ±0.65	2.82 ±1.09	1.38 ±1.19	26.34 ±13.49
INDUSTRY	3.29 ±1.13	2.57 ±1.01	0.57 ±1.70	5.22 ±11.89
HOSPITAL	3.88 ±0.85	2.70 ±1.04	1.18 ±1.16	12.16 ±12.29
GENERAL	3.80 ±0.95	2.69 ±1.04	1.06 ±1.38	13.24 ±15.00
PUBLIC HEALTH				
COMMUNITY	3.75 ±0.88	2.43 ±0.88	1.36 ±1.22	5.28 ±6.44
INDUSTRY	2.95 ±1.19	2.44 ±0.89	0.46 ±1.54	2.95 ±10.77
HOSPITAL	3.25 ±1.24	2.47 ±1.02	0.76 ±1.28	4.66 ±10.73
GENERAL	3.30 ±1.16	2.45 ±0.93	0.84 ±1.39	4.15 ±9.80

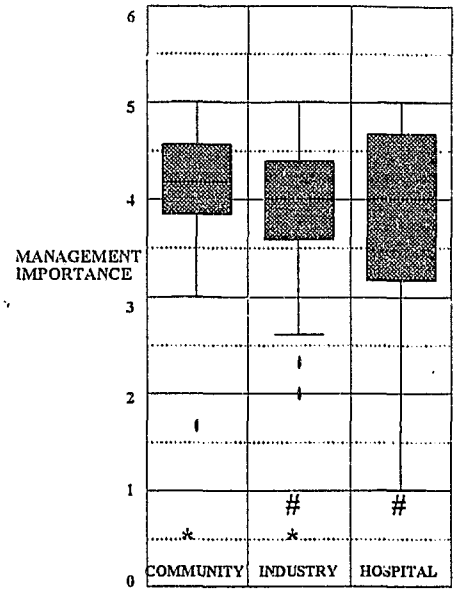
Note: In order to calculate the I-C difference the responding pharmacist had to respond to both the importance of the activity and their perceived competence in the activity. It is therefore not simply calculated by deducting the mean competence from the mean importance.

Figure 4.2.1.1 (b) shows that community pharmacists ($\bar{x}$ = 2.46) perceive that they are slightly more competent in managerial activities than their hospital ($\bar{x}$ = 2.38) colleagues, and much more competent than industrial ($\bar{x}$ = 1.92) pharmacists. Industrial pharmacists feel that they are the least competent in management activities and the small difference between the two whiskers shows that this opinion is common to many industrial pharmacists. Only four industrial pharmacists fall outside their colleagues' perceived competence. Community and hospital pharmacists are similarly competent, and significantly more competent than industrial pharmacists. This may be due to two different reasons:

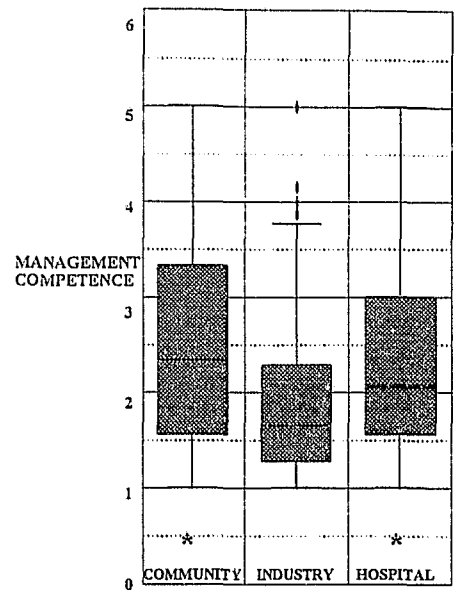
1) Pharmaceutical education may be more community oriented, as such, the management lectures are more oriented to community pharmacy, and hospital pharmacy management requirements may be similar to that required for a community pharmacy.

2) The second and more likely reason is that industrial pharmacy is more management oriented than either hospital or community pharmacists and that industrial pharmacists therefore feel less competent in these management fields as the shortcomings of their education are revealed.

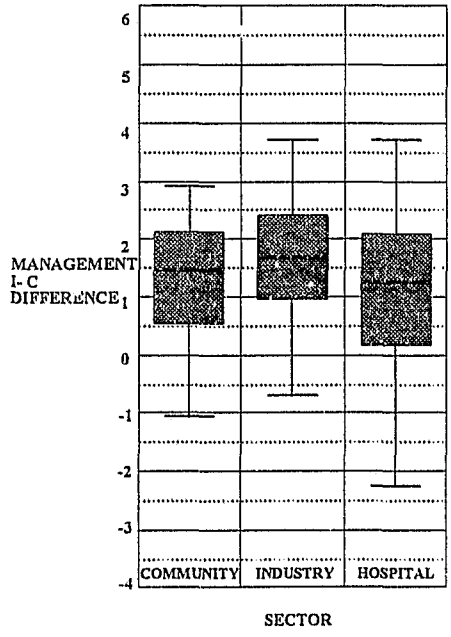
Figure 4.2.1.1 (c) rates the difference or gap between the perceived importance of the activity and the pharmacists competence to perform these activities (I-C difference). If the I-C difference is negative it implies that the pharmacist feels overtrained for the importance of the activity. If the gap is positive, it indicates a failure by pharmaceutical education to suitably educate the pharmacist to perform in this major practice function. In the plot, both community ($\bar{x}$ = 1.71) and industry ($\bar{x}$ = 2.02) have a narrow range of scores regarding the I-C difference, while hospital pharmacists ($\bar{x}$ = 1.47) show a broader range of opinion. Hospital pharmacists show the greatest amount of over-training as nearly 25 % indicate themselves as over-qualified. Industrial pharmacists show the greatest shortcoming in their formal pharmaceutical education. The I-C difference between the various pharmacy sectors is significantly different across all three sectors. Industrial pharmacists have the highest I-C gap and are therefore, indicating that they are not being suitably educated in the management activities related to industrial pharmacy.



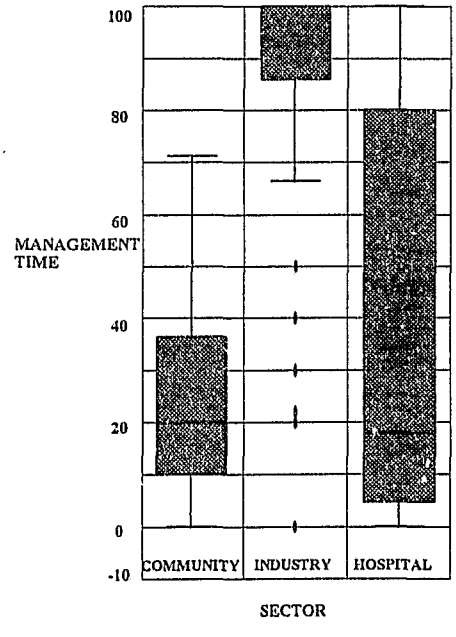
(a) Importance



(b) Competence



(c) I-C Difference



(d) Time

Figure 4.2.1.1 Box-and-Whisker plots of management activities, (a) importance, (b) competence, (c) I-C difference and (d) time versus sector. (There is no significant difference between those plots marked with an asterisk or between those marked with a hash).

Figure 4.2.1.1 (d) shows the amount of time spent by the various sectors in management. Industrial pharmacists spend the greater part of their working day in management ($\bar{x}$ = 86.17 %), with only six industrial pharmacists indicating that they spend less than 60 % of the day in management related activities. The lack of the upper two quartiles indicates that at least 50 % of industrial pharmacists are involved in full-time management. Community pharmacists spend an average 25.15 % of the day and hospital pharmacists spend an average of 36.89 % of the day in managerial activities. The greatest variation in opinion concerning the amount of time spent in management is by hospital pharmacists, as can be seen by the size of the interquartile range.

Overall, the management results show that while all pharmacy sectors rate management as important, they all rate their competence to perform these activities as lower than the importance of the activity. Therefore, not one sector of pharmacy indicates that they are over-trained in management activities. The competence of Industrial pharmacists is particularly poor, considering the importance of managerial activities and especially the amount of time spent in management.

4.2.2 Management correlation matrix plots

Figure 4.2.2.1 shows the relationship between importance, competence, I-C difference and time for management according to the various sectors (including a 'general' pharmacy category). In interpreting the correlation matrixes, those with a positive correlation and a significance level of less than 0.1 show that as the rating of the function increases, so the other corresponding function increases. A negative correlation with a significance level of less than 0.1 shows that as the rating of the one function increases, the rating of the other decreases.

These positive correlations of importance in figure 4.2.2.1 (a) indicate that as the rating of their importance increases, their perceived competence also increases, the I-C difference increases and community pharmacists spend more time performing management related activities. The negative correlation between the perceived competence ratings of community

pharmacists and their corresponding I-C difference occurs because although their competence level at graduation has not changed, the importance of managerial activities has increased over the years, resulting in an I-C difference that increases over the years.

The positive correlation between importance and I-C difference in figure 4.2.2.1 (b) indicates that as the rating of their importance increases, the I-C difference also increases. The negative correlation between the perceived competence ratings of community pharmacists and their corresponding I-C difference occurs because although their competence level at graduation has not changed, the importance of managerial activities has increased over the years, resulting in an I-C difference that increases over the years. Therefore, the gap between the pharmacists competence when they graduated and the importance of the activity in their present day work has increased.

Figure 4.2.2.1 (c) shows a positive correlation between the importance of managerial activities, and I-C difference and time. There is a negative correlation between competence and I-C difference. The positive correlations show that as the rating of managerial importance by hospital pharmacists increased, the I-C difference and the time spent by hospital pharmacists on managerial activities increased. The positive correlation between the I-C difference and time, indicates that the less competent (the greater the I-C difference) the pharmacist is in management, the more time they spend in performing the activity.

Figure 4.2.2.1 (d) shows that as the importance of management activities increases, the pharmacist spends more time in managerial activities. As the importance of managerial activities increases, so the gap between the importance of management and their competence at graduation widens. The negative correlation between competence and time shows that the more competent a pharmacist is in performing their managerial activities, the less time they need to spend on it.

	Importance	Competence	I-C Difference	Time
Importance		+ 0.0930	+ 0.0146	+ 0.0783
Competence	+ 0.0930		— 0.0000	— 0.8670
I-C Difference	+ 0.0146	— 0.0000		+ 0.3009
Time	+ 0.0783	— 0.8670	+ 0.3009	

(a) Community

	Importance	Competence	I-C Difference	Time
Importance		+ 0.6120	+ 0.0000	+ 0.2295
Competence	+ 0.6120		— 0.0000	— 0.8107
I-C Difference	+ 0.0 0	— 0.0000		+ 0.5742
Time	+ 0.2295	— 0.8107	+ 0.5742	

(b) Industry

	Importance	Competence	I-C Difference	Time
Importance		+ 0.2470	+ 0.0000	+ 0.0154
Competence	+ 0.2470		— 0.0000	— 0.5876
I-C Difference	+ 0.0000	— 0.0000		+ 0.0333
Time	+ 0.0154	— 0.5876	+ 0.0333	

(c) Hospital

	Importance	Competence	I-C Difference	Time
Importance		+ 0.0513	+ 0.0000	+ 0.0193
Competence	+ 0.0513		— 0.0000	— 0.0070
I-C Difference	+ 0.0000	— 0.0000		+ 0.0004
Time	+ 0.0193	— 0.0070	+ 0.0004	

(d) General

Figure 4.2.2.1 Correlation matrix plots of management importance, competence, I-C difference and time for, (a) community, (b) industry, (c) hospital and (d) general pharmacy.

4.2.3 Mean values for importance, competence and I-C difference of management activities for each pharmacy sector

Table 4.2.3.1 is a summary of the management activities of the survey. The table gives the mean value of the respondents rating $\pm$ the standard deviation of the values.

The highest importance ratings for the three main sectors of pharmacy are 4.652 for community pharmacy in purchasing management, 4.640 for industry in general management, and 4.167 for hospital in financial management.

The lowest importance ratings are 2.158 for hospital pharmacy in sales management, 3.000 for industry - also in sales management, and 3.444 for community pharmacy in production management. The hospital and community pharmacy result is not surprising, as they would not be expected to rate sales management or production management highly in their respective work. What is surprising is that sales management importance is low for industry. While pharmacists in industry still rate sales management as important they consider it as the least important of the various management activities.

The three highest competence ratings for community, hospital and industry are all in stability management. The highest of the three is for community pharmacy ($\bar{x} = 3.854$). The lowest competence for a management activity is 1.492 for industrial pharmacists in production management. The lowest competence in community pharmacy is 2.000 in personnel management. Hospital pharmacists also have their lowest competence rating in personnel management (2.020). The I-C difference highlights the gap between the perceived importance of a management activity and the pharmacists perceived competence in the activity. The greatest mean I-C difference $\pm$ standard deviation for the three sectors is 2.558 ± 1.501 for community pharmacists - financial management, 2.136 ± 1.622 for hospital pharmacists - personnel management and 2.792 ± 1.255 for industrial pharmacists - general management. The perceived failing of the curriculum in meeting community pharmacists needs is probably due to the increased need by community pharmacists to render more cost effective, practical services, and also due to the increased medicine discounts and staff salaries. Hospital pharmacy management activities seem to be the best

Table 4.2.3.1

Mean values for importance, competence and I-C difference of management activities for each pharmacy sector

MANAGEMENT ACTIVITIES	MEAN RATING ± S.D.		
	COMMUNITY	HOSPITAL	INDUSTRY
GENERAL MANAGEMENT			
IMPORTANCE	4.356 ± 0.773 *#	4.058 ± 1.179 #	4.640 ± 0.607 *
COMPETENCE	2.391 ± 1.273 *	2.146 ± 1.161 *#	1.889 ± 1.042 #
I-C DIFFERENCE	1.932 ± 1.469 *	2.000 ± 1.637 *	2.792 ± 1.255
PERSONNEL MANAGEMENT			
IMPORTANCE	4.233 ± 0.895 *	4.156 ± 1.086 *	4.145 ± 0.989 *
COMPETENCE	2.000 ± 1.113 *	2.020 ± 1.266 *	1.554 ± 0.936
I-C DIFFERENCE	2.220 ± 1.458 *	2.136 ± 1.622 *	2.703 ± 1.305 *
PURCHASING MANAGEMENT			
IMPORTANCE	4.652 ± 0.640	4.022 ± 1.055 *	3.763 ±1.208 *
COMPETENCE	2.378 ± 1.319 *	2.396 ± 1.284 *	1.516 ± 0.971
I-C DIFFERENCE	2.267 ± 1.388 *	1.674 ± 1.569 *	2.246 ± 1.539 *
FINANCIAL MANAGEMENT			
IMPORTA' 'CE	4.600 ± 0.688 *	4.167 ± 1.234 *	3.544 ± 1.310
COMPETE∧CE	2.070 ± 1.298 *	2.056 ± 1.393 *#	1.574 ± 0.884 #
I-C DIFFERENCE	2.558 ± 1.501 *	2.071 ± 1.698 *	1.963 ± 1.387 *
SALES MANAGEMENT			
IMPORTANCE	3.773 ± 1.236	2.158 ± 1.259	3.000 ± 1.414
COMPETENCE	2.311 ± 1.221 *	2.091 ± 1.259 *#	1.679 ± 1.052 #
I-C DIFFERENCE	1.395 ± 1.545 *	0.235 ± 1.091	1.159 ± 1.509 *
PRODUCTION MANAGEMENT			
IMPORTANCE	3.444 ± 1.311 *	3.756 ± 1.110 *	3.948 ± 1.234 *
COMPETENCE	2.032 ± 1.048 *	2.200 ± 1.256 *	1.492 ± 0.809
I-C DIFFERENCE	1.577 ± 1.501 *	1.321 ± 1.307 *	2.455 ± 1.573
STABILITY MANAGEMENT			
IMPORTANCE	4.000 ± 1.082 *	4.104 ± 1.207 *	3.970 ± 1.255 *
COMPETENCE	3.854 ± 1.174 *	3.529 ± 1.155 *#	3.090 ± 1.138 #
I-C DIFFERENCE	0.225 ± 1.230 *	0.604 ± 1.144 *#	0.939 ± 1.695 #

Note: There is no significant difference between those values marked with an asterisk or between those marked with a hash in the horizontal plane.

catered for of the three sectors of pharmacy as their largest I-C difference is significantly smaller than community and industry. The greatest failing of the pharmacy curriculum, with management activities is reserved for industry in general management activities, as the largest I-C gaps occur in this sector of pharmacy.

The smallest I-C difference occurs where the past pharmacy curriculum has best met the needs of practicing pharmacists. This is 0.225 ± 1.230 for community pharmacy in stability management, 0.235 ± 1.091 for hospital pharmacy in sales management and 0.939 ± 1.695 for industrial pharmacy in stability management.

The I-C difference of 0.939 ± 1.695 obtained for industrial pharmacists indicates that industrial pharmacists competencies are not being as successfully met as those for community and hospital pharmacists, whose I-C differences are much lower. The low I-C difference in sales management for hospital pharmacists can be expected as not all pharmacists are involved to any large extent in sales or promotions.

Table 4.2.3.2 shows the I-C differences ranked from largest (greatest failing of the past pharmacy curriculum to meet current needs) to smallest (greatest success of the past pharmacy curriculum to meet current needs) in the three main sectors of pharmacy. While all management activities do require attention, the greatest need is obviously those with the largest difference between the importance of the activity and the pharmacist's competence to perform it (i.e. the largest I-C gap). Overall for management activities, it would seem that hospital pharmacists have been better catered for by the past pharmacy curriculum than either community or industrial pharmacists.

Table 4.2.3.2

Mean I-C difference for management activities, ranked from largest to smallest, for each sector of pharmacy

COMMUNITY		HOSPITAL		INDUSTRY	
MANAGEMENT ACTIVITIES	MEAN RATING ± S.D.	MANAGEMENT ACTIVITIES	MEAN RATING ± S.D.	MANAGEMENT ACTIVITIES	MEAN RATING ± S.D.
FINANCIAL	2.558 ± 1.501	PERSONNEL	2.136 ± 1.622	GENERAL	2.792 ± 1.255
PURCHASING	2.267 ± 1.388	FINANCIAL	2.071 ± 1.696	PERSONNEL	2.703 ± 1.305
PERSONNEL	2.220 ± 1.458	GENERAL	2.000 ± 1.637	PRODUCTION	2.455 ± 1.573
GENERAL	1.932 ± 1.469	PURCHASING	1.674 ± 1.569	PURCHASING	2.246 ± 1.539
PRODUCTION	1.577 ± 1.501	PRODUCTION	1.321 ± 1.307	FINANCIAL	1.963 ± 1.387
SALES	1.395 ± 1.545	STABILITY	0.604 ± 1.144	SALES	1.159 ± 1.509
STABILITY	0.255 ± 1.230	SALES	0.235 ± 1.091	STABILITY	0.939 ± 1.695

4.2.4 Box-and-Whisker plots for dispensing and manufacturing

Figure 4.2.4.1 shows the Box-and-Whisker plots from the results of the dispensing and manufacturing activities of the survey.

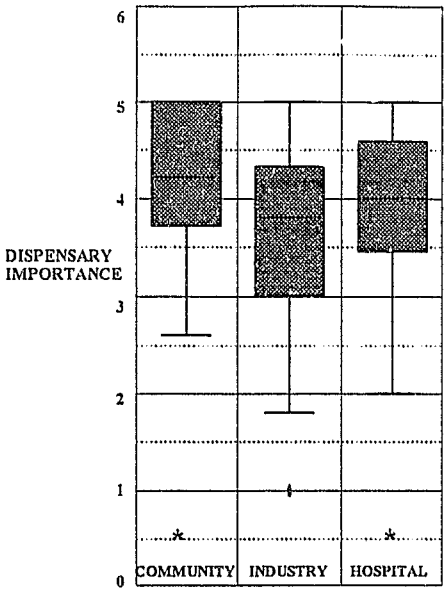
Figure 4.2.4.1 (a) shows that community pharmacists attach a greater importance ($\bar{x}$ = 4.18) to dispensing and manufacturing activities than do either industrial ($\bar{x}$ = 3.47) or hospital pharmacists ($\bar{x}$ = 3.95). The upper 25 % of community pharmacists rate dispensing and manufacturing activities as extremely important, hence the missing whisker. Community

pharmacists therefore consider that dispensing and manufacturing activities are very important while industrial and hospital pharmacists rate it as moderately important. Industrial pharmacists show the greatest variation in their opinions of the importance of dispensing and manufacturing activities. This wide range of opinions regarding the importance of these activities is due to the varied job descriptions of industrial pharmacists (not all are necessarily involved in manufacturing).

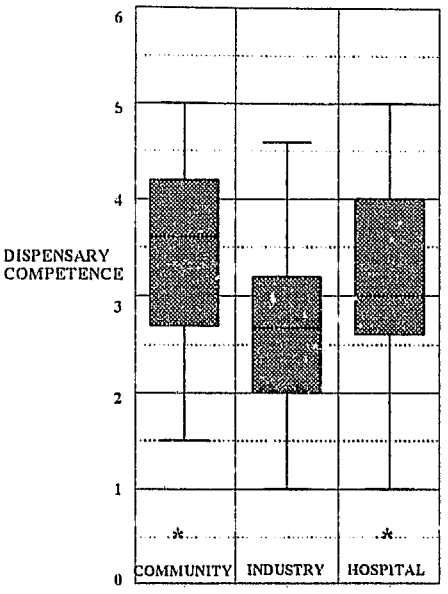
Figure 4.2.4.1 (b) shows that community pharmacists rate themselves as fairly competent ($\bar{x} = 3.48$) in relation to industrial pharmacists ($\bar{x} = 2.63$) and hospital pharmacists ($\bar{x} = 3.16$) in dispensing and manufacturing activities. Industrial pharmacists rate their overall competence to perform dispensing and manufacturing activities as fairly low. These competencies suggest (as in management competence) that pharmaceutical education is targeted towards community pharmacy and that hospital pharmacists require a similar competence to community pharmacists. The greatest range of values was with hospital pharmacists whose opinions ranged from not competent to extremely competent. This shows that pharmacy educators are possibly not meeting all the requirements for hospital pharmacy.

Figure 4.2.4.1 (c) shows that industrial pharmacy ($\bar{x} = 0.80$) has the greatest I-C difference concerning the importance of the activity and their competence to perform this activity and yet five pharmacists consider themselves as over-trained for the role they play in dispensing and manufacturing. The mean values for community and hospital are 0.71 and 0.82. The reason for the lower industrial mean is because of these five outlying pharmacists. This profile of the I-C differences between the three pharmacy sectors is very similar to that which occurs in management (Figure 4.2.1.1 (c)).

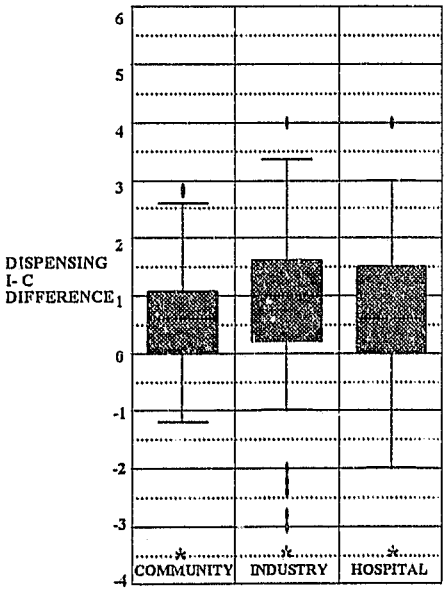
Figure 4.2.4.1 (d) shows that while community pharmacists ($\bar{x} = 43.45$) and hospital pharmacists ($\bar{x} = 46.31$) spend similar proportions of their day involved in dispensing and manufacturing activities, industrial pharmacists spend only an average of 5.83 % of their day on these activities. The range of opinion regarding time spent on dispensing and manufacturing activities is extremely narrow for industrial pharmacy, resulting in a box-and-whisker plot that cannot be seen on this scale. While industrial pharmacists indicate that



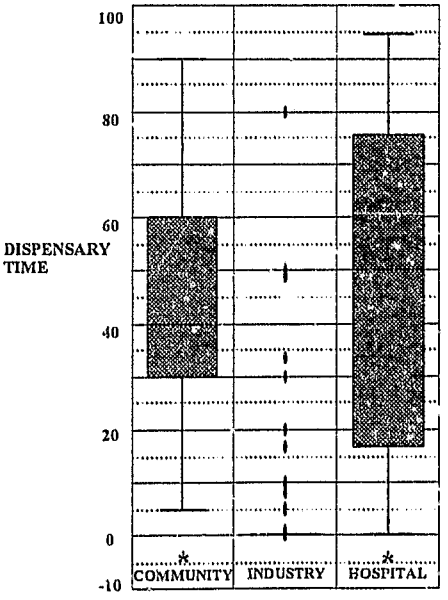
(a) Importance



(b) Competence



(c) I-C Difference



(d) Time

Figure 4.2.4.1 Box-and-Whisker plots of dispensing and manufacturing activities, (a) importance, (b) competence, (c) i-c difference and (d) time versus sector. (There is no significant difference between those plots marked with an asterisk).

dispensing and manufacturing activities are important, they do not spend much time in performing these activities. It is possible that they regard manufacturing and dispensing as more of a management activity since their positions are typically leadership/management roles. So while they need to be familiar with the procedures and be capable of problem-solving, they have mainly a managerial role.

4.2.5 Dispensing and manufacturing correlation matrix plots

Figure 4.2.5.1 shows the relationship between importance, competence, I-C difference and time for dispensing and manufacturing according to the various sectors (including a 'general' pharmacy category).

These positive correlations of importance in figure 4.2.4.1 (a) indicate that as the rating of their importance increases, their perceived competence also increases and the I-C difference increases. The negative correlation between the perceived competence ratings of community pharmacists and their corresponding I-C difference occurs because although their competence level at graduation has not changed, the importance of dispensing and manufacturing activities has increased since they graduated, resulting in an increasing I-C difference over the years.

Figure 4.2.5.1 (b) shows that for industrial pharmacists, as the importance of the activity increases, the I-C gap widens. The negative correlation between the perceived competence ratings of industrial pharmacists and their corresponding I-C difference occurs because although their competence level at graduation has not changed, the importance of dispensing and manufacturing activities has increased since they graduated, resulting in an increasing I-C difference over the years. This gap can be decreased by increasing competence, which can only be achieved through increased training and continuing education courses.

	Importance	Competence	I-C Difference	Time
Importance		+ 0.0027	+ 0.0375	+ 0.4284
Competence	+ 0.0027		— 0.0000	+ 0.1595
I-C Difference	+ 0.0375	— 0.0000		— 0.3894
Time	+ 0.4284	+ 0.1595	— 0.3894	

(a) Community

	Importance	Competence	I-C Difference	Time
Importance		— 0.2326	+ 0.0000	+ 0.3098
Competence	— 0.2326		— 0.0000	— 0.4046
I-C Difference	+ 0.0000	— 0.0000		+ 0.1529
Time	+ 0.3098	— 0.4046	+ 0.1529	

(b) Industry

	Importance	Competence	I-C Difference	Time
Importance		+ 0.0479	+ 0.0002	+ 0.6895
Competence	+ 0.0479		— 0.0000	— 0.7098
I-C Difference	+ 0.0002	— 0.0000		+ 0.7144
Time	+ 0.6895	— 0.7098	+ 0.7144	

(c) Hospital

	Importance	Competence	I-C Difference	Time
Importance		+ 0.0063	+ 0.0000	+ 0.0070
Competence	+ 0.0063		— 0.0000	+ 0.0200
I-C Difference	+ 0.0000	— 0.0000		+ 0.6414
Time	+ 0.0070	+ 0.0200	+ 0.6414	

(d) General

Figure 4.2.5.1 Correlation matrix plots of dispensing and manufacturing importance, competence, I-C difference and time for, (a) community, (b) industry, (c) hospital, and (d) general pharmacy.

Analysing figure 4.2.5.1 (c) shows that for hospital pharmacists, as the importance of the activity increases, the I-C gap widens. The negative correlation between the perceived competence ratings of hospital pharmacists and their corresponding I-C difference occurs because although their competence level has not changed, the importance of dispensing and manufacturing activities has increased since they graduated, resulting in an increasing I-C difference over the years.

When considering figure 4.2.5.1 (d) it is seen that as the importance of dispensing and manufacturing increases, the pharmacist spends more time involved in these activities. As the importance of dispensing and manufacturing activities increases, so the gap between the importance of the activity and their competence to perform the activity at graduation widens. The positive correlation between competence and time shows that the more competent a pharmacist is, the more time they spend in performing these activities. This is a possible effect of the past pharmacy curriculum. Simply put, where the pharmacist is comfortable in performing dispensing and manufacturing activities, they are more likely to spend more time performing these activities.

4.2.6 Mean values for importance, competence and I-C difference of dispensing and manufacturing activities for each pharmacy sector

Table 4.2.6.1 is a summary of the dispensing and manufacturing activities section of the survey. It provides the mean value of the respondents rating $\pm$ the standard deviation of the values.

Dispensing activities are regarded as the most important dispensing and manufacturing activity by all three sectors of pharmacy. The mean value $\pm$ standard deviation for community, hospital and industrial pharmacists is 4.792 ± 0.544; 4.436 ± 0.738 and 3.625 ± 1.540 respectively. It is however important to note that community pharmacists do consider the developing and maintaining of patient records/profiles as the second most important dispensing and manufacturing activity.

Table 4.2.6.1

Mean values for importance, competence and I-C difference of dispensing and manufacturing activities for each pharmacy sector.

DISPENSING AND MANUFACTURING ACTIVITIES	MEAN RATING ± S.D.		
	COMMUNITY	HOSPITAL	INDUSTRY
DISPENSING ACTIVITIES			
IMPORTANCE	4.792 ± 0.544 *	4.536 ± 0.738 *	3.625 ± 1.540
COMPETENCE	3.915 ± 1.060 *	3.500 ± 1.128 *#	3.382 ± 1.179
I-C DIFFERENCE	0.872 ± 1.209 *#	1.056 ± 1.309 *	0.281 ± 2.020 #
PATIENT RECORDS			
IMPORTANCE	4.750 ± 0.565	3.800 ± 1.079 *	3.345 ± 1.565 *
COMPETENCE	3.587 ± 1.392 *	3.044 ± 1.331 *	2.434 ± 1.294
I-C DIFFERENCE	1.152 ± 1.264 *	0.756 ± 1.428 *	0.607 ± 2.079 *
COMPOUNDING ACTIVITIES			
IMPORTANCE	4.044 ± 1.107 *	3.686 ± 1.140 *#	3.333 ± 1.516 #
COMPETENCE	3.977 ± 1.080 *	3.537 ± 1.059 *#	3.377 ± 1.213 #
I-C DIFFERENCE	0.093 ± 1.288 *	0.216 ± 1.172 *	-0.167 ± 1.724 *
PARENTERAL THERAPY			
IMPORTANCE	2.619 ± 1.466 *	4.054 ± 1.153	2.818 ± 1.436 *
COMPETENCE	2.645 ± 1.305 *	2.571 ± 1.364 *	2.000 ± 1.123
I-C DIFFERENCE	-0.263 ± 1.881 *	1.576 ± 1.751 #	0.591 ± 1.843 *#
PRODUCTION TECHNOLOGY			
IMPORTANCE	2.368 ± 1.423	3.348 ± 1.369 *	3.458 ± 1.271 *
COMPETENCE	2.286 ± 1.150 *	2.516 ± 1.029 *	2.123 ± 1.119 *
I-C DIFFERENCE	0.294 ± 1.687 *	0.773 ± 1.716 *	1.196 ± 1.809 *

Note: There is no significant difference between those values marked with an asterisk, or between those marked with a hash in the horizontal plane.

The lowest importance for a dispensing and manufacturing activity is 2.368 ± 1.423 for production technology by community pharmacists. The lowest for hospital pharmacists is 3.348 ± 1.369 in production technology and the lowest for industrial pharmacists is 2.818 ± 1.436 in parenteral therapy.

Community and hospital pharmacists have their highest competence in compounding activities with a mean competence of 3.977 ± 1.080 and 3.537 ± 1.059 respectively. The highest competence for industrial is in compounding activities (3.537 ± 1.059). The lowest competence is 2.516 ± 1.029 by industrial pharmacists for production technology. The lowest competence for community and hospital pharmacists is 2.286 ± 1.150 and 2.516 ± 1.029 respectively, for production technology.

The highest I-C difference for a dispensing and manufacturing activity is 1.576 ± 1.751 for hospital pharmacists in the preparation of parenteral therapy. This is of concern because of the risks involved to the patient, if the pharmacist feels incompetent or not suitably trained to prepare parenteral therapies. The second highest I-C difference is for industrial pharmacists in production technology (1.196 ± 1.809). Community pharmacists have their highest I-C difference in the developing and maintaining of patient records and profiles (1.152 ± 1.264). Community pharmacists are therefore aware of the need of developing and maintaining patient records and profiles, but it is not being met by the pharmacy curriculum, which can have a detrimental effect on the provision of patient centred care by community pharmacists.

The lowest I-C difference is -0.263 ± 1.881 for community pharmacists in parenteral therapy. Therefore, community pharmacists are over trained for the use they make of the knowledge and skills they receive from the curriculum in parenteral therapy activities. Industrial pharmacists have a mean I-C difference of -0.167 ± 1.724 for compounding activities. In fact, compounding activities have the lowest I-C difference for industry and hospital (0.216 ± 1.172) and the second lowest for community pharmacy (0.093 ± 1.288). These findings suggest that the past pharmacy curriculum is better adapted for educating pharmacists in compounding activities. This therefore reflects the more traditional compounding role of pharmacy, rather than an attempt to modify the curriculum to best

meet pharmacists needs. While this I-C difference should still be kept as close to zero as possible, it suggests that the curriculum is still reflecting many of the traditional duties required of the pharmacist and not that of the newer developments, such as creating and monitoring patient records and profiles and dispensing activities. The emphasis by the past pharmacy curriculum on compounding activities can therefore be reduced.

Table 4.2.6.2 shows the mean I-C differences for dispensing and manufacturing activities, ranked from the largest to the smallest in the three main sectors of pharmacy.

Table 4.2.6.2

Mean I-C difference for dispensing and manufacturing activities, ranked from largest to smallest, for each sector of pharmacy

COMMUNITY		HOSPITAL		INDUSTRY	
MANAGEMENT ACTIVITIES	MEAN RATING ± S.D.	MANAGEMENT ACTIVITIES	MEAN RATING ± S.D.	MANAGEMENT ACTIVITIES	MEAN RATING ± S.D.
PATIENT RECORDS	1.152 ± 1.264	PARENTAL THERAPY	1.576 ± 1.751	RODUCTION	1.196 ± 1.809
DISPENSING	0.872 ± 1.209	DISPENSING	1.056 ± 1.309	PATIENT RECORDS	0.607 ± 2.079
PRODUCTION	0.294 ± 1.687	PRODUCTION	0.773 ± 1.716	PARENTAL THERAPY	0.591 ± 1.843
COMPOUNDING	0.093 ± 1.288	PATIENT RECORDS	0.756 ± 1.428	DISPENSING	0.281 ± 2.020
PARENTAL THERAPY	-0.263 ± 1.881	COMPOUNDING	0.216 ± 1.172	COMPOUNDING	-0.167 ± 1.724

While the curricular needs for dispensing and manufacturing activities, with regard to parenteral therapy for community pharmacists and compounding activities for industrial pharmacists, do require modification. The aspect of the curriculum regarding patient records and dispensing requires particular attention for community pharmacists. The greatest failing of the pharmacy curriculum in dispensing and manufacturing activities is for hospital pharmacists, who require attention in parenteral therapy, dispensing functions, production technology and patient records and profile activities. The main failing of the past pharmacy curriculum for industrial pharmacists as far as dispensing and manufacturing activities is concerned, is for production activities.

4.2.7 Box-and-Whisker plots for counselling

Figure 4.2.7.1 shows the box-and-whisker plots from the results of the counselling sector values.

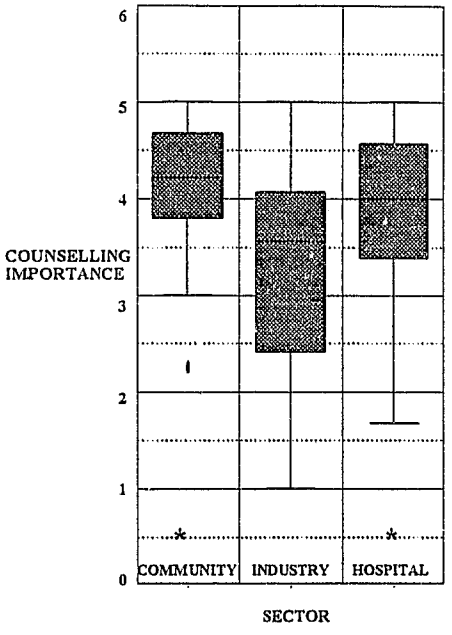
The box-and-whisker plot of counselling importance (Figure 4.2.7.1 (a)) shows that community pharmacy ($\bar{x} = 4.18$) and hospital pharmacy ($\bar{x} = 3.88$) are similar to each other, in that they rate the importance of counselling activities similarly. However, industrial pharmacists rate the importance of counselling activities significantly lower than this ($\bar{x} = 3.29$). Both community and hospital pharmacists rate the communication of medical information and counselling as important. The range of opinions for community pharmacy is very narrow in comparison to hospital and industry. In fact, all community pharmacists, except one, regarded counselling activity as either important or very important. The spread of opinion for hospital and industrial pharmacy is wider, especially for industrial pharmacists. This divergence of opinion for industrial pharmacists is of a significant size and is probably due to some pharmacists not being actively involved in the dissemination of product and trade information to medical and allied health staff.

Figure 4.2.7.1 (b) shows the pharmacists competence in counselling. There is no significant difference between community, hospital or industry. All pharmacists have a fairly wide variety of opinions about their competency as can be seen by the upper and lower whiskers

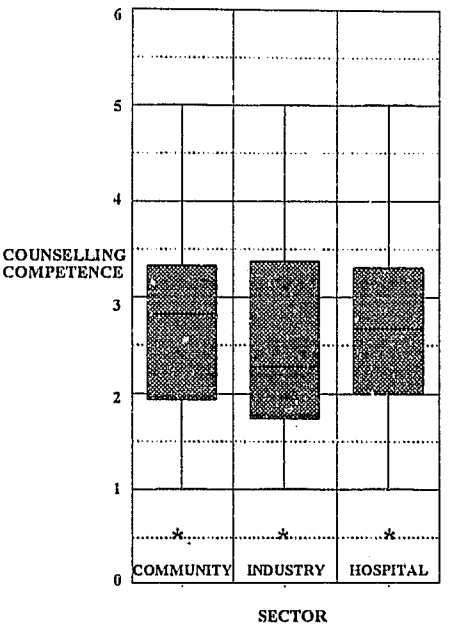
for each plot. Pharmacist's opinions range from no competence to extremely competent in counselling and yet the mean competence in counselling activities for community pharmacy is 2.82, industrial pharmacy is 2.57 and hospital pharmacy is 2.70. The average pharmacist therefore considers themselves as 'fairly competent' to 'competent' in counselling activities. These profiles of competence between the three sectors are similar to those in management and dispensing and manufacturing activities, which are shown in Figure 4.2.1.1 (b) and Figure 4.2.4.1 (b) respectively.

Analysis of figure 4.2.7.1 (c) shows that the I-C gap is larger for community ($\bar{x}$ = 1.38) and hospital pharmacists ($\bar{x}$ = 1.18), than it is for industry ($\bar{x}$ = 0.57). This profile is similar to that seen in figure 4.2.5.1 (a). Industrial pharmacists do show a wider range of opinions regarding the I-C difference. They are therefore divided on the importance of counselling and communication in the workplace, and their competency in this area. This is shown in the diagram by the fact that more than 25 % of industrial pharmacists rate themselves as over-trained. The high values obtained in the I-C difference box-and-whisker plots indicates that there is a large difference between the pharmacists perceived importance of the activity and the pharmacists perceived competence in the activity. Also of interest is that this profile is different to that achieved in management (Figure 4.2.1.1 (c)) and in dispensing and manufacturing activities (Figure 4.2.4.1 (c)). The past pharmacy curriculum seems to have better met the needs of industrial pharmacists than community or hospital pharmacists.

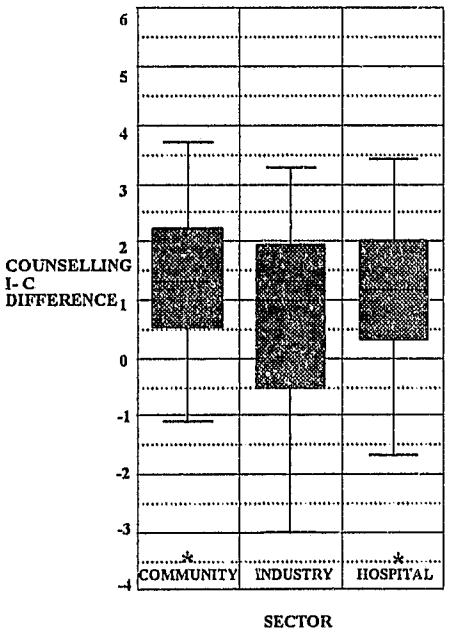
Figure 4.2.7.1 (d) compares the amount of time pharmacists spend in counselling activities. Community pharmacists ($\bar{x}$ = 26.34) spend significantly more time in counselling than either industrial ($\bar{x}$ = 5.22) or hospital pharmacists ($\bar{x}$ = 12.16). Generally industrial pharmacists seemed to spend very little time counselling. In fact nearly all industrial pharmacists spend between zero and 10 % of the day on counselling. It is surprising that hospital pharmacists spend so little time counselling as they spend a similar amount of time to community pharmacists involved in dispensing and manufacturing activities. This may be due to the 'pressure' brought to bear on over-worked pharmacists to dispense to large queues of patients, or hospital pharmacists might not actually be doing much patient dispensing, instead they are involved in, for example, ward stock up. If this is the case is would also have a detrimental effect on the implication of pharmaceutical care in a hospital environment.



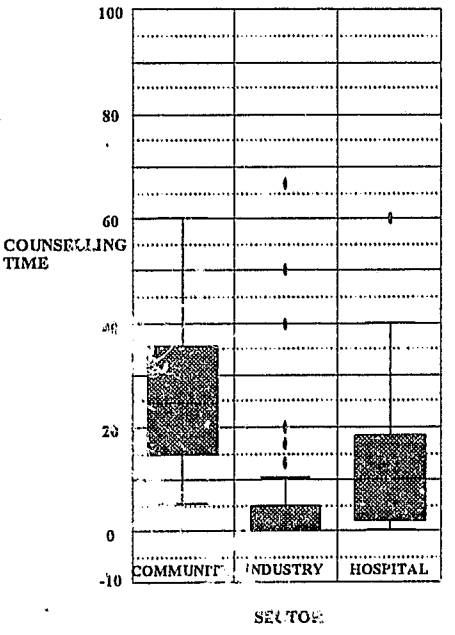
(a) Importance



(b) Competence



(c) I-C Difference



(d) Time

Figure 4.2.7.1 Box-and-Whisker plots of counselling activities, (a) importance, (b) competence, (c) I-C difference and (d) time versus sector. (There is no significant difference between those plots marked with an asterisk).

4.2.8 Counselling correlation matrix plots

Figure 4.2.8.1 shows the relationship between importance, competence, I-C difference and time for counselling according to the various sectors (including a 'general' pharmacy category).

When considering figure 4.2.8.1 (a) it can be seen that as the importance of counselling and the communication of medical information increases, the I-C gap increases. Of particular significance is the negative correlation between importance and time. It would seem that as the importance of counselling increases, community pharmacists spend less time counselling. Another possibility is that while the pharmacists do become more aware of the importance of counselling, they are incapable of spending more time in counselling, due to the necessity of spending sufficient time on management and especially dispensing and manufacturing related activities.

Figure 4.2.8.1 (b) shows that as industrial pharmacists become more aware of the importance of counselling and communication, that they spend more time on these activities. The negative correlation between the perceived competence ratings of industrial pharmacists and their corresponding I-C difference occurs because although their competence level at graduation has not changed, the perceived importance of counselling activities has increased since they graduated, resulting in an increasing I-C difference over the years.

According to figure 4.2.8.1 (c) as the hospital pharmacist becomes more aware of the importance of counselling activities, they spend a greater proportion of their time involved in counselling. As has already been mentioned, both community and hospital pharmacists spend a similar amount of time in dispensing and manufacturing activities, and yet community pharmacists spend a significantly greater amount of time on counselling activities.

In general, figure 4.2.8.1 (d) shows that as the importance of the activity increases, the I-C gap widens. But as the pharmacists perception of the ir unselling increases,

	Importance	Competence	I-C Difference	Time
Importance		+ 0.3459	+ 0.0035	− 0.0246
Competence	+ 0.3459		− 0.0000	+ 0.9115
I-C Difference	+ 0.0035	− 0.0000		+ 0.2167
Time	− 0.0246	+ 0.9115	+ 0.2167	

(a) Community

	Importance	Competence	I-C Difference	Time
Importance		− 0.1695	+ 0.0000	+ 0.0926
Competence	− 0.1695		− 0.0000	− 0.6062
I-C Difference	+ 0.0000	− 0.0000		+ 0.0728
Time	+ 0.0926	− 0.6062	+ 0.0728	

(b) Industry

	Importance	Competence	I-C Difference	Time
Importance		+ 0.0500	+ 0.0001	+ 0.2066
Competence	+ 0.0500		− 0.0000	+ 0.0476
I-C Difference	+ 0.0001	− 0.0000		− 0.4061
Time	+ 0.2066	+ 0.0476	− 0.4061	

(c) Hospital

	Importance	Competence	I-C Difference	Time
Importance		+ 0.5074	+ 0.0000	+ 0.0079
Competence	+ 0.5074		− 0.0000	+ 0.2431
I-C Difference	+ 0.0000	− 0.0000		+ 0.1773
Time	+ 0.0079	+ 0.2431	+ 0.1773	

(d) General

Figure 4.2.8.1 Correlation matrix plots of counselling importance, competence, I-C difference and time for, (a) community, (b) industry, (c) hospital, and (d) general pharmacy.

they spend an increasing amount of time performing the activity. Therefore, to increase the amount of counselling done by pharmacists it would be necessary to increase the pharmacists realisation of the importance of the activity using, for example, continuing education.

4.2.9 Mean values for importance, competence and I-C difference of counselling activities for each pharmacy sector

Table 4.2.9.1 is a summary of the counselling activities section of the survey. It provides the mean value of the respondents rating $\pm$ the standard deviation of the values.

Counselling of patients and medical staff on prescribed medicines are regarded as the most important activity by community and hospital pharmacists (4.708 $\pm$ 0.582 and 4.321 $\pm$ 0.974 respectively). Industrial pharmacists consider the provision of drug information to prescribers as the most important counselling activity (3.694 $\pm$ 1.283). These differences in opinion as to what type of counselling activity is more important, clearly demonstrates the differences between the community and hospital pharmacists patient centered role and the industrial pharmacists prescriber/medicine oriented role due to the detailing of medicines to prescribers.

The lowest importance for industrial pharmacists in a counselling activity is 3.034 $\pm$ 1.614 for the advising on the results of therapeutic drug monitoring. Community pharmacy also rates T.D.M. as the lowest of the counselling activities, with a low of 3.828 $\pm$ 1.104. The lowest counselling importance for hospital pharmacists is for health care counselling (3.268 $\pm$ 1.379).

The highest competence in a counselling activity is 3.553 $\pm$ 1.316 for community pharmacists in over the counter (O.T.C.) counselling, with drug counselling rated as the second highest. The highest competence in a counselling activity for hospital pharmacists is 3.439 $\pm$ 1.181 in drug counselling, while the highest competence for industrial pharmacists is 3.259 $\pm$ 1.148 in O.T.C. counselling.

Table 4.2.9.1

Mean values for importance, competence and I-C difference of counselling activities for each pharmacy sector

COUNSELLING ACTIVITIES	Mean Rating ± S.D.		
	COMMUNITY	HOSPITAL	INDUSTRY
DRUG COUNSELLING			
IMPORTANCE	4.708 ± 0.582 *	4.321 ± 0.974 *	3.615 ± 1.498
COMPETENCE	3.532 ± 1.213 *	3.439 ± 1.181 *	3.211 ± 1.098 *
I-C DIFFERENCE	1.192 ± 1.296 *	0.875 ± 1.453 *♯	0.474 ± 1.983 ♯
O.T.C. COUNSELLING			
IMPORTANCE	4.625 ± 0.606	3.875 ± 1.223	3.378 ± 1.277
COMPETENCE	3.553 ± 1.316 *	3.217 ± 1.315 *	3.259 ± 1.148 *
I-C DIFFERENCE	1.085 ± 1.412 *	0.615 ± 1.648 *♯	-0.027 ± 1.554 ♯
DIAGNOSTIC TEST COUNSELLING			
IMPORTANCE	4.000 ± 1.113 *	3.372 ± 1.254♯	3.621 ± 1.208 *♯
COMPETENCE	2.372 ± 1.398 *	2.000 ± 1.317 *	1.896 ± 1.153 *
I-C DIFFERENCE	1.610 ± 1.464 *	1.244 ± 1.714 *	1.444 ± 1.739 *
HEALTHCARE COUNSELLING			
IMPORTANCE	3.591 ± 1.226 *	3.268 ± 1.379 *	3.407 ± 1.279 *
COMPETENCE	2.047 ± 1.413 *	1.905 ± 1.186 *	1.796 ± 1.080 *
I-C DIFFERENCE	1.571 ± 1.580 *	1.216 ± 1.734 *	1.240 ± 1.763 *
SCREENING SERVICES			
IMPORTANCE	4.250 ± 1.006	3.500 ± 1.192 x	3.179 ± 1.492 x
COMPETENCE	2.275 ± 1.414 x	2.000 ± 1.296 x♯	1.468 ± 0.952♯
I-C DIFFERENCE	1.923 ± 1.458 x	0.875 ± 1.258 ♯	1.615 ± 1.835 x♯
DRUG INFORMATION			
IMPORTANCE	4.267 ± 0.963 *	4.224 ± 0.956 *	3.694 ± 1.283
COMPETENCE	3.227 ± 1.292 *	3.153 ± 1.284 *	3.115 ± 1.166 *
I-C DIFFERENCE	1.116 ± 1.451 *	1.069 ± 1.323 *	0.382 ± 1.706
T.D.M. ACTIVITIES			
IMPORTANCE	3.828 ± 1.104 *	4.000 ± 1.051 *	3.034 ± 1.614
COMPETENCE	2.364 ± 1.270 *	2.450 ± 1.300 *	1.659 ± 1.160
I-C DIFFERENCE	1.444 ± 1.528 *	1.543 ± 1.442 *	1.074 ± 1.960 *

Note: There is no significant difference between those values marked with an asterisk, or between those marked with a hash in the horizontal plane.

Both hospital and community pharmacists consider their lowest competence to be in the counselling on health care equipment, for example, nebulisers with a 1.905 ± 1.186 and a 2.047 ± 1.413 respectively. Industrial pharmacists consider themselves to be least competent in providing counselling on screening services (1.468 ± 0.952).

The greatest failing in the past pharmacy curriculum as concerns counselling activities has been for community pharmacy in screening services, with an I-C gap of 1.923 ± 1.458. It would therefore seem that the past pharmacy curriculum has not adequately prepared community pharmacists to play a role in the provision, and counselling on the results of screening tests. This would also seem to be the case for industrial pharmacists, with an I-C difference of 1.615 ± 1.835. The largest I-C difference for hospital pharmacists is 1.534 ± 1.442 in the provision of therapeutic drug monitoring and advising on the results. This would also seem to show that the past pharmacy curriculum has not adequately prepared hospital pharmacists for what would seem to be a pharmacy related work activity.

The lowest I-C difference, where the past pharmacy curriculum has best met the needs of practicing pharmacists is in O.T.C. counselling, with 1.085 ± 1.412, 0.615 ± 1.648 and -0.027 ± 1.544 for community, hospital and industrial pharmacists. The decreasing I-C difference between community, hospital and industrial pharmacists would seem to reflect each pharmacy sectors requirements. It would be expected that community pharmacists would have a greater I-C difference than hospital pharmacists. Greater use is made of O.T.C. counselling in community pharmacy than in either hospital or industrial settings.

Table 4.2.9.2 shows the counselling activities I-C differences for each sector of pharmacy ranked from highest to lowest.

Table 4.2.9.2

Mean I-C difference for counselling activities, ranked from largest to smallest, for each sector of pharmacy

COMMUNTY		HOSPITAL		INDUSTRY	
MANAGEMENT ACTIVITIES	MEAN RATING ± S.D.	MANAGEMENT ACTIVITIES	MEAN RATING ± S.D.	MANAGEMENT ACTIVITIES	MEAN RATING ± S.D.
SCREENING SERVICES	1.923 ± 1.458	T.D.M. ACTIVITIES	1.543 ± 1.442	SCREENING SERVICES	1.615 ± 1.835
DIAGNOSTIC TEST	1.610 ± 1.464	DIAGNOSTIC TEST	1.244 ± 1.714	DIAGNOSTIC TEST	1.444 ± 1.739
HEALTH CARE COUNSELLING	1.571 ± 1.580	HEALTH CARE COUNSELLING	1.216 ± 1.734	HEALTH CARE COUNSELLING	1.240 ± 1.763
T.D.M. ACTIVITIES	1.444 ± 1.528	DRUG INFORMATION	1.069 ± 1.323	T.D.M. ACTIVITIES	1.074 ± 1.960
DRUG COUNSELLING	1.192 ± 1.296	SCREENING SERVICES	0.875 ± 1.258	DRUG COUNSELLING	0.474 ± 1.983
DRUG INFORMATION	1.116 ± 1.451	DRUG COUNSELLING	0.875 ± 1.453	DRUG INFORMATION	0.382 ± 1.706
O.T.C. COUNSELLING	1.085 ± 1.412	O.T.C. COUNSELLING	0.615 ± 1.648	O.T.C. COUNSELLING	-0.027 ± 1.554

The I-C difference in community pharmacy for counselling activities are all high. The past pharmacy curriculum seems to have neglected to emphasise the new patient-oriented pharmacy role, therefore leading to this perceived deficiency in the curriculum. The I-C differences for hospital pharmacists are lower than for community pharmacists. However, it is only in industry, that the past pharmacy curriculum seems to have had some success in meeting pharmacists needs. Screening, diagnostic testing, health care and T.D.M. activities still require attention for industrial pharmacists. One obvious reason for the presumed

'success' of the past pharmacy curriculum in the pharmacy industry sector is that industrial pharmacists have a lower mean importance for various counselling activities, while indicating a similar competence to community and hospital pharmacists.

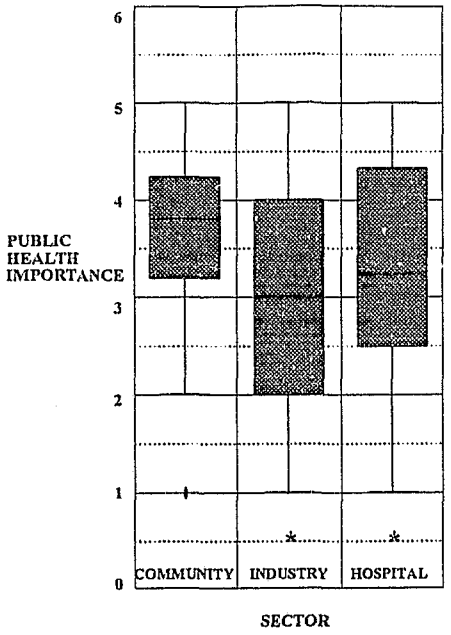
4.2.10 Box-and-Whisker plots for public health

Figure 4.2.10.1 shows the box-and-whisker plots from the results of the public health sector values.

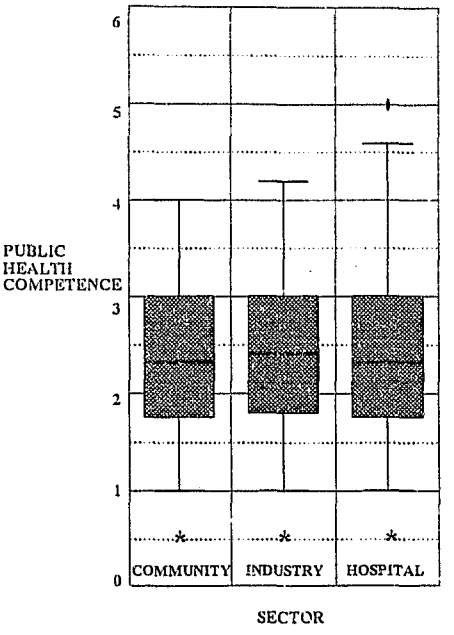
Figure 4.2.10.1 (a) shows that community pharmacists ($\bar{x}$ = 3.75) rate public health activities as fairly important. Both hospital ($\bar{x}$ = 3.25) and industry ($\bar{x}$ = 2.95) rate these activities as significantly less important. The smallest variation in opinions regarding public health importance is by community pharmacists. They therefore have a greater consensus of opinion regarding the importance of public health related activities. There is only one pharmacist who rates the importance of public health activities as 'not important'.

Figure 4.2.10.1 (b) indicates that all three sectors of pharmacy rate their competence in public health activities as fairly low. Hospital pharmacists ($\bar{x}$ = 2.47) rate their competence as better than either industry ($\bar{x}$ = 2.44) or community pharmacy ($\bar{x}$ = 2.43). However, this difference is not significant. The range of pharmacist opinions in this area is largest for hospital pharmacy and smallest for community pharmacy.

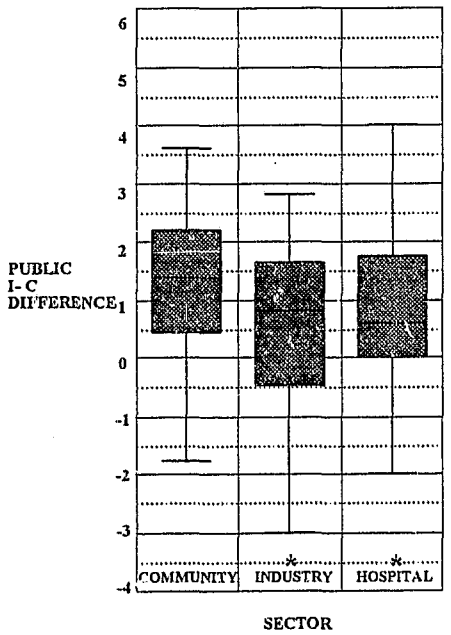
Figure 4.2.10.1 (c) shows that the widest difference regarding the importance of public health activities versus competence in the activities is for community pharmacy ($\bar{x}$ = 1.36). Some hospital pharmacists ($\bar{x}$ = 0.76) indicate that they are fairly incompetent, while rating the importance of the activity very high. The box and whisker plot also shows the greatest over-training of a pharmacy sector in all of the four major function activities. Slightly more than 25 % of industrial pharmacists ($\bar{x}$ = 0.46) and approximately 25 % of hospital pharmacists indicate that they are over-trained for those activities that constitute a public health function. Interestingly, hospital pharmacists show the widest range concerning the I-C difference. The past pharmacy curriculum has therefore had more success in meeting the



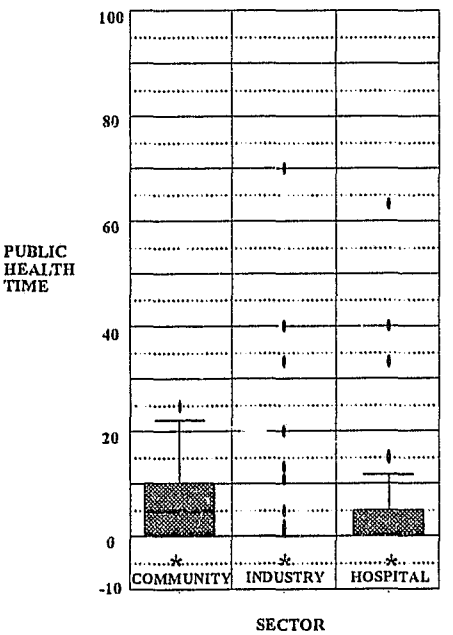
(a) Importance



(b) Competence



(c) I-C Difference



(d) Time

Figure 4.2.10.1 Box-and-Whisker plots of public health activities, (a) importance, (b) competence, (c) I-C difference, and (d) time versus sector. (There is no significant difference between those plots marked with an asterisk).

needs of industrial and hospital pharmacists, than community pharmacists. A future curriculum will therefore need to pay particular attention to better meeting the needs of community pharmacists.

Figure 4.2.10.1 (d) indicates that community pharmacists spend an average of 5.28 % of their working day on public health related activities. 75 % of community pharmacists spent less than 10 % of their day on public health related activities. Industrial pharmacists spend on average 2.95 % of their working day on public health related activities. There are though, a number of pharmacists who spend a greater amount of time on these activities, including one who spends 70 % of the day on these activities, resulting in a mean value of 2.95. Hospital pharmacists spend an average of 4.66 % of the day in this area. In fact, nearly all hospital pharmacists spend less than 10 % of the day on public health related activities. Once again, as with industrial pharmacists, there are a number of pharmacists who spend more time in these activities than the average, including one pharmacist who spends 65 % of the day on public health related activities.

4.2.11 Public health correlation matrix plots

Figure 4.2.11.1 shows the relationship between importance, competence, I-C difference and time for public health according to the various sectors (including a 'general' pharmacy category).

When considering figure 4.2.11.1 (a) it can be seen that the pharmacist who is competent in public health related activities will spend time performing these activities. Thus the means to increase community pharmacy involvement in public health related activities is to ensure that they are sufficiently competent and confident in their skills and knowledge upon graduation.

Analysis of figure 4.2.11.1 (b) shows that in industrial pharmacy, as the importance of the activity increases, the I-C difference increases. To decrease the I-C gap, the pharmacist

	Importance	Competence	I-C Difference	Time
Importance		+ 0.8983	+ 0.0000	+ 0.1031
Competence	+ 0.8983		− 0.0000	+ 0.0039
I-C Difference	+ 0.0000	− 0.0000		− 0.3228
Time	+ 0.1031	+ 0.0039	− 0.3228	

(a) Community

	Importance	Competence	I-C Difference	Time
Importance		− 0.8602	+ 0.0000	+ 0.3642
Competence	− 0.8602		− 0.0000	+ 0.8662
I-C Difference	+ 0.0000	− 0.0000		+ 0.2913
Time	+ 0.3642	+ 0.8662	+ 0.2913	

(b) Industry

	Importance	Competence	I-C Difference	Time
Importance		+ 0.0041	+ 0.0000	+ 0.1728
Competence	+ 0.0041		− 0.0007	+ 0.7794
I-C Difference	+ 0.0000	− 0.0007		+ 0.2481
Time	+ 0.1728	+ 0.7794	+ 0.2481	

(c) Hospital

	Importance	Competence	I-C Difference	Time
Importance		+ 0.0744	+ 0.0000	+ 0.0306
Competence	+ 0.0744		− 0.0000	+ 0.1715
I-C Difference	+ 0.0000	− 0.0000		+ 0.1559
Time	+ 0.0306	+ 0.1715	+ 0.1559	

(d) General

Figure 4.2.11.1 Correlation matrix plots of public health importance, competence, I-C difference and time for, (a) community, (b) industry, (c) hospital, and (d) general pharmacy.

must become more competent in public health activities. This can be achieved by a better curriculum, which is better suited to the practice needs of pharmacists.

Figure 4.2.11.1 (c) indicates that as the importance of public health activities increases, the I-C difference increases.

Figure 4.2.11.1 (d) shows that the I-C gap increases, as the activity becomes more important. As the pharmacist becomes aware of the importance of public health related activities, they spend more time performing these activities. It is therefore important to educate the pharmacist about the importance of public health activities and their role in primary health care, in order to motivate the pharmacist to spend more time in performing these activities.

What has not yet been mentioned in any of the correlation matrix plots is the correlation between importance and competence. The respondents were specifically asked in the questionnaire to give their competence in the various activities upon graduation, and the importance of the activities in their present day work. There are an equal number of positive correlations and non significant correlations between importance and competence. This is what is known as a 'nonsense correlation', as competence at the time of graduation cannot increase as the importance of the activity in the present day work increases. This is also proven by the fact that there is always a positive correlation between importance and I-C difference. Therefore indicating that as the importance of the present day activity increased, the difference between the importance of the activity and the competence at graduation also increases. It is further proven by the negative correlation between competence and I-C difference.

4.2.12 Mean values for importance, competence, I-C difference of public health activities for each pharmacy sector

Community pharmacists rate the giving of advice on health related issues as the most important public health activity (4.205 ± 0.930). Industrial pharmacists also rate health related advice as their most important public health activity (3.290 ± 1.322). Hospital

pharmacists rate the provision of poison and drug related information as their most important public health activity (3.540 ± 1.265).

Table 4.2.12.1

Mean values for importance, competence and I-C difference of public health activities for each pharmacy sector

PUBLIC HEALTH ACTIVITIES	Mean Rating ± S.D.		
	Community	Hospital	Industry
POISON AND DRUG INFORMATION			
IMPORTANCE	3.884 ± 1.199 *	3.540 ± 1.265 *#	3.146 ± 1.429 #
COMPETENCE	2.781 ± 1.194 *	2.880 ± 1.240 *	2.772 ± 1.181 *
I-C DIFFERENCE	1.122 ± 1.764 *	0.646 ± 1.422 *#	0.383 ± 1.764 #
DISEASE AND INJURY ADVICE			
IMPORTANCE	4.068 ± 1.021	3.244 ± 1.464 *	3.205 ± 1.380 *
COMPETENCE	2.814 ± 1.296 *	2.447 ± 1.230 *	2.759 ± 1.081 *
I-C DIFFERENCE	1.286 ± 1.566 *	0.705 ± 1.519 *#	0.316 ± 1.646 #
VETERINARY MEDICINE ADVICE			
IMPORTANCE	2.917 ± 1.251 *	2.000 ± 1.155 #	2.625 ± 1.279 x#
COMPETENCE	1.611 ± 0.766 *	1.546 ± 1.057 *	1.489 ± 0.869 *
I-C DIFFERENCE	1.324 ± 1.365 *	0.417 ± 0.515 *	1.087 ± 1.730 *
PHARMACY HEALTH MATTERS			
IMPORTANCE	3.543 ± 1.291 *	3.276 ± 1.386 *	3.091 ± 1.156 *
COMPETENCE	2.000 ± 1.111 *	2.719 ± 1.198	2.122 ± 1.073 *
I-C DIFFERENCE	1.606 ± 1.600 *	0.417 ± 1.381 #	0.871 ± 1.455 *#
HEALTH RELATED ADVICE			
IMPORTANCE	4.205 ± 0.930	3.475 ± 1.301 *	3.290 ± 1.322 *
COMPETENCE	2.698 ± 1.301 *	2.558 ± 1.119 *#	2.160 ± 1.057 #
I-C DIFFERENCE	1.548 ± 1.347 *	0.763 ± 1.403 #	1.067 ± 1.760 *#

Note: There is no significant difference between those values marked with an asterisk, or between those marked with a hash in the horizontal plane.

All three sectors of pharmacy consider the giving of advice on veterinary medicines as the least important of the public health activities (2.917 ± 1.251 for community pharmacy, 2.625 ± 1.279 for industrial pharmacy and 2.000 ± 1.155 for hospital pharmacy).

Hospital and industrial pharmacists rate their poison and drug information competence to be their highest competence in the public health activities; 2.880 ± 1.240 and 2.772 ± 1.181 respectively. Community pharmacists consider their highest competence to be in the provision of advice on injuries and the management of disease states (2.814 ± 1.296).

All three pharmacy sectors rate their competence in advising on veterinary medicines as the lowest of their competencies in public health activities; 1.611 ± 0.766 for community pharmacy, 1.546 ± 1.057 for hospital pharmacy and 1.489 ± 0.869 for industrial pharmacy. The largest I-C difference for community pharmacists in public health activities is for pharmacy health matters (1.606 ± 1.600), that is the education of consumers on drug abuse and so forth. The largest I-C difference for hospital pharmacists is 0.763 ± 1.403 for health related advice. The largest I-C difference for industry is 1.087 ± 1.730 for veterinary medicine.

The smallest I-C difference for community pharmacists is 1.122 ± 1.764 in poison and drug information. This is still a large I-C difference and therefore indicates that the pharmacy curriculum has not adequately prepared community pharmacists for public health activities. The smallest I-C difference for hospital pharmacists is 0.417 ± 0.515 and 0.417 ± 1.381 for veterinary medicine and pharmacy health related matters respectively. The smallest I-C difference for industrial pharmacists is 0.316 ± 1.646 in disease and injury advice.

Table 4.2.12.2 ranks the I-C difference from largest to smallest for the three sectors of pharmacy.

The past pharmacy curriculum has not been very effective for community pharmacy as far as public health activities are concerned. The smallest I-C difference is 1.122 ± 1.764 for poison and drug information, while the largest is 1.606 ± 1.600 for pharmacy health

matters. Hospital pharmacist's needs seem to have been better catered for under the past pharmacy curriculum than either community and industrial pharmacists, with the largest I-C difference for hospital pharmacists being 0.763 ± 1.403 for health related advice in the public health activities. For industry, veterinary medicine, health related advice and pharmacy health matters seem to particularly require attention.

Table 4.2.12.2

Mean I-C difference for public health activities, ranked from largest to smallest, for each sector of pharmacy

COMMUNITY		HOSPITAL		INDUSTRY	
MANAGEMENT ACTIVITIES	MEAN RATING ± S.D.	MANAGEMENT ACTIVITIES	MEAN RATING ± S.D.	MANAGEMENT ACTIVITIES	MEAN RATING ± S.D.
PHARMACY HEALTH MATTERS	1.606 ± 1.600	HEALTH RELATED ADVICE	0.763 ± 1.403	VETERINARY MEDICINE ADVICE	1.087 ± 1.730
HEALTH RELATED ADVICE	1.548 ± 1.347	DISEASE AND INJURY ADVICE	0.705 ± 1.519	HEALTH RELATED ADVICE	1.067 ± 1.760
VETERINARY MEDICINE ADVICE	1.324 ± 1.365	POISON AND DRUG INFORMATION	0.646 ± 1.422	PHARMACY HEALTH MATTERS	0.871 ± 1.455
DISEASE AND INJURY ADVICE	1.286 ± 1.566	VETERINARY MEDICINE ADVICE	0.417 ± 0.515	POISON AND DRUG INFORMATION	0.3831 ± 1.764
POISON AND DRUG INFORMATION	1.122 ± 1.764	PHARMACY HEALTH MATTERS	0.417 ± 1.381	DISEASE AND INJURY ADVICE	0.316 ± 1.646

4.2.13 Subject contribution to pharmacist competence

Figure 4.2.13.1 shows the community, hospital and industrial pharmacists educational need profile with reference to current subjects offered in pharmacy. There are a number of points of interest. Firstly, all responses for the subjects vary in the range of 'fairly important' to 'very important'. Secondly, that the hospital and community educational need profiles are fairly similar, as they mirror each other in nearly all subjects, although the degree of importance for various subjects may differ slightly. For instance, First Aid/E.M.A. is rated as more important by community pharmacists, than by hospital pharmacists, while Microbiology is considered more important by hospital pharmacists.

Table 4.2.13.1 shows the ranking of subjects by pharmacists according to the perceived value that each subject area made to their competence to perform their full-time work. Of immediate interest is that Biochemistry occupies the lowest rank for all three pharmacy sectors. Pharmacology is ranked highly by community, hospital and industrial pharmacy. Pharmacotherapy has a greater clinical orientation and therefore finds greater favour for community and hospital, where it is of greater use than in industrial pharmacy. Pharmaceutics is ranked first by industry and eighth and ninth by hospital and community pharmacists respectively. For community pharmacy this is to be expected as the subject area has both a clinical and an industrial orientation. It is surprising that it is not higher in hospital, but this is possibly because the majority of hospital pharmacists are not involved in therapeutic drug monitoring and so forth. Pharmaceutical Preparations and Dispensing are ranked higher in community and hospital than in industry, as industry is more concerned with the managerial and science aspects than in small scale physical preparation. First Aid/E.M.A. is used in community pharmacy for first aid and pharmacist advice on minor health problems. It does not find a high importance ranking for hospital (where Doctors and Nurses are available) or industry (no first aid is required for the pharmacists day-to-day activities). Pharmacy Practice/Forensic Pharmacy is ranked fairly high for all pharmacy sectors, but highest in industry. This is fairly unusual as one would expect Forensic Pharmacy to be more prominent in the daily dealings and workings of community and hospital pharmacists.

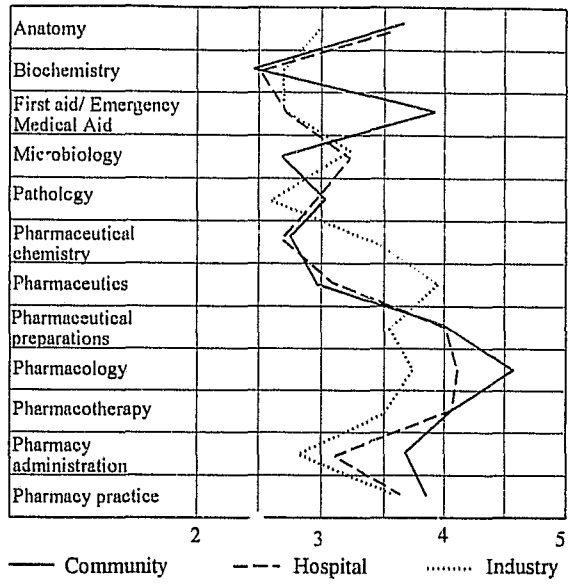


Figure 4.2.13.1 Educational need profile for community, hospital and industrial pharmacy

Table 4.2.13.1

Ranking of subjects according to pharmacy sector

	Community	Hospital	Industry
1	Pharmacology	Pharmacology	Pharmaceutics
2	Pharmacotherapy	Pharmacotherapy	Pharmacology
3	Pharmaceutical preparations	Pharmaceutical preparations	Pharmacy practice/ Forensic pharmacy
4	First aid/ E.M.A	Pharmacy practice/ Forensic pharmacy	Pharmaceutical preparations
5	Pharmacy practice/ Forensic pharmacy	Anatomy/ Physiology	Pharmacotherapy
6	Pharmacy administration	Pharmacy administration	Pharmaceutical chemistry
7	Anatomy/ Physiology	Microbiology	Microbiology
8	Pathology	Pharmaceutics	Anatomy/ Physiology
9	Pharmaceutics	Pathology	Pathology
10	Pharmaceutical chemistry	First aid/ E.M.A	Pharmacy administration
11	Microbiology	Pharmaceutical chemistry	First aid/ E.M.A
12	Biochemistry	Biochemistry	Biochemistry

4.3 Curriculum models by stepwise regression

In part four of the questionnaire the respondent was asked to rate the contribution that each subject area made to their competence to practice in full-time work. It is assumed that the pharmacist's competence in practice is engendered by those subjects to which they have been exposed to in the pharmacy curriculum. Therefore, by using stepwise regression, an educational model can be calculated that explains which subjects were significantly responsible for the pharmacists competence when they graduated. Here the dependent variable is the pharmacists overall competence to perform and the subject areas are the independent variables. All data used was uniformly distributed. The plots of residuals versus their predicted values were random. There was no trend or pattern discernable in any of the plots. Therefore, the models proposed are accurate.

4.3.1 Community curriculum model

Table 4.3.1.1 shows the curriculum model calculated for community pharmacy. The subjects included in the model are, First aid/E.M.A., Pathology, Pharmaceutical Chemistry, Pharmaceutical Preparations and Dispensing, Pharmacotherapy and Pharmacy Practice/Forensic Pharmacy.

The subjects excluded from this model are, Anatomy/Physiology, Biochemistry, Microbiology, Pharmaceutics, Pharmacology and Pharmacy Administration.

The R^2 value of 0.28276 indicates that 28.28 % of community pharmacists competence can be explained by the proposed model. What is of concern is why Pharmacology should have been excluded from the model. The values given by community pharmacy respondents for the Pharmacology subject area and their mean competence were then investigated. It was found that some of the pharmacists had a low mean competence, while giving pharmacology a high importance rating. The mathematical model therefore rejected Pharmacology as the pharmacists had a varied and wide opinion regarding its contribution to their competence.

The other possibility is that these pharmacists deliberately answered Pharmacology as high because they felt it was expected of them as pharmacists to answer that they do require Pharmacology as community pharmacists.

Table 4.3.1.1

Stepwise regression analysis model for community pharmacy

Selection: Backward				F-to-enter:	.10
Control: Automatic				F-to-remove:	.10
R-Squared (R^2): .28276	Adjusted:	-.07586	MSE: 1.05508	D.F.: 12	
Variables in Model	Coefficient	F-Remove	Variables Not in Model	P.corr	F-Enter
First aid/E.M.A.	0.27444	.6732	Anatomy/Physiology	.0387	.0165
Pathology	0.19480	.6828	Biochemistry	.0062	.0004
Pharmaceutical Chemistry	0.14709	.3243	Microbiology	.0497	.0273
Pharmaceutical Preparations	-0.24169	.4447	Pharmaceutics	.0378	.0158
Pharmacotherapy	-0.40648	1.2146	Pharmacology	.0098	.0011
Pharmacy Practice	0.22937	.5388	Pharmacy Administration	.0181	.0036

The reason for the model being so poor in explaining the pharmacists competence as a result of the subject areas in the pharmacy curriculum could be due to the following reasons:

1) With the upheaval in community pharmacy (the new pricing structure, new ownership laws and the introduction of pharmaceutical care and so forth), community pharmacists vary widely in their opinions of what competencies are actually needed for practice. In comparison, the present changes do not significantly affect hospital and industrial pharmacy.

2) The setting of community pharmacy varies widely from clinics and small pharmacies to large chains.

The result is that community pharmacists place completely different demands on the pharmacy curriculum. Because of the above mentioned points, the curriculum model appears to be more accurate for industrial and hospital pharmacy sectors. In these sectors most respondents agree a little more about the contribution of the subjects to their competence resulting in a better curriculum model.

4.3.2 Hospital curriculum model

Table 4.3.2.1 shows the curriculum model calculated for hospital pharmacy. The subjects included in the model are, Anatomy/Physiology, Biochemistry, Microbiology, Pathology, Pharmaceutical Chemistry, Pharmaceutical Preparations and Dispensing, Pharmacology, Pharmacotherapy and Pharmacy Practice/Forensic Pharmacy.

The subjects which were excluded from the model are, First aid/E.M.A., Pharmaceutics, and Pharmacy Administration.

Table 4.3.2.1

Stepwise regression analysis model for hospital pharmacy

Selection: Backward				F-to-enter:	.10
Control: Automatic				F-to-remove:	.10
R-Squared (R^2): .68664	Adjusted: .37328		MSE: 0.52243	D.F.: 9	
Variables in Model	Coefficient	F-Remove	Variables Not in Model	P.corr	F-Enter
Anatomy/Physiology	-0.75530	8.2426	First aid/E.M.A.	.0015	.0000
Biochemistry	0.63117	4.8325	Pharmaceutics	.0717	.0413
Microbiology	0.88529	7.0011	Pharmacy Administration	.0714	.0409
Pathology	-0.67988	4.7648			
Pharmaceutical Chemistry	-0.25307	2.0553			
Pharmaceutical Preparations	0.53352	1.7218			
Pharmacology	-0.90340	3.9785			
Pharmacotherapy	0.56328	2.0434			
Pharmacy Practice	-0.41653	.9497			

The R^2 value of 0.68664 indicates that 68.66 % of the pharmacists competence can be explained by the proposed model.

4.3.3 Industrial curriculum model

Table 4.3.3.1 shows the curriculum model calculated for industrial pharmacy. The subjects included in the model are, Anatomy/Physiology, First aid/E.M.A., Microbiology, Pharmaceutical Chemistry, Pharmaceutics, Pharmaceutical Preparations and Dispensing, Pharmacotherapy and Pharmacy Practice/Forensic Pharmacy.

The subjects which were excluded are, Biochemistry, Pathology, Pharmacology and Pharmacy Administration.

The R^2 value of 0.55007 indicates that 55.01 % of the pharmacists competence can be explained by the proposed model.

Table 4.3.3.1

Stepwise regression analysis model for industrial pharmacy

Selection: Backward				F-to-enter:	.10
Control: Automatic				F-to-remove:	.10
R-Squared (R^2): .55007	Adjusted: .40010		MSE: 0.438598	D.F.: 24	
Variables in Model	Coefficient	F-Remove	Variables Not in Model	P.corr	F-Enter
Anatomy/Physiology	0.28340	4.7666	Biochemistry	.0532	.0653
First aid/E.M.A.	-0.26952	3.9101	Pathology	.0475	.0521
Microbiology	0.36791	5.9105	Pharmacology	.0505	.0588
Pharmaceutical Chemistry	0.11655	.7556	Pharmacy Administration	.0147	.0050
Pharmaceutics	0.18017	1.8206			
Pharmaceutical Preparations	0.15654	1.6094			
Pharmacotherapy	-0.17815	2.7104			
Pharmacy Practice	-0.05510	.2945			

4.3.4 General pharmacy curriculum model

Table 4.3.4.1 shows the curriculum model calculated for all pharmacists regardless of sector. The subjects included in the model are, Biochemistry, First aid/E.M.A., Microbiology, Pharmaceutical Chemistry, Pharmaceutics, Pharmacology, Pharmacotherapy and Pharmacy Administration.

The subjects excluded from the model are, Anatomy/Physiology, Pathology, Pharmaceutical Preparations and Dispensing, and Pharmacy Practice/Forensic Pharmacy.

Table 4.3.4.1

Stepwise regression analysis model for general pharmacy

Selection: Backward				F-to-enter:	.10
Control: Automatic				F-to-remove:	.10
R-Squared (R^2): .22252	Adjusted: .12220		MSE: 0.805313	D.F.: 62	
Variables in Model	Coefficient	F-Remove	Variables Not in Model	P.corr	F-Enter
Biochemistry	0.18522	2.0003	Anatomy/Physiology	.0275	.0460
First aid/E.M.A.	0.05843	.3710	Pathology	.0203	.0250
Microbiology	0.03412	.1016	Pharmaceutical Preparations	.0286	.0500
Pharmaceutical Chemistry	0.12967	1.2773	Pharmacy Practice	.0001	.0000
Pharmaceutics	-0.14840	1.6072			
Pharmacology	0.21558	1.3597			
Pharmacotherapy	-0.16829	1.0007			
Pharmacy Administration	0.19960	4.8271			

The R^2 value of 0.22252 indicates that 22.25 % of the competence of the average pharmacist can be explained by means of the curriculum.

This model is affected by two components;

1) the community pharmacists are included and disrupt the model, and

2) the requirements of the three pharmacy sectors are different. The model is therefore expected to be poor as it is not tailored for any specific sector, but rather tried to be all things for every sector. This therefore does not completely satisfy any sector.

It is important to note that the subjects that have been excluded from the curriculum model should not necessarily be excluded from the curriculum. These subjects may be necessary to ensure an understanding of the other subjects that have been included in the model. Instead the size of the course or the depth of material covered by these courses can be reduced.

4.4 Curriculum analysis factor

The curriculum analysis factor (CAF) is a factor devised by the author to weight the curriculum according to the mean I-C difference, amount of time spent performing the major function, and the percentage of registered pharmacists working in the specific pharmacy sector. The CAF is therefore the product of the mean I-C difference, the fraction of time spent on the major function and the percentage of pharmacists registered in that pharmacy sector. See equation 3.2.7.5. Table 4.4.1 shows the curriculum analysis factor by the major function for each pharmacy sector. That is management, dispensing and manufacturing, counselling and public health activities. Those sectors with a curriculum analysis factor greater than five, deserve to be given particular attention in the pharmacy curriculum. Of particular importance is the fact that community pharmacy scores the highest curriculum analysis factor for management, dispensing and manufacturing, counselling and public health activities. This is predominantly due to the fact that the majority of registered pharmacists (53.08%) practice in the community pharmacy sector. Between them industrial (5.69%) and hospital (15.80%) pharmacists form only 21.49% of all registered pharmacists. Community pharmacists also have the highest I-C difference and spend the most time, in counselling and public health functions when compared to industrial or hospital pharmacists. Community pharmacists also have the second highest I-C difference in the management function. Only in the dispensing and manufacturing function, do community pharmacists have the smallest I-C difference. Therefore, more emphasis must be placed on the educational needs of community pharmacists in a general curriculum. The lowest curriculum analysis factors are for industry in public health, counselling and dispensing and manufacturing activities. Hospital has the lowest curriculum analysis factor in management.

Table 4.4.1

Calculated curriculum analysis factor

FUNCTIONS OF PHARMACISTS PER SECTOR	MEAN I-C DIFFERENCE	X	FRACTION OF TIME SPENT ON THE MAJOR FUNCTION	X	PERCENTAGE OF REGISTERED PHARMACISTS	=	CURRICULUM ANALYSIS FACTOR
MANAGEMENT							
COMMUNITY	1.71		0.2515		53.08		22.8279
INDUSTRY	2.02		0.8617		5.69		9.9042
HOSPITAL	1.47		0.3689		15.80		8.5681
TOTAL	5.20		1.4821		75.57		41.3001
DISPENSING AND MANUFACTURING							
COMMUNITY	0.71		0.4345		53.08		16.3749
INDUSTRY	0.80		0.0583		5.69		0.2654
HOSPITAL	0.82		0.4631		15.80		5.9999
TOTAL	2.33		0.9559		74.57		22.6402
COUNSELLING							
COMMUNITY	1.38		0.2634		53.08		19.2942
INDUSTRY	0.57		0.0522		5.69		0.1693
HOSPITAL	1.18		0.1216		15.80		2.2671
TOTAL	3.13		0.4372		74.57		21.7306
PUBLIC HEALTH							
COMMUNITY	1.36		0.0528		53.08		3.8116
INDUSTRY	0.46		0.0295		5.69		0.0772
HOSPITAL	0.76		0.0466		15.80		0.5596
TOTAL	2.58		0.1289		74.57		4.4484

Chapter 5 Conclusion and recommendations

5.1 The past pharmacy curriculum

The past pharmacy curriculum, up to 1995, seems to have had mixed success in preparing pharmacists for present practice. All pharmacists, irrespective of their practice sector regard the importance of the major functions; management, dispensing and manufacturing, counselling, and public health, as higher than their perceived competence to perform these major functions. There are only three specific activities within the major functions where pharmacists indicate that they are over-qualified. Industrial pharmacists for O.T.C. counselling, and compounding activities, and community pharmacists for parenteral therapy. In all three cases the pharmacists have rated the importance of these activities as low in comparison to other activities. It is therefore, not so much a case of how well the curriculum has prepared the graduate for practice, but the relative importance of the activities.

The prescribed pharmacy curriculum has had its greatest failing in the teaching of management skills. This is the only function where the activities have an I-C gap greater than two. Management activities therefore, need to be addressed in the development of any future pharmacy curriculum.

While the past pharmacy curriculum has prepared pharmacists well for the older product-oriented role, it did not succeed in preparing pharmacists for the new patient-oriented role. Careful attention must therefore, be directed towards developing a curriculum which will ensure competent entry level pharmacists, who are capable of delivering pharmaceutical care. Furthermore, all three sectors of pharmacy require greater management knowledge and skills, this will also have to be included in the new pharmacy curriculum.

5.1.1 Community pharmacy

Community pharmacists needs have best been met by the past pharmacy curriculum in dispensing and manufacturing activities. As this is the function where community

pharmacists spend nearly half of their time, it is probably to be expected. However, if community pharmacists are to play a more patient-oriented role, they need to spend more time in public health and, especially, the counselling function. These functions are in fact the second and third worst prepared areas respectively, after management.

While community pharmacists do consider counselling activities to be important, they spend nearly twice as much time in dispensing and manufacturing activities as they do in counselling. This is most likely as a result of the past pharmacy curriculum, as the community pharmacists could be staying with the activities and functions which they feel most comfortable performing. To encourage more community pharmacists to become involved in pharmaceutical care, they need to feel more competent in applying the knowledge and skills required to practice pharmaceutical care. This can be achieved by redesigning the undergraduate pharmacy degree, or by implementing life-long learning for qualified pharmacists.

The activities necessary for community pharmacists to be competent in pharmaceutical care, are those areas where the past pharmacy curriculum has had the least success in preparing community pharmacists for practice. For example, patient records, screening services, diagnostic test counselling, and so forth. The past pharmacy curriculum has also failed in meeting community pharmacists requirements as far as managerial activities are concerned.

In conclusion, the past pharmacy curriculum has not prepared community pharmacists for their new patient-oriented role, as well as it has prepared them for the more traditional product-oriented role.

5.1.2 Hospital pharmacy

Hospital pharmacists needs are best met for public health activities, the major function where they spend the least amount of their time. It would therefore seem that the pharmacy curriculum can be better directed to other areas, such as management, where hospital pharmacists do spend an appreciable amount of their working day.

Hospital pharmacists have, like community pharmacists, been fairly well prepared by the past pharmacy curriculum as far as dispensing and manufacturing activities are concerned. This is similar to community pharmacy, as hospital pharmacists spend nearly 50 % of their day in dispensing and manufacturing activities.

Of concern is the finding that hospital pharmacists spend approximately 12 % of their day in counselling activities. This is less than half the amount of time that community pharmacists spend on counselling, and yet community and hospital pharmacists spend nearly an equal amount of time in dispensing and manufacturing activities. This discrepancy may be due to the fact that hospital pharmacists are more involved in dispensing to other health professionals, for example, nursing sisters. Another possible reason, is that hospital pharmacists do a major part of their dispensing to patients, but time constraints, long queues of patients and insufficient staff, result in hospital pharmacists being incapable of giving the same time commitment to their patients as community pharmacists give to theirs. If this is the case, there is likely to be serious implications to the provision and implementation of pharmaceutical care in a hospital environment.

For hospital pharmacists particular attention should be paid to personnel, financial and general management activities in the curriculum, as this is where the greatest I-C gaps occur.

In summary, the past pharmacy curriculum has best met the needs of hospital pharmacists in public health and then in dispensing and manufacturing activities. It has not adequately met the needs of hospital pharmacists in management, and counselling activities. The past pharmacy curriculum has therefore, as in community pharmacy, not fully prepared hospital pharmacists for their new patient-oriented role. Neither has it prepared hospital pharmacists for their management activities.

5.1.3 Industrial pharmacy

The past pharmacy curriculum has best met the needs of industrial pharmacists in the counselling and public health functions. This is a misdirected effort, as industrial pharmacists

spend less than 10 % of their day's activities in this major function. Industrial pharmacists greatest needs are in the management function, where they spend nearly 90 % of their working day.

The past pharmacy curriculum has had a fair amount of success in meeting industrial pharmacists needs in the dispensing and manufacturing, counselling, and public health functions. However, it is in the managerial function where industrial pharmacists spend most of their time, and it is here that the curriculum has had the least success in meeting the industrial pharmacists requirements of the curriculum.

For industrial pharmacists particular attention should be paid to general, personnel, production and purchasing management in the curriculum.

5.2 Proposed future curricula

While the curriculum models for the various pharmacy sectors do not completely explain the pharmacist's competence, they can explain more than 50 % of their competence, except in the cases of community pharmacy and general pharmacy. The percentage of pharmacists competence not accounted for by the formal pharmacy curriculum can most likely be accounted for, as life skills learnt in school or real-life situations. For example, writing, communication, etc. This does not mean, of course, that these skills should not be covered in the curriculum. An entry level graduate must have a prescribed set of skills and competencies. The only way to achieve this is to try to control to as large an extent as possible their learning activities, so as to ensure that no skill or competency is excluded. This does however, mean that some students will undergo a repeat of material or skills training that they might, to a large extent already be familiar with, or competent in. For this type of situation it would be best to be able to initially assess the students capability in various life skills and then exempt them from those sections of the curriculum that they are already competent in. This would prevent frustration on the part of the student and allow them to use this time more constructively in gaining competence in some other pharmacy

related activity. This would also correspond with the multiple entry and exit points for a new curriculum, which is mentioned in section 1.3.

5.2.1 Community pharmacy

While the curriculum model discussed in section 4.3.1 can only explain 28 % of the community pharmacists competence, it can still be used to provide guidance on what subjects or subject areas should be included in the curriculum.

The subjects to be included in a community pharmacy curriculum would include First Aid/E.M.A., Pathology, Pharmaceutical Chemistry, Pharmaceutical Preparations and Dispensing, Pharmacotherapy, Pharmacology, and Pharmacy Practice/Forensic Pharmacy. Subjects whose size and depth of material should be reduced are Anatomy/Physiology, Biochemistry, Microbiology, Pharmaceutics and Pharmacy Administration.

The reason for the poor curriculum model fit for community pharmacy is, it is believed, due to all the changes being experienced in community pharmacy. These changes include; the law governing pharmacy ownership, the shift from a product to a customer-oriented approach under pharmaceutical care and increasing pressure on the profit margins of community pharmacy. Pharmacy managers and owners have become more aware of the necessity of increasing their management skills. This has resulted in 'confusion' by the pharmacist regarding the subjects that will best suit them for their future roles in community pharmacy. Community pharmacists however, still, gave a higher importance rating for those subjects and subject areas that were applicable to community pharmacy, than those subjects and subject areas which have greater application and use in industrial pharmacy, for example, Pharmaceutics or in hospital pharmacy, for example, Microbiology. A similar orientation was observed by Kharbanda et al (1993) in a survey of community pharmacists and the subject content of the pharmacy degree.

5.2.2 Hospital pharmacy

The curriculum model discussed in section 4.3.2 can explain nearly 70 % of the pharmacists competence due to the subjects and subject areas of the past pharmacy curriculum. The subjects that should be included in a future hospital oriented curriculum are Anatomy/Physiology, Biochemistry, Microbiology, Pathology, Pharmaceutical Chemistry, Pharmaceutical Preparations and Dispensing, Pharmacology, Pharmacotherapy, and Pharmacy Practice/Forensic Pharmacy. The subjects or subject areas that need to be reduced or modified (First Aid/E.M.A., Pharmaceutics and Pharmacy Administration), are those which hospital pharmacists feel have the least application and use in a contemporary hospital pharmacy setting. A similar subject profile was obtained by Wilson et al (1993) when inquiry was conducted into the requirements that hospital pharmacists place on the pharmacy curriculum.

5.2.3 Industrial pharmacy

Stepwise regression analysis conducted on the data from the survey, could explain 55 % of the pharmacists competence, due to the subjects and subject areas to which they were exposed in the past pharmacy curriculum. The subjects or subject areas which should therefore be included in a dedicated industrial pharmacy curriculum are Anatomy/Physiology, First Aid/E.M.A., Microbiology, Pharmaceutical Chemistry, Pharmaceutics, Pharmaceutical Preparations and Dispensing, Pharmacotherapy, and Pharmacy Practice/Forensic Pharmacy.

The subjects which should either be reduced or modified so as to become more relevant for industrial pharmacists include Biochemistry, Pathology, Pharmacology and Pharmacy Administration. Industrial pharmacists have considered pharmaceutical science subjects and law as more important than typical, hospital or community pharmacy subjects. The rejection of Pharmacy Administration occurs, because industrial pharmacists have the largest I-C difference of any pharmacy sector for management. Therefore, Pharmacy Administration has inadequately prepared industrial pharmacists for practice. This I-C difference for

management is particularly important, as industrial pharmacists spend nearly 90 % of their day in a managerial capacity. The research of Patel et al (1993) revealed that industrial pharmacists had a similar preference for industrial related subjects in the pharmacy curriculum.

5.2.4 General pharmacy

If the present status quo is to be retained, i.e. where one general curriculum is used to equip pharmacy students for practice in all three of the main sectors of pharmacy, then the following subjects or subject areas must be emphasised in the curriculum; Biochemistry, First Aid/E.M.A., Microbiology, Pharmaceutical Chemistry, Pharmaceutics, Pharmacology, Pharmacotherapy and Pharmacy Administration. Subjects and subject areas which then require particular attention as to whether to reduce, modify or exclude from the curriculum are Anatomy/Physiology, Pathology, Pharmaceutical Preparations and Dispensing, and Pharmacy Practice/Forensic Pharmacy.

This model can only explain 22 % of the competence of the average pharmacist, as a result of the past pharmacy curriculum. It therefore indicates that training pharmacists for the three main sectors of pharmacy with a single general pharmacy curriculum is not a very satisfactory compromise.

For general pharmacy this is expected, firstly due to the low community pharmacy relationship between subject areas and their competence and secondly, because the present curriculum is used to educate pharmacy graduates who are competent to practice in all the pharmacy sectors, and the curriculum therefore does not instill specific competencies for specific practice settings, but rather general competencies for general practice. It is rather a generic curriculum for instilling generic skills and knowledge. There is nothing wrong with this concept as long as educators, students, business and so forth are made aware that this curriculum is for the training of entry level practitioners in all pharmacy sectors.

The pharmacists competence when they graduate is fixed, while the importance of the activity varies amongst the positions held by pharmacists as they advance up their chosen career path or as the nature of pharmacy practice changes to meet newly defined roles, as in the case of pharmaceutical care. For new undergraduates the pharmacy curriculum can be modified to meet the deficiencies of the present curriculum. For qualified pharmacists continuing education courses must be offered to bridge the gap between their competence when they graduated and their present required competencies.

As most pharmacists do not actively involve themselves in formalised competency education the importance of the various activities generally outstrips their competence to perform at the entry level into the profession. Therefore, the greater the necessity, that pharmacists undertake some form of life-long learning. If pharmacists are not willing to undergo voluntary continuing education, then continuing education should be made mandatory by means of government legislation. This will ensure that qualified pharmacists remain competent to practice their chosen profession.

Livingstone et al (1993) in a survey of 600 pharmacists, 200 community, hospital and industrial pharmacists respectively, found that 20 % of the pharmacists sampled favoured a separate course for each sector. The other 80 % considered that some sort of specialisation was required in the last year of study.

While this research did not explicitly ask practicing pharmacists whether or not separate courses for community, hospital or industrial pharmacy should be offered, it can be inferred that this would be the result, if such a question had been asked. The evidence that leads to this conclusion is that firstly, each pharmacy sector favours those subjects or subject areas that have the greatest applicability to their practice role. Secondly, the time spent in the four major activities differs remarkably between sectors. This is especially true, for industrial pharmacists who spend approximately 90 % of their day in managerial activities and only 10% in the three other major functions. Another example, is that community pharmacists spend 26 % of their day in a counselling function, while hospital and industrial pharmacists spend only 12 % and 5% respectively in counselling .

5.3 Curriculum Analysis Factor

The curriculum analysis factor is used to direct the available resources of pharmacy educational institutions to where they are most needed, based upon the failing of the curriculum to adequately prepare students for the future role of pharmacy, the time that is spent by pharmacists in various activities and the percentage that the pharmacy sector forms of the total registered pharmacist population.

While industrial pharmacists do have the largest I-C difference for management activities amongst the three major sectors, they do form the smallest percentage of the three main sectors of qualified pharmacists. The curriculum analysis factor indicates that the major focus of the undergraduate pharmacy curriculum should be devoted to reducing the I-C difference in community pharmacy, which is where the greatest need lies. While attention should also be paid to industrial and hospital management, it is likely to be more feasible to increase managerial competence in these two sectors by continuing education. The pharmacists employed in these sectors would therefore, if necessary, specialise their management skills for the sector in which they are employed. There would also be a certain amount of 'fall out' from a community pharmacist oriented management course, that would be of use to industrial and hospital pharmacists. Certain managerial skills are of a generic nature and can therefore be applied regardless of practice setting.

Because of the low curriculum analysis factor value for indust in dispensing and manufacturing activities, it would seem that the curriculum is fairly well suited towards meeting the entry level requirements for industrial pharmacists, taking into consideration the number of pharmacists in the sector and the amount of time spent on these activities. Industrial pharmacists may regard their role in dispensing and manufacturing as more of a management or supervisory role. Industrial pharmacists would therefore, still require an understanding of dispensing and manufacturing activities in order to be competent in their management role. This would seem to be the case as industrial pharmacists regard pharmaceutical subjects as having made an important contribution to their competence.

As for counselling activities, the curriculum analysis factor value for community pharmacy is nearly nine times greater than the next nearest curriculum analysis factor value, which is for hospital pharmacy. Here again the limited resources of pharmacy education would seem to be wasted if not nearly completely directed towards ensuring a satisfactory competence in counselling activities for community pharmacy

While the public health activities curriculum analysis factor value is greatest for community pharmacy, all the sectors fall below a curriculum analysis factor value of five. Therefore, unless pharmacists start to spend a greater proportion of their working day in performing public health related activities or the importance of public health related activities increases, there seems to be no reason for the present emphasis of the pharmacy curriculum to be changed.

While the C.A.F. does direct most of the curriculum towards meeting the need of community pharmacists, it must be remembered that many of the skills and knowledge provided by the curriculum are of a generic nature. They can therefore, be applied regardless of practice setting. Those skills and knowledge that are specific to a practice setting will have to be acquired by means of continuing educations or specialisation

The C.A.F. indicates that greater focus by a future curriculum should be on the management function, regardless of sector. The C.A.F. does not, indicate that greater attention should be directed towards the concept of pharmaceutical care. The reason for this is that while pharmacists do consider the activities that constitute pharmaceutical care as important, they do not spend a major part of their day in performing these activities.

If pharmaceutical care is to gain prominence in the practice of pharmacy, two events will have to occur. Firstly, pharmacists will have to be convinced of the importance of pharmaceutical care. Secondly, pharmacist will have to start spending time in those activities that constitute pharmaceutical care. It would seem that the first has already occurred as the pharmacists do consider those activities that constitute pharmaceutical care as important. However, pharmacists are not spending time performing these activities. This can be because of two elements. Firstly, pharmacists may be dishonest with themselves.

Pharmacists are not spending time in these activities, but they do say they are important. These two statements are obviously in conflict. What might be occurring is the two reasons mentioned by Pharasi and Price (1993). Firstly, that community pharmacists are not integrated into health care teams with other health professionals, and secondly, reimbursement of the pharmacist is such that pharmacists devote their time and effort to activities that are profitable and not necessarily patient-oriented. Another possibility is that pharmacists spend their time and effort in those activities where they feel most competent. Therefore, while they do feel pharmaceutical care is important, they do not have the competence to feel comfortable in providing pharmaceutical care. Regardless of the reason or reasons, it is the pharmacy curriculum and continuing education, which will convince pharmacists of the importance of pharmaceutical care and provide them with the necessary knowledge and skills to provide pharmaceutical care to South Africa's population.

The pharmacy curriculum must therefore be directed towards satisfying the management needs of pharmacists, and if the present status quo is to be changed greater emphasis must be placed upon the competence function.

5.4 Recommendations for future pharmacy education

5.4.1 Focus of skills

Pharmacy educators will have to change students to become independent thinkers, ensure that they are computer literate, and instill in them generic skills. Pharmacy students come to university adept at memorizing facts, but as a professional they must be able to analyse and evaluate a situation so as to arrive at a solution. Pharmacy students must therefore develop the necessary skills of inquiry, abstract logical thinking, and critical analysis (Bootman et al, 1986).This is achieved within the pharmacy curriculum by allowing the student to;

1) solve patients' drug-related problems,

2) learn those facts which they require to understand processes, and

3) learn how to assimilate new material with the information that they already know (Commission to Implement Change in Pharmaceutical Education, Background Paper II, 1993).

The student must be transformed from a dependent to an independent learner as they pass through the pharmacy curriculum. Students must understand that to be educated is to know what questions to ask and where they can find the answers (Commission to Implement Change in Pharmaceutical Education, Background Paper II, 1993).

Pharmacy students must also be computer literate. For those who are not familiar with the use of computers, it is a skill that must be taught. Much of what is done in our health care systems today is done on computers, and soon everything from medical records to the ordering of drugs will be done by computer (Ebert and Shields, 1991; Bandaranayake, 1985).

The information to be remembered by a pharmacy student makes up the largest part of the curriculum and yet this body of knowledge is temporary. Generic skills, unlike knowledge, are permanent and help pharmacy students to acquire and integrate new skills and knowledge (Lowenthal and Meth, 1993).

Generic skills;

1) are not influenced by the professions information base,

2) prevent the profession from becoming obsolete or replaced by technicians,

3) enable the professional to adapt to change,

4) are applicable to other areas of the students life, and

5) can vary with the needs, motivation, and values of the student.

One of the problems facing educators is where to fit in the increased information that pharmacy students must know. Those areas of study with little application for the present pharmacist must be reduced or even done away with. Bandaranayake (1985) states that one area of the curriculum that can be reduced, is the number of practicals. Irrelevant information is often included because of the false belief that a student must be trained in a task in order to develop an awareness of the task.

5.4.2 Communication

The competence of a pharmacist is expressed through their competence in communication. Communication is a means to an end, they are tools with which entry level graduates should be equipped. Too often the results of information gathering and analysis are lost because the students are unable to communicate. The pharmacy curriculum must therefore, train a pharmacy student who has the basic knowledge, confidence, attitude and skills to read, write, listen, and speak effectively (Bootman et al, 1986; Ebert and Shields, 1991). Pharmacy educators must also realise that a student can lack the confidence to speak or express their opinions (Bootman et al, 1986). The educational environment must therefore instill intellectual confidence in the student, with the student having sufficient confidence to act on their knowledge and skills. Popovich (1991) states that a pharmacist with the knowledge, but no confidence will be a poor professional as they will not have the confidence to communicate their knowledge or use their skills. While a pharmacist who has very little knowledge but a lot of confidence is a threat to those served.

5.4.3 Quantitative reasoning

Developing quantitative reasoning must be one of the major aims of the pharmacy curriculum. Pharmacists require a knowledge of equations, graphs, charts, statistics, and numbers. Clinical decisions are often made by selecting the drug which will give the patient the maximum benefit while causing the least harm (Bootman et al, 1986; Ebert and Shields, 1991). These decisions can only be made if the pharmacist has the necessary quantitative skills.

5.4.4 Continuing education

Universities and other educational institutions should actively promote life-long learning;

1) for specialisation in a specific sector of pharmacy e.g. management courses for industry, and

2) to ensure that pharmacists in the various sectors of pharmacy remain current in their specific field of practice.

Universities can, and should offer post-graduate degrees in various specialities. In the U.S.A. this has resulted in pharmacy evolving into a profession of generalists and specialists. Generalists must be capable of practising in a number of different practice environments, while specialists require education and training above and beyond that needed for a generalist (Commission to Implement Change in Pharmaceutical Education, Background Paper II, 1993).

5.4.5 Continual curriculum analysis

It is only by predictive planning and analysis of changes in the role played by the pharmacist in the practice environment that irrelevant information can be detected. The pharmacy curriculum must be carefully studied from the perspective of the practicing pharmacist in order to ensure that it results in a curriculum that teaches the student the necessary skills, knowledge, attitudes and competencies required in practice. A curriculum that fails to meet all the requirements for that profession will result in these educational gaps being exploited by other professions, who will then assume these roles (Smith, 1990).

It is therefore, recommended that the curriculum evaluation model proposed by Coles and Grant (1985) should actually have an additional feedback loop (refer to figure 5.1). This would create a closed system which constantly maintains the curriculum. As the complete review of a curriculum lasting four years is rarely done, a more practical approach is that the

Faculty or Department of Pharmacy should continuously review the various courses offered. Pharmacy practice is dynamic and is undergoing continuous changes in order to adapt to a continuously changing environment. The pharmacy curriculum must therefore be constantly reviewed in order to maintain a curriculum which is effective. This allows new material to be incorporated in a systematic and co-ordinated manner with the rest of the curriculum (Coles and Grant, 1985; Lowenthal and Meth, 1993).

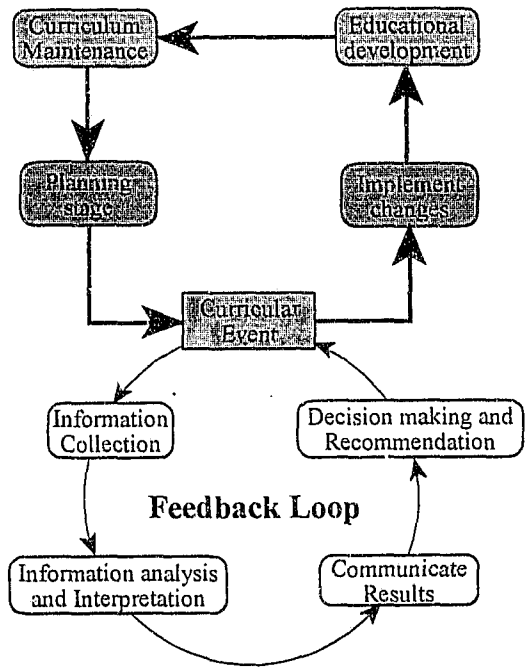


Figure 5.1 Modified curriculum evaluation model (adapted from Coles and Grant, 1985)

Chapter 6 Summary

Chapter one of this dissertation introduced the research, the reasons for the research and gave the background to the research problem. It briefly described the various factors that have affected the pharmacy profession. These factors include; the practice environment, the economic environment, demographical changes and information technology. While pharmacy education has attempted to keep pace with the changes in the practice of pharmacy - such as the implementation of pharmaceutical care - concern has been raised as to whether or not pharmaceutical education has kept up with these changes and therefore, whether it is adequately preparing students for contemporary practice. Chapter one also gave the objectives of the research, which are;

1) to develop a quantitative instrument that will direct the universities resources to those areas where the past pharmacy curriculum has not met the pharmacists requirements for their present practice role;

2) to develop an educational model that will indicate which subjects have made a significant contribution to the pharmacists competence to perform their present full-time work; and

3) to propose a curriculum evaluation model for future curriculum evaluations.

Chapter two highlighted the existing literature concerning curriculum evaluation and the use of the results to develop pharmacy curricula. It described the responsibility of pharmacy educators to design a curriculum which results in a competent entry level pharmacist who is capable of adapting to future practice activities. Chapter two also explained the concept of an entry level pharmacist and described the similarities between a business which must remain close to its customers, and educationalists who need to remain close to their customers. The role of curriculum evaluation was also discussed and the three major parts of an effective curriculum were described. That is, the documented curriculum, active

curriculum and the student experienced curriculum. The possible reasons for curriculum evaluation were described and the two opposing views about curriculum development were also mentioned. The various stages in curriculum evaluation were explained and the adoption of an appropriate educational strategy for a health professional curriculum.

In Chapter three, the methodology of the research was presented. The first part of the chapter described the theory concerning questionnaire development and implementation. It described the planning of the research, various research methods available. How to choose a survey research method, with emphasis being placed on the accuracy of the information received, the cost per completed interview, the amount of information obtained and the speed of return of the information. A step-by-step process for questionnaire design and implementation was then described. The second part of chapter three dealt with the methodology used for this research. It described the reason for using a mail survey, how research bias was reduced and how the returned questionnaires were tested for research bias. It discussed the physical format of the questionnaire and how the questionnaire was developed. Chapter three also discussed the method of sampling and sample size calculation, as well as the editing of the questionnaire and the statistical analysis of the information received from the returned questionnaires.

Chapter four gave the results obtained from the returned questionnaires and discussed the results. It described the verification of the questionnaire, concerning the number of full-time versus part-time respondents, number of respondents versus sample size and tested for any bias. It provided a breakdown of responses according to pharmacy sector and position.

Chapter four also reported, by means of box-and-whisker plots, the analysis of the responses for the work activities according to the pharmacists perceived importance, competence, and importance minus competence (I-C) difference for major activities, as well as the amount of time spent in each major activity. It described the correlation between the importance, competence, I-C difference and time for each major activity, in the three main sectors of pharmacy and 'general' pharmacy. The mean values for importance, competence and I-C difference for each pharmacy sector were given, for each activity in the four major functions of pharmacy. These major functions are; management, dispensing and

manufacturing, counselling and public health. The contribution of each subject in the pharmacy curriculum to the pharmacists perceived competence was given. A curriculum model was defined for each sector of pharmacy by means of stepwise regression, taking into consideration the contribution of the subjects to the pharmacists mean competence to perform in the workplace. Lastly, the use of a curriculum analysis factor (CAF) in curriculum planning was also discussed. The curriculum analysis factor is a formula which was devised by the author to indicate how much emphasis the pharmacy curriculum should place on the major functions for each sector of pharmacy.

Chapter five concerned the conclusions and recommendations made by the author. Regardless of sector, the importance of the major function was always greater than the pharmacist average 'perceived level' of competence to perform the major function. This indicated that none of the pharmacists felt over qualified. Community pharmacy had the highest average importance for management, dispensing and manufacturing, counselling and public health activities. Community pharmacy also had the highest average competence rating for management, dispensing and manufacturing and counselling. The highest public health competence rating was for hospital pharmacy. Overall, regarding specific subject areas, community and hospital pharmacists ranked Pharmacology as the subject area that has made the greatest contribution to their competence to function in their jobs. Industry ranked the Pharmaceutics subject area as having made the greatest contribution to their competence to function in their full-time work. All three pharmacy sectors ranked Biochemistry as having made the least contribution. According to the curriculum analysis factor the pharmacy curriculum's emphasis should be placed upon community pharmacy for all four major functions. Finally, a modified curriculum assessment model was recommended by the author for the continued maintenance of a competency-based education.

Appendix A

SURVEY OF PHARMACISTS' PERCEPTIONS OF COMPETENCE AND EDUCATION

UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG

This questionnaire forms part of the research towards my masters degree. It would be greatly appreciated if you could take the time to fill it in and return it as soon as possible as every response would help to improve the statistical validity of the research. This is your opportunity as a pharmacist to contribute towards the future of pharmacy and its direction.

The pharmacist has begun to move away from a product orientated to a patient orientated role. This is a worldwide phenomenon. The drug or product will always remain the link between the patient and pharmacist, but the pharmacist has begun to play a more expanded role with greater clinical involvement, such as measuring blood pressure, giving advice on paediatric nutrition and family planning etc. This expanded role will require the pharmacist to have the necessary knowledge and skill competencies to be able to perform those duties and functions required of him or her.

This questionnaire will help us to realise what skills and competencies are required by you in the performance of your every day duties and functions. The pharmacy curriculum can then be analysed for its suitability for teaching the necessary skills and knowledge required by you the pharmacist.

We would then be able to use this information as the basis for restructuring the curriculum, so that it would be suitable for teaching the new skills and competencies required by you the pharmacist in your expanded role.

Please fill in this questionnaire and return it by the 31st of July 1995.

Yours Sincerely

C.J.E. Hartshorne
Enquiries 647 - 2274 (011)

This questionnaire is confidential.

Part 1 - Personal information

INSTRUCTIONS: Please answer the following questions by making a cross(x) in the corresponding square or by filling in the blank.

A. SEX

Male	
Female	

B. AGE

20 - 30	
30 - 40	
40 - 50	
> 50	

C. YEAR GRADUATED 19___

D. QUALIFICATION(S) _____

E. UNIVERSITY/TECHNIKON _____

F. PRESENTLY WORKING

FULL-TIME	
PART-TIME	
OTHER	

IF OTHER PLEASE SPECIFY

G. PLEASE MARK WITH A CROSS(X) YOUR PRESENT(FULL-TIME) POSITION AND THEN FILL IN THE NUMBER OF YEARS IN THIS POSITION.

MAJOR FUNCTION		POSITION	NUMBER OF YEARS
RETAIL	- EMPLOYEE		
	- MANAGER/OWNER/ETC		
INDUSTRY	- MARKETING		
	- PRODUCTION		
	- REGISTRATION		
HOSPITAL	- PRIVATE		
	- PUBLIC		
OTHER (SPECIFY IF OTHER)			

Part 2

INSTRUCTIONS: Please respond to the following work activities in terms of:
A) their **importance** in your full-time work.
B) your **level of competence** when you **graduated**.

Importance of the Activity
On a scale of 1 to 5, with **1 = "Not Important"**, **2 = "Fairly Important"**, **3 = "Important"**, **4 = "Very Important"** and **5 = "Extremely Important"**, cross the square that best represents the importance of the activity in your overall practice. Cross **NA(not applicable)** if you do not perform the activity.

Level of Competence
On a scale of 1 to 5, with **1 = "Not Competent"**, **2 = "Fairly Competent"**, **3 = "Competent"**, **4 = "Very competent"** and **5 = "Extremely Competent"**, cross the square that best represents your level of competence to perform the activity when **you received your degree or diploma of pharmacy**. Cross **NA(not applicable)** if you do not perform the activity. Cross # if you do not remember your level of competence upon graduation.

Management Activities

A. General management including planning, organizing, analysing, controlling and developing strategies, policies and procedures.

1.	Importance	NA	1	2	3	4	5	
2.	Competence	NA	1	2	3	4	5	#

B. Personnel management including recruiting, selecting and hiring, training, supervising, disciplining and evaluating personnel.

3.	Importance	NA	1	2	3	4	5	
4.	Competence	NA	1	2	3	4	5	#

C. Purchasing and controlling inventory, including selecting suppliers.

5.	Importance	NA	1	2	3	4	5	
6.	Competence	NA	1	2	3	4	5	#

D. Financial management including budgeting, monitoring cash flow and accounts receivable, developing price strategies/ structure and completing and submitting medical aid claims.

7.	Importance	NA	1	2	3	4	5	
8.	Competence	NA	1	2	3	4	5	#

E. Sales and promotions including developing advertising, making displays and related activities.

9.	Importance	NA	1	2	3	4	5	
10.	Competence	NA	1	2	3	4	5	#

F. Production planning and operations management e.g. material requirement planning(MRP) and production scheduling.

11.	Importance	NA	1	2	3	4	5	
12.	Competence	NA	1	2	3	4	5	#

G. Ensuring and assessing the stability and correct storage of medicines, e.g. the effect of incorrect storage on the safety and quality of medicines.

13.	Importance	NA	1	2	3	4	5	
14.	Competence	NA	1	2	3	4	5	#

Dispensing and Manufacturing Activities

A. Dispensing functions including the verification of the legality of the prescription, evaluating the patient profile for possible interactions with other medication/allergies and processing the prescription.

15.	Importance	NA	1	2	3	4	5	
16.	Competence	NA	1	2	3	4	5	#

B. Developing and maintaining patient records/profiles.

17.	Importance	NA	1	2	3	4	5	
18.	Competence	NA	1	2	3	4	5	#

C. Compounding prescriptions extemporaneously, except IV additives.

19.	Importance	NA	1	2	3	4	5	
20.	Competence	NA	1	2	3	4	5	#

D. Preparing parenteral therapy including IV additives, TPN and reconstitution of injectable medications or cytotoxic medication.

21.	Importance	NA	1	2	3	4	5	
22.	Competence	NA	1	2	3	4	5	#

E. Production technology i.e. setting up of tabletting and other unit processes.

23.	Importance	NA	1	2	3	4	5	
24.	Competence	NA	1	2	3	4	5	#

Counselling Activities

A. Counselling patients or medical and nursing staff on the patients medication, how and when to take it, length of therapy and what side effects are to be expected.

25.	Importance	NA	1	2	3	4	5	
26.	Competence	NA	1	2	3	4	5	#

B. Counselling patients on OTC drugs, galenicals and patent medicines.

27.	Importance	NA	1	2	3	4	5	
28.	Competence	NA	1	2	3	4	5	#

C. Counselling patients or medical and nursing staff on the correct use and maintenance of (self-)monitoring and diagnostic equipment and products(e.g., pregnancy tests, glucometers etc).

29.	Importance	NA	1	2	3	4	5	
30.	Competence	NA	1	2	3	4	5	#

D. Counselling patients or medical and nursing staff on the selection and use of health care equipment, including surgical supplies (e.g. nebulisers) and other (home) health care equipment.

31.	Importance	NA	1	2	3	4	5	
32.	Competence	NA	1	2	3	4	5	#

E. Providing screening services such as diabetes, cholesterol, pregnancy, blood pressure and anticoagulation monitoring etc.

33.	Importance	NA	1	2	3	4	5	
34.	Competence	NA	1	2	3	4	5	#

F. Consulting with prescribers concerning drug information or prescribed items.

35.	Importance	NA	1	2	3	4	5	
36.	Competence	NA	1	2	3	4	5	#

G. Provision of therapeutic drug monitoring(TDM) and advising on the results thereof (recommending on cost effectiveness etc).

37.	Importance	NA	1	2	3	4	5	
38.	Competence	NA	1	2	3	4		#

Public Health Activities

A. Advising on poison and drug information queries.

39.	Importance	NA	1	2	3	4	5	
40.	Competence	NA	1	2	3	4	5	#

B. Advising on injuries and the management of disease states.

41.	Importance	NA	1	2	3	4	5	
42.	Competence	NA	1	2	3	4	5	#

C. Counselling on the selection of veterinary medicines, dosages and length of therapy.

43.	Importance	NA	1	2	3	4	5	
44.	Competence	NA	1	2	3	4	5	#

D. Education of consumer groups on pharmaceutical health related matters e.g. drug abuse lectures to schools etc.

45.	Importance	NA	1	2	3	4	5	
46.	Competence	NA	1	2	3	4	5	#

E. Advising on health related matters e.g. Infant health and nutrition.

47.	Importance	NA	1	2	3	4	5	
48.	Competence	NA	1	2	3	4	5	#

Part 3

INSTRUCTIONS: Please indicate as a percentage, the amount of time you spend in a day on each of the following pharmacy related activities.

CATEGORY	% of time
49. Management	_____
50. Dispensing	_____
51. Counselling	_____
52. Public health	_____
53. Other activity utilizing over 1% of time. Please Specify._____	_____
TOTAL	100 %

Part 4

INSTRUCTIONS: On a scale of 1 to 5, with 1 = "No Contribution", 2 = "Fair level of Contribution", 3 = "Contributed", 4 = "Good level of Contribution" and 5 = "Excellent Contribution", cross(x) the square that represents the value each subject area made to your competence to practise your Full-Time Work. Mark NA(Not Applicable) if you did nct have the course(s).

54. Anatomy and/or physiology.

1	2	3	4	5	NA

55. Biochemistry.

1	2	3	4	5	NA

56. First Aid\Emergency Medical Aid(EMA).

1	2	3	4	5	NA

57. Microbiology.

1	2	3	4	5	NA

58. Pathology.

1	2	3	4	5	NA

59. Pharmaceutical chemistry.

1	2	3	4	5	NA

60. Pharmaceutics, Biopharmaceutics, Kinetics and Analysis.

1	2	3	4	5	NA

61. Pharmaceutical preparations and dispensing.

1	2	3	4	5	NA

62. Pharmacology.

1	2	3	4	5	NA

63. Pharmacotherapy.

1	2	3	4	5	NA

64. Pharmacy Administration.

1	2	3	4	5	NA

65. Pharmacy Practise/Forensic Pharmacy.

1	2	3	4	5	NA

Thankyou for filling in this questionnaire .

yours sincerely

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C.J.E Hartshorne

Appendix B

OPNAME VAN APTEKERS SE PERSEPSIE TEN OPSIGTE VAN BEVOEGDHEID EN OPLEIDING

UNIVERSITEIT VAN DIE WITWATERSRAND JOHANNESBURG

Hierdie vraelys vorm deel van die navorsing ten opsigte van my meestersgraad. Dit sal besonder waardeer word indien u die tyd kan vind om dit in te vul en so gou moontlik terug te stuur, aangesien elke respons sal bydrae tot die statisties geldigheid van die navorsing. Dit is u geleentheid as apteker om by te dra tot die toekoms en rigting van aptekerswese.

Die apteker begin om weg te beweeg van 'n produk-georiënteerde na 'n pasient-georiënteerde rol. Dit is 'n wereldwye verskynsel. Die geneesmiddel of produk sal altyd die skakel bly tussen pasient en apteker, maar die apteker het begin om 'n meer uitgebreide rol te vervul met groter kliniese betrokkenheid soos die neem van bloeddruk, die advisering ten opsigte van pediatriese voeding en gesinsbeplanning ens.

Diè uitgebreide rol vereis dat die apteker oor die nodige kennis en vaardighede beskik om die pligte en funksies wat van hom of haar verwag word te vervul. Hierdie vraelys sal ons help om te bepaal watter vaardighede en bevoegdhede van u vereis word in die uitvoering van u daaglikse pligte en funksies. Die kurrikulum vir aptekerswese kan dan ontleed word om te bepaal of dit geskik is vir die onderrig van die nodige vaardigheid en kennis wat van u as apteker vereis word.

Ons sal dan instaat wees om hierdie inligting te gebruik as die basis vir herstrukturering van die kurrikulum sodat dit geskik sal wees vir die onderrig gee van die nuwe vaardighede en bekwaamhede wat van u as die apteker in u uitgebreide rol verwag word.

Voltooi asb hierdie vraelys en stuur terug voor 31 Julie 1995.

Die Uwe

C.J.E. Hartshorne
Navrae 647 - 2274(011)

Hierdie vraelys is vertroulik.

Deel 1 - Persoonlike inligting

INSTRUKSIES: Beantwoord asseblief die volgende vrae deur die maak van 'n kruisie(x) teenoor die ooreenstemmende blokkie of deur voltooiing van die oop spasie.

A. GESLAG

Manlik	
Vroulik	

B. OUDERDOM

20 - 30	
30 - 40	
40 - 50	
> 50	

C. JAAR GEKWALIFISEER 19___

D. KWALIFIKASIE(S) _____

E. UNIVERSITEIT/TECHNIKON _____

F. HUIDIGE WERK

HEELTYDS	
DEELTYDS	
ANDER	

SPESIFISEER INDIEN ANDER

G. DUI AAN MET 'N KRUISMERK(X) U HUIDIGE(HEELTYDSE) BETREKKING EN DUI DAN DIE AANTAL JARE AAN WAT U DIE POSISIE BEKLEE HET.

HOOFFUNKSIE		BETREKKING	AANTAL JARE
KLEINHANDEL	- WERKGEWER		
	- BESTUURDER/EIENAAR		
INDUSTRIE	- BEMARKING		
	- PRODUKSIE		
	- REGISTRASIE		
HOSPITAAL	- PRIVAAT		
	- PUBLIEKE		
ANDER (SPESIFISEER INDIEN ANDER)			

Deel 2

INSTRUKSIES: Dui die belangrikheid van elk van die volgende aktiwiteite aan, met betrekking tot:
a) u **heeltydse** werk.
b) u vlak van **bevoegdheid** by **voltooiing** van u kursus.

Belangrikheid van die aktiwiteit
Op 'n skaal van 1 tot 5, met **1 = "Nie Belangrik", 2 = "Redelik Belangrik", 3 = "Belangrik", 4 = "Baie Belangrik"** en **5 = "Uiters Belangrik"**, merk die blokkie wat die belangrikheid van die aktiwiteit in u praktyk die beste weergee . Merk **NVT(NIE VAN TOEPASSING)** as u nie die aktiwiteit uitvoer nie.

Vlak van Bevoegdheid
Op 'n skaal van 1 tot 5, met **1 = "Nie bevoeg", 2 = "Redelik Bevoeg", 3 = "Bevoeg", 4 = "Hoogs Bevoeg"** en **5 = "Uiters bevoeg"**, merk die blokkie wat u vlak van vaardigheid om die aktiwiteit uit te voer die beste voorstel toe u **u graad of diploma ontvang het**. Merk **NVT(NIE VAN TOEPASSING)** as u nie die aktiwiteit verrig nie. Merk # indien u nie u vlak van vaardigheid met graduering kan herroep nie.

Bestuursaktiwiteite

A. Algemene bestuur, insluitend beplanning, organisering, ontleding, kontrolering, ontwikkelingstrategie, beleid en prosedures.

1.	Belangrikheid	NVT	1	2	3	4	5	
2.	Bevoegdheid	NVT	1	2	3	4	5	#

B. Personeelbestuur met 'n begrip van werwing, keuring en aanstelling, opleiding, toesighouding, dissiplinering en evaluering.

3.	Belangrikheid	NVT	1	2	3	4	5	
4.	Bevoegdheid	NVT	1	2	3	4	5	#

C. Aankoop en kontrolering van voorraad, insluitende keuring van verskaffers.

5.	Belangrikheid	NVT	1	2	3	4	5	
6.	Bevoegdheid	NVT	1	2	3	4	5	#

D. Finansiele bestuur, insluitend opstel van begroting, monitering van kontantvloei en betaling van rekeninge, ontwikkeling van prysstrategie en voltooing en voorlegging van mediese fonds eise.

7.	Belangrikheid	NVT	1	2	3	4	5	
8.	Bevoegdheid	NVT	1	2	3	4	5	#

E.Verkope en promosie, insluitend ontwikkeling van advertering en opstel van uitstallings en verwante aktiwiteite.

9.	Belangrikheid	NVT	1	2	3	4	5	
10.	Bevoegdheid	NVT	1	2	3	4	5	#

F. Produksie-beplanning en bedryfsbestuur bv. voorraadbehoefte-beplanning en produkskedulering.

11.	Belangrikheid	NVT	1	2	3	4	5	
12.	Bevoegdheid	NVT	1	2	3	4	5	#

G. Bevestiging en beraming van die stabiliteit en korrekte berging van geneesmiddel bv. die effek van foutiewe berging op die veiligheid en kwaliteit van geneesmiddels.

13.	Belangrikheid	NVT	1	2	3	4	5	
14.	Bevoegdheid	NVT	1	2	3	4	5	#

Reseptering en Vervaardigingsaktiwiteite

A. Resepteer-funksie, insluitend die verifikasie van die geldigheid van die voorskrif, evaluering van die pasient profiel vir moontlike interaksies met ander medikasie/allergie en verwerking van die voorskrif.

15.	Belangrikheid	NVT	1	2	3	4	5	
16.	Bevoegdheid	NVT	1	2	3	4	5	#

B. Ontwikkeling en instandhouding van pasient rekords/profiele.

17.	Belangrikheid	NVT	1	2	3	4	5	
18.	Bevoegdheid	NVT	1	2	3	4	5	#

C. Samestelling van voorskrifte, behalwe IV toevoeging.

19.	Belangrikheid	NVT	1	2	3	4	5	
20.	Bevoegdheid	NVT	1	2	3	4	5	#

D. Voorbereiding van parenterale terapie, insluitend IV toevoegings, TPN en rekonstitusie van inspuitbare geneesmiddels of sitotoksiese medikasie.

21.	Belangrikheid	NVT	1	2	3	4	5	
22.	Bevoegdheid	NVT	1	2	3	4	5	#

E. Poduksie-tegnologie d.i. die opstel van tablettering en ander eenheidsprosesse.

23.	Belangrikheid	NVT	1	2	3	4	5	
24.	Bevoegdheid	NVT	1	2	3	4	5	#

Beradingsaktiwiteite

A. Berading van pasiente of mediese- en verplegingspersoneel oor pasient medikasie, hoe en wanneer dit geneem moet word, duur van terapie en watter verwante effekte verwag kan word.

25.	Belangrikheid	NVT	1	2	3	4	5	
26.	Bevoegdheid	NVT	1	2	3	4	5	#

B. Pasientberading oor ODT geneesmiddels, aangemaakte medisyne(galenicals) en patente geneesmiddels.

27.	Belangrikheid	NVT	1	2	3	4	5	
28.	Bevoegdheid	NVT	1	2	3	4	5	#

C. Berading van pasiente of mediese- en verplegingspersoneel ten opsigte van die korrekte gebruik van, en instandhouding van (self-) moniterings- en diagnostiese toerusting en produkte bv. swangerskap toetse, glukometers.

29.	Belangrikheid	NVT	1	2	3	4	5	
30.	Bevoegdheid	NVT	1	2	3	4	5	#

D. Berading van pasiente of mediese- en verplegingspersoneel ten opsigte van die seleksie en gebruik van gesondheidsorg-toerusting, insluitend chirurgiese voorrade bv. stuifsproeiers en ander (tuis) gesondheidsorg-toerusting.

31.	Belangrikheid	NVT	1	2	3	4	5	
32.	Bevoegdheid	NVT	1	2	3	4	5	#

E. Voorsiening van siftingsdienste soos suikersiekte, cholesterol, swangerskap, bloeddruk en antistollings monitering ens.

33.	Belangrikheid	NVT	1	2	3	4	5	
34.	Bevoegdheid	NVT	1	2	3	4	5	#

F. Konsultasie met voorskrywers rakende geneesmiddel-inligting of voorgeskrewe items.

35.	Belangrikheid	NVT	1	2	3	4	5	
36.	Bevoegdheid	NVT	1	2	3	4	5	#

G. Voorsiening van terapeutiese geneesmiddel-monitering en advisering oor die resultaat (aanbeveling ten opsigte van koste-effektiwiteit)

37.	Belangrikheid	NVT	1	2	3	4	5	
38.	Bevoegdheid	NVT	1	2	3	4	5	#

Gemeenskaps-gesondheidsaktiwiteite

A. Advisering ten opsigte van gifstowwe en geneesmiddelinligtings navrae.

39.	Belangrikheid	NVT	1	2	3	4	5	
40.	Bevoegdheid	NVT	1	2	3	4	5	#

B. Advisering ten opsigte van beserings en die hantering van siektetoestande.

41.	Belangrikheid	NVT	1	2	3	4	5	
42.	Bevoegdheid	NVT	1	2	3	4	5	#

C. Berading ten opsigte van die seleksie van veterinêre geneesmiddels, dosisse en duur van terapie.

43.	Belangrikheid	NVT	1	2	3	4	5	
44.	Bevoegdheid	NVT	1	2	3	4	5	#

D. Opleiding van verbruikersgroepe ten opsigte van farmaseutiese gesondheidsverwante aangeleenthede bv. dwelmmisbruik lesings by skole ens.

45.	Belangrikheid	NVT	1	2	3	4	5	
46.	Bevoegdheid	NVT	1	2	3	4	5	#

E. Toeligting van gesondheidsverwante aangeleenthede bv. kindergesondheid en voeding.

47.	Belangrikheid	NVT	1	2	3	4	5	
48.	Bevoegdheid	NVT	1	2	3	4	5	#

Deel 3

INSTRUKSIES: Dui asseblief aan as persentasie die hoeveelheid tyd wat u per dag bestee aan elk van die volgende farmaseuties-verwante aktiwiteite.

Kategorie	**% van tyd**
49. Bestuur	_____
50. Reseptering	_____
51. Berading	_____
52. Gemeenskapsgesondheid	_____
53. Ander aktiwiteite wat meer as 1% van u tyd in beslag neem. Spesifiseer asseblief._____	_____
TOTAAL	100 %

Deel 4

INSTRUKSIES: Op 'n skaal van 1 to 5, met 1 = "Geen Bydrae", 2 = "Redelike Bydrae", 3 = "Bydrae", 4 = "Goeie Bydrae" en 5 = "Baie Goeie Bydrae", merk die blokkie wat die vlak van bydrae wat elke vakgebied tot u bekwaamheid in u huidige heeltydse werk bygedra het. Merk **NVT(Nie Van Toepassing)** as jy nie die kursus voltooi het nie.

54. Anatomie en/of fisiologie.

1	2	3	4	5	NVT

55. Biochemie.

1	2	3	4	5	NVT

56. Eerstehulp\Mediese noodhulp.

1	2	3	4	5	NVT

57. Mikrobiologie.

1	2	3	4	5	NVT

58. Patologie.

1	2	3	4	5	NVT

59. Farmaseutiese chemie.

1	2	3	4	5	NVT

60. Farmaseutika, Biofarmaseutika, Kinetika en Analise.

1	2	3	4	5	NVT

61. Farmaseutiese preparate en reseptering.

1	2	3	4	5	NVT

62. Farmakologie.

1	2	3	4	5	NVT

63. Farmakoterapie.

1	2	3	4	5	NVT

64. Farmasie Administrasie.

1	2	3	4	5	NVT

65. Farmasie-Praktyk/Forensiese Farmasie.

1	2	3	4	5	NVT

Dankie dat u hierdie vraelys ingevul het.

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Die uwe

C.J.E.Hartshorne

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