Variables Affecting Success in Technical Education in Egypt

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Contents

Chapter 5:
The plumber questionnaire and data analysis

List of Tables

List of Figures

Abstract

In an attempt to offer foundations on which to improve the plumber technical education in Egypt, this study reports an investigation into the effectiveness and relevance of the graduates of the plumbing section by examining the evolution and outcomes of the system, as well as gathering views and opinion of those directly involved with the graduates.

Seeking to explore this, the researcher investigated the perspectives of 275 technical secondary Egyptian students in four schools serving three areas in Egypt. The views of 22 teachers in these schools were also analysed. The study also looked at the vital factor of motivation by applying an interest inventory on these technical students. In an attempt to provide a comprehensive picture of the efficiency of the graduates, the practical side of the issue was also investigated through comparatively exploring the perspective of 42 Egyptian plumbers with 41 British plumbers. The study adopts a combination of quantitative and qualitative approaches.

Data analysis revealed that there are many dimensions to technical education and training, which must be taken into account in defining the variables affecting its success. The study reached the following variables: social variables, enrolment variables, school-related variables, and labour market variables. Technical crafts in general, and plumbing in particular are regarded as low status positions in society despite their importance. Joining technical education was found to be based entirely on a score basis without any considerations of the students' interest or motivations. Essential materials and tools were scarce, curriculum content needed updating, and physical conditions were not always appropriate.

The following conclusion can be drawn. There is a need for awareness raising in Egypt about the relevance of handcrafts. The complex pattern of provision and practice of technical education and training defies easy adaptations or generalisations across societies. The success of vocational education must be based on economic as well as social, educational and political consideration. The results of the present research emphasise the importance of internal and external efficiency in ensuring the success of the technical education system.

Declaration

No portion of the work referred to in this thesis has been submitted in support of an application for another degree or qualification of this or any other university or other institute of learning.

Copyright Statement

Dedication

First of all my praise and gratitude goes to Allah (God) who gave me an opportunity and strength to complete this research.

Furthermore, this work is especially dedicated to
the memory of my parents

Haj Farouk El-Kersh (1943-1998)
and
El-Hajja (1948-2003)

who taught me the love of God, people and work; who during their lives spared no effort to give me support, patience, and praying; who have longed to see this moment but destiny did not allow them to see the fruition of their prayers;

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who is the most important 'variable' in my life, who stood behind me, encouraged me through her endless support, and who lived with me in all the agonies, excitements and sufferings during the course of my study;

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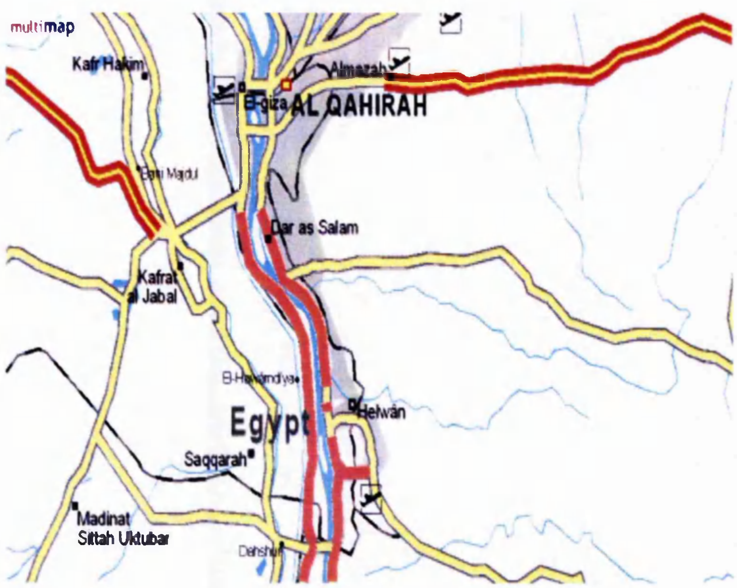
To all the above, without whom this study could not have come to fruition, I acknowledge my gratefulness.

In the name of Allah the most merciful
The most compassionate

Map of Egypt

1. Map of Egypt showing the general location of schools in the research



2. The map of the Cairo area

Chapter 1

An introduction and identification of the problem

1.1 Introduction

This chapter identifies the factors that led to the current investigation into the variables that might lead to success of Egyptian technical school graduates. The purpose of the study and its potential significance are explained and an indication of the research hypotheses is given.

1.2 Background

1.2.1 Social Pressure for Change

There is a growing consciousness that quality training of teachers is necessary, not only for traditional basic education in primary and secondary schools, but for vocational alternatives. For example, the international Round Table on Training for Teachers noted that, with regard to technical education (T.E.)....

> ....concern for effective technical and professional training of teachers is increasing the world over. However, such concern frequently does not extend to the area of the professional training essential for those whose role is to teach and train people in preparation for and in the maintaining of their efficiency within the world of work, that is, T.E teachers and trainers. Yet the global economy, with its comparative productivity, the impact of the technology on the skills required for employment the fast-changing job market with its festering unemployment, all these depend effectivly and primarily upon the effective preparation of T.E teachers and trainers, (UNEVOC, 1974:1).

Technical education represents a major pillar of any educational system worldwide. Clearly, the graduates of technical education schools constitute a major portion of the labour force in their fields of specialization. The technical education issue occupies a key position in the plan of technical work over all the countries of the Arab nation and it is for this reason, amongst others, that Egypt had been eager to promote technical education (Khalil, 1989: 23). It aims to raise the quality of technical education so as to form an Egyptian personality that is capable of facing the future, and to realise an expansion of technical education in order to cope with technological advance and the achievement of comprehensive development (Mahran, 1994(a): 75). The curriculum philosophy in Egypt aims to give the students experiences in and out of the school to support them towards success in their life.

Mahran (1993:6) makes the point that one of the most important issues, which he believes should occupy a larger scope in the field of pedagogical research, is that of the fusion between the processes of education and national economic development. He suggests that each of these represents a different side of one coin, which is the contribution to the welfare of the human being. Whenever an aspect of life in society changes (as happens with changing technology) this change will impose new missions upon the pedagogical institutions. These institutions are responsible for the elaboration of the needs and preparation of the members of the society in order to cope with modernisation of scientific and technical fields and their impact on living.

Metwaly (1989:411) agrees, adding that this link is necessary for the technical secondary school in its place as the intermediate stage in the educational process. Metwaly adds that technical (secondary) education is also the main source in Egypt for the graduation of the necessary technical staff with the skills to adapt to the scientific processes in manufacturing (especially contract) companies and factories. It aims to qualify the youth for useful work based on scientific fundamentals and to link between the missions of scholarly education and the trade and professional fields. Such an education also aims to assist the youth to master the skills, the knowledge and the concepts that enable them to enter a trade or profession, or help them to progress further in this trade or profession.

Technical schools provide society every year with a number of graduates to join the labour market and this market has educational requirements (and thus curriculum specifications) that must be renewed when the conditions of work change. In Egypt, more than 600,000 students are enrolled nationwide under the umbrella of technical secondary schools (Abou Zeid and Attallah, 2000: 264). Yet analytical studies of the reality of industrial education in Egypt (Mahran, 1994(b): 175; Senate, 1998:33) have revealed the ongoing retardation of educational syllabus development and in the means and tools for delivery in the schools. This applies with respect to the theoretical aspects of the syllabus (its rigidity of content and its failure to cope with different situations) and to the absence of a syllabus that enables the student to think in a scientific way, instead of reliance on rote learning methods. This also applies with respect to the practical aspects of the syllabus. Mahran (1994(b)) and Senate (1998) referred this failure to several factors, such as the lack of integration between the scholarly subjects, and an artificial separation between theoretical and practical aspects of teaching content. This separation or lack of integration prevents any utility arising. These studies have also revealed a lack of caring by the teachers about the skills and talents gained by students, beside the ineffectiveness of the means of student evaluation.

In a recent conference that took place in the American University in Cairo, Abou Zeid and Attallah (2000: 266-267) have reported that Technical Education and Vocational Training (TEVT) in Egypt is encountering the following challenges:

- There is a significant lack of information regarding the labour market. Consequently, planning and setting policies cannot be appropriately done in the absence of this information.

- On the whole, TEVT is operating as supply driven and not demand driven. This is a serious problem as it can contribute to the increase of unemployment. It is worth mentioning that each year, about 600 000 finish their technical education studies and seek job opportunities.

- There exists no national body for certification and accreditation that establishes standards, classifies the trades and the level of skills for them and grants the accreditation in Egypt.

- Similar to many other countries, the apprentices and the graduates of technical education do not enjoy the same good social image as their peers of secondary schools and university graduates. Thus, the selection of apprentices is often a negative selection one. This means that apprentices who join are those who could not make it to the secondary schools.

(Abou Zeid and Attallah, 2000: 266-267)

They suggest that these facts have led to the low standard (comparing internationally) of the Egyptian technical labour market.

By comparing the content of the curricula over a number of years, the researcher had reached the conclusion that the Egyptian technical education curriculum in general, and that of the plumbing section curriculum specifically is very outdated. It has not changed for decades despite all the development in the corresponding commercial field. For example, gas has now been used over most of Egypt for the last ten years. But nothing has been added to or changed in the curriculum to improve the skills of the students in the plumbing section of technical secondary schools to do this kind of job when they join the labour market. The starting point for the present research is the current status of technical education in Egypt. The level of technical education graduates in Egypt does not meet with the standard demanded by the labour market

On the other hand, a thorough search of the literature on technical education in Egypt yielded only few sources at master's or doctoral level concerning the architectural* technical education curriculum and its examples. Most of these theses describe successful programmes addressed to technical education students. However, none of them suggest or research the information and background necessary for teachers and educators to make instructional decisions and plan programs that address the changing and developing labour market, and this absence gives impetus to the present research.

The researcher in the present study, as a technical teacher trainer in the university sector in Egypt with a particular interest in the plumbing aspects of architectural education, is thus concerned with the improvement of the quality of the students who leave the Egyptian technical educational system, and who will contribute to society through the use of their acquired practical skills.

- The term 'architectural' is used in Egyptian education to describe not only building design but also the skills and trades involved in realizing that design

1.2.2 Reasons for the Focus on Plumbing

The plumbers in Egypt were chosen as the subjects of the present study apart from any other profession for a number of reasons. First, the researcher was engaged in teaching, training and supervising teachers-to-be in the field of plumbing at Helwan University in Egypt. Second, from close encounter with this sector, the researcher noticed that the plumbers in particular lack governmental attention; their professional experience is randomly acquired. Thirdly, the context of the curriculum for the plumbing section has not witnessed any changes for decades, despite all the modern innovations in the field. This is surprising, as these curricula have been written only by architectural specialists without the assistance of education and curriculum specialists. Furthermore, there are no teachers' teaching guides for these curricula. Another reason for the researcher's interest derived from the fact that this craft is of great importance in Egypt; it has an influential effect on the national economy of a country with relatively low rainfall. Well-skilled plumbers could save thousands of pounds. If we take, for example, only one million flats of Cairo's total flats; and assuming that one drop of water is wasted per minute equivalent to, say 0.15 cm^3, then about 80 million litres are wasted per year; Egypt is wasting a lot of it's natural as well as financial resources.

In addition, despite the fact that Egypt is a developing country, there are many serious efforts to develop and build new cities to overcome the over population problem. The plumbing and sanitation plans for these cities are designed and planned by skilled architects. The problem lies when these plans are being accomplished. The health future of these new cities lies in the hands of these workers. If nothing is done to upgrade the workers' proficiency levels, then the new cities will suffer from the same defects. These cities will then carry only new names with the same old problems. Furthermore, there is an 'International Plumbers Union', but Egypt is not a member.

Other good reasons for the focus on plumbing arise in the particularly poor motivation of students in this field in the technical secondary schools. Evidence of this is revealed in the following research. It will be seen that plumber education is the 'worst case' situation in Egyptian education.

It is noted that in Egypt the work of a plumber includes not only interior pipework and fittings, but also rainwater goods, sewerage systems, swimming pools, etc. (Headar, 1988: 1, Compton, 1997 (CD)) .

1.2.3 Balancing Educational Provision and Market Demands

At present there is no scientific or practical indication regulating the education of the enrolled students in architectural technical (secondary) education in terms of (i) the needs of the labour market, or (ii) the students' employment (or self-employment) needs after graduation, or (iii) personal fulfillment (Mahran, 1993: 6). The researcher believes that all these three aspects must be seen as important in any well-developed technical curriculum system. The balance between these must, however, be a matter of debate. One of the deficiencies of the lack of such an understanding is the imbalance between the number of secondary school graduates in this trade area and the actual labour market needs, (Radwan, 1998). There are no statistics to guide the educational process (Radwan, 2002). On the other hand, even if the labour market did take in these graduates there is no true indication to find out how far they represent an *effective* labour force.

Ideally, the curriculum should be planned in the light of the general plans of the country, whether in the economic or social fields. The promotion of an effective level of technical education cannot be achieved unless by the evolution of its curriculum. It is necessary, in order to liberate the manpower, for attention to be given to the full national breadth of educational effort, as well as developing the specific intellectual energies of the students in their schools to the best possible level. There is need to concentrate on the overall quality of the education and not just the quantity of learning in the classroom, so as to assist in development of proficiency in work – and to gain access to membership of the developed world. In the specialized field of plumbing this involves ongoing learning as practising tradesmen or employers.

Deficiencies in the present Egyptian technical system indicate a need for research to give better guidance to those who teach them. The present study is based on the premise that the curriculum philosophy in Egyptian technical schools needs to be rethought to produce a new policy, specifying a number of approaches which aim to upgrade both the content and the process of technical education, and in both its quantity and quality. Thus, the present research study aims to find out the characteristics of successful plumbers that best lead Egyptian trainee plumbers to join the labour market, successfully having acquired all the skills that must be applied in the field, and to find out the characteristics and attitudes of students and teachers to give a foundation for future curriculum design.

The curriculum in Egypt in this subject area therefore needs carefully targeted research pertinent to curriculum improvement. The research described in this thesis seeks to make a significant contribution to beginning this procedure. Though the issue applies to all sections of the architectural technical curriculum, as an example for this research the focus is solely on the area which the writer believes has the greatest deficiencies – that of plumbing education. It is not part of this research to design a new curriculum.

1.2.4 Background research in plumber education

In this subject area of plumber education in Egypt there is a serious scarcity of formal academic research. There are schemes of work available (especially in the USA), but these are more local in interest than international and are not generally applicable to Egypt. There are no doctoral or masters' dissertations or theses in plumbing in Egypt.

A most useful example of a plumbing curriculum looked at was that of the Mississippi Office of Vocational, Technical and Adult Education (Piazza, 1989, Atkinson,1993). The curriculum has been designed by the Mississippi State University for use in the state and assisted the writer as a source list in selecting skills and equipment for consideration in the research.

A small number of other dissertations, theses and reports have made minor contributions to the writer's thinking in considering the aims for the present research:

Kinn, S.M. (2000) provides a very short dissertation (43 pages) on effectiveness of the safety and health aspects of the plumbing and pipefitting industries in NW Ohio. This alerted the writer to the need to include safety aspects in the research.

Johnson M.D. (1982), in his California State University MA thesis, looks into the supervisory skills needs in apprenticeship training. The necessity of the feedback between teachers/supervisors in the classroom/workshop is emphasised. This aspect was thus covered in the present research.

Tsai, C-Y (1992) presented a PhD dissertation at the Iowa State University evaluating the Taiwanese National Plumbing Competency Test. It is based on good inferential statistical methodology. It shows the particular difficulties in testing plumbing competences – and led to the writer's decision to include questions for the teachers about the methods of student assessment.

Cipriano, A.V. (1979) studied perceptions of indentured apprentices in his University of Connecticut PhD dissertation. This included attitudes to 'selected aspects of work-related instruction'. It leads to the writer asking questions regarding attitudes to joining the labour market.

Ogle, M. (1992) is an interesting historical study of plumbing systems, presented as her PhD dissertation at Iowa State University. It alerted the writer to the importance of the historical aspects of skills in plumbing – though in this respect Egypt is very different to the USA.

Casline, A.F. (1996) presented a dissertation, for his Ed.D. at the University at Albany, State University of New York, on attitudes in public secondary schools towards vocational-technical education. It assisted the writer in thinking about the design of an inventory and the importance of vocational attitude measurement.

Atkinson, Leagman and Mauty (1993) draw attention to vocabulary issues for students in a report sponsored by the Office of Vocational and Adult Education in Washington, DC. Similar vocabulary studies were required in the present research.

North Windham (1989) produced their plumbing and heating curriculum comprising 142 pages. This curriculum is a good example, and provides a lot of details about what a course for plumbers should include.

Oklahoma State Department (1988) developed on introduction to plumbing in 194 pages including the instruction for all tools that should the plumber use in his field and how he can use it.

Edwards (1995)in his paper on one day in the life a plumber, would like to get answers for a lot of questions around this kind of hand craft. Laborers-AGC Education and Training Fund, Pomfret Center (1997), Skill Standards for Open Cut Pipe Laying, in 54 pages identifies skill standards for utility construction in a format that uses various scenarios to provide a picture of the construction process under consideration. The scenarios provide a general description of the four pipe laying informational components in the construction process, conventional industry standards, key tasks and workplace skills.

1.3 The Identification of the Problem

In parallel with the preceding discussion the problem for the present study could be summarised as follows. (Further evidence in this area is given in Chapter 2.)

1. There is no connection between the content of the course of plumbing education and the content of the labour market. This lack of connection leads to the inability of graduated students to deal with recent trends and techniques in the plumbing labour market, or to cope with any additions in the future.

2. The aims for the students in the technical schools are unclear. Thus there is no adequate foundation for design of curriculum improvement.

3. There is no list of the skills that the students should know before joining the present labour market. There is no skills profile for plumbers in Egypt. (Though it is not the aim of this research to produce such a list, considerable progress has been made towards foundations for such a list).

4. There is no detailed understanding of the structure of the plumbing profession in Egypt, in terms of education and training, career development, occupational success, rewards of employment and skills maintenance and improvement. Such understanding is essential, in the view of the researcher, for curriculum development to take place.

5. Teachers in the technical secondary schools are qualified in very limited areas of

the syllabus; for example teachers of theoretical studies and practical studies are qualified separately and not interchangeable in the schools. Though the theoretical teachers cover several technical disciplines (e.g. electrical, building, plumbing), the practical teachers have their training confined to one area.

6. No attention is given to the students' interest and motivations as a predictor to their success in the plumbing section. Joining the plumbing section, as for all the other technical sections, is based mainly on the students' prior achievement grades, but access to the plumbing section (except for an enthusiastic minority) is mainly by rejection from other options.

1.4 General Research Aims

The research therefore has as its main aim a contribution to developing the effectiveness of technical education in the technical secondary schools; doing this requires the drawing out of job description profile and understanding the teachers and students. It is therefore an attempt to develop *foundations* for policy and curriculum improvement based on understanding the following (in general and with particular reference to plumbing):

1. To investigate the extent to which the technical education objectives correspond to the objectives of the labour market.

2. To identify in technical educational outcomes (i.e. the students)

   (a) The extent to which they are qualified to *join* the labour market,

(b) The identification for curriculum purposes of those skills required by the plumbers to *be successful in* the labour market.

3. To identify parameters with regard to present students' motivation, attitude, career plans and learning difficulties.

4. To identify parameters with regard to present teachers' with regard to their levels of education and training to teach, attitude and career plans; including their perceptions of difficult areas to teach

5. To attempt to identify the main educational guidelines to achieve commercial success in the plumbers' labour market.

It should be noted that the purpose of the present study is not to design a new curriculum. However, it aims to contribute to the technical education training programmes provided to Egyptian technical students, through offering foundations on which to plan a new curriculum for plumber technical education in Egypt.

1.5 The Hypotheses of the Study

1. There is a difference between the UK and Egyptian plumbers sample regarding:
    - a) Level of Skills
    - b) Level of Qualification
    - c) Income
    - d) Means of improving skills

e) Reasons for joining the labour market

2. There is a difference between the education systems and cultures of Egypt and the UK, which implies an inability of adopting the same system and curricula.

3. There are problems of motivation of the students in Egypt joining the plumbing section.

4. There is a difference between what the Egyptian students receive in their education and their employment requirements.

5. There is a difference between the technical education teacher qualification training and the teaching tasks they are required to perform.

1.6 The Originality of the Research

A thorough search of the literature on technical education in both Egypt and the UK has not yielded any relevant specific studies concerning plumbing. This is unlike the case in the USA where there is an abundant number of research studies in that field, though those identified were almost entirely action research in the field of curriculum innovation and evaluation. The few examples that were useful were noted earlier in Section 1.2.4.

Thus, the present study is the first study of its type in the Middle East, as well as in Egypt, to tackle the understanding of the variables affecting the success of the technical education system in meeting the needs of the developed labour market in this field. It is the first quantitative comparison of plumbing skills training in correspondence with the UK. It makes a significant and original contribution to our understanding of the reasons for deficiencies in the present system, and potential routes for progress.

The data from the study could enable the instructors and administrators to identify and analyse the needs as indicated by the students, plumbers, and their employers and adjust their programs accordingly.

The significance of the present study also derives from the fact that it is the first research study in Egypt and the Middle East to redesign Thurstone's Interest Inventory (1947) into an Arabic version and apply it on Egyptian technical secondary school students as a means of testing their interest and as a predictor of achievement. In order to achieve this aim the researcher had to take into consideration the issue that some occupations in the original Thurstone inventory were not familiar to the Egyptian technician students. A second major issue was that of culture; these procedures are discussed in detail in Chapter 8.

1.7 Structure of the Thesis

This section outlines the content of the remaining eight chapters:-

One of the first steps during the research process has been to set the questions asked in the context of general information about Egypt. This general information is covered in Chapter 2 and Chapter 3. Literature searches are embedded within these chapters.

Chapter 2 consists of three sections. The first section deals with the education system in Egypt: its aims, policies, education structure and such relevant issues as class sizes. It also includes description of the system and subjects. The second section of chapter two deals with the technical education system in Egypt: its history, aims, regulations, subjects and its specific problems. The final section of Chapter 2 deals with teacher training in Egypt with special attention devoted to the technical teacher training which is the core of the present research study.

Chapter 3 covers the social history of plumbing in Egypt as well as the present day the social, economic, and historical context of plumbing.

Chapter 4 covers the methodology for the empirical research, data analysis of the preliminary study, along with justification for the data collection methods chosen.

Chapter 5 reports the implementation, description of the sample and the discussion of the findings of the quantitative study of the characteristics of both Egyptian and UK practising plumbers.

Chapter 6 reports the implementation, description of the population sample and the discussion of the findings of the qualitative study of the background attitudes and abilities of the Egyptian practicing technical teachers.

Chapter 7 reports the implementation, the sample and the discussion of the findings of the quantitative study of the background interest and opinions of technical education students in Egypt. It is also reports the implementation of the modified Arabic version of the Thurstone Interest Schedule on the Egyptian technical secondary students.

Finally, Chapter 8 discusses conclusions from the study, makes recommendations and suggests areas for further research.

Chapter 2

The educational context of the research study

2.1 The structure of education in Egypt

This second chapter begins to set the scene in which the research is based. The motivation underlying this research is concerned with the training of teachers for technical education. The particular focus is that of training those technical teachers who will train the next generation of plumbers. In order to understand the relevance of the research and the more subtle points of interpretation it is necessary therefore to understand both (a) the educational context in which the research takes place and also (b) the social, historical and economic context with regard to the technical issues concerned. These two areas form respectively this chapter and the following chapter of this study.

2.1.1 Principles and general objectives of education in Egypt

Egypt and its political leadership are always careful to place education at the top of the country's priorities (Ministry of Education, 1999(a): 3; Noweir, 1999: 4).

Egypt's education policy attempts to meet the real needs of the people and effectively cope with international challenges. This policy is based on several principles: education as a national security issue and as an investment; equality of educational opportunities; democracy in policy-making; and ensuring that education does not place any additional burdens, financial or psychological, on families (Senate, 1998:10; Al-Sayyid, 1999: 5; Abdel Maksoud, 1999: 8).

2.1.2 Current educational priorities and concerns

Egypt's national economy is organised according to an overall development plan geared to increasing the national income, distributing justice, and raising the standard of living, as well as eliminating unemployment, increasing job opportunities, and linking wages to production. Since 1991, Egypt has started implementing programs for improving its economic performance, increasing production and productivity, doubling exports and lessening imports, controlling inflation, as well as reducing the balance of payment and national budgetary deficits (Galal, A., et al, 1996:2; Baha El-Din, 1997: 13).

The family is seen as the cornerstone of society in Egypt and is anchored in religion, morals and patriotism. The country is keen to safeguard the original features of the Egyptian family as represented in its values and traditions. Moreover, the country cares for the protection of motherhood, children, and youth (Senate, 1998:275).

Since the onset of the 1990s, education and culture have been made a priority, and Egypt has been exerting its efforts to develop education at all levels as the cornerstone of progress (Senate, 1998). The new education policy specifies a number of approaches, which aim to upgrade the national condition of education in quantity and quality (Galal et al, 1996:7); a few are listed below.

A reform of teachers' conditions: training programs were organised by the internal training centre collaboratively with faculties of education and 400 teachers were annually sent to advanced countries beginning in 1993. This number increased to 1,000 teachers annually starting from the academic year 1996. Teachers are also sent abroad for training in fields such as modern methods of teaching or induction in the use of advanced technology. (Galal et al, 1996:7)

Improved flexibility among different types of education: a system was set up to help technical education graduates to join the universities and higher education institutes. Alternative opportunities were made available to encourage young men to complete their university and higher education through open education and oriented matriculation. Moreover, professional and academic higher studies diplomas are currently available to achieve the concepts of continuous education and transformative training. (Senate, 1998:281-282)

Initiatives in curriculum development: the focus is on the acquisition of basic skills, self-education, and the use of new technology and information. Emphasis is placed on Arabic as well as foreign languages to help the learner be able to understand other cultures. Great importance is given to sciences and mathematics. In addition, religious education moulds values and principles. Furthermore, in the new education policy, educational media such as computers, television, broadcast, language laboratories and sciences were developed to be used as teaching media. (Senate, 1998:280)

It is an educational priority in Egypt to attempt, insofar as it is possible, to be up to date in the use of modern techniques and facilities – and to use cost-effective methods. The Ministry of Education (MOE) and the Broadcast and Television Union are co-operating in the development of educational programs and distance in-service education, producing educational media including video tapes, multimedia discs, educational computer programs and audio cassettes, and developing science clubs. About 200 secondary schools and 50 preparatory schools have been equipped with the required appliances for connection with the International Network for Information (Internet) so that one such school at least is established in every district throughout all governorates. (UNESCO, 1999:3)

Yet other priority approaches are: fostering religious and artistic activities; nutrition and health care for students and attention to pupils with special needs; the development of technical education; sustaining higher and university education;

promotion of the role of the private sector; and a ten-year campaign for the eradication of illiteracy (Birdsall and O'Connell, 1999).

Despite the huge efforts exerted and the tangible increase of education allocations in recent years, there are still many difficulties facing the process of education reform, such as:

- Seeking adequate financing for the overall education reform;
- Generalisation and dissemination of compulsory education, particularly in rural areas and among disadvantaged people, especially women and girls;
- Construct enough schools to allow full enrolment, reduce class sizes and the multiplication of school shifts;
- Raising the required allocations to continue improving the material and social conditions of teachers and upgrading their professional and scientific standards;
- Overcoming illiteracy and developing systems and programs of adult education, particularly in remote areas. (Baha El-Din, 1999: 40)

We thus see that technical education, though a significant priority area with implications for national economic development, is only one such area that has to contend with other priorities in terms of support.

2.1.3 Vocationalisation

In order for the Egyptian technical schools to develop, they should be affected by the experience of the developed countries, especially the industrial developed countries, because these countries use new technology and new methods. In a World Bank funded project (Middleton,et al :1993:186) it was noted that…

...vocationalization" of secondary education is taken to mean curriculum change in a practical or vocational direction. This is an old and recurring policy theme in many countries, especially in the Third World (Lillis and Hogan, 1983; Hultin, 1987; Chisman, 1987; Gustafsson, 1987). What is remarkable in the 1980s is the prevalence of vocationalization as a trend that transcends the divide between rich and poor countries, and between different political systems (Grubb, 1985; Droogleever, Fortuijn et al., 1987). The range of country case studies included in this volume illustrates the international importance of the theme.

It will be argued that these policies are mainly a political response to poor articulation of schooling with the labor market. Vocationalization is intended to ease school-leavers into jobs or self-employment, under conditions of widespread youth unemployment. An important question then is how far this intention is realistic. Critics of vocationalization argue that it is not, and that educational change, at least in the short run, does not alleviate depressed economic opportunity. Vocationalization policies are nonetheless a response to economic recession. But recession means tight public finance, making it harder to meet the greater cost per student that vocationalization requires. It will also be argued that vocational and practical subjects, as "pedagogic systems," have unusually complex requirements which are not easily met, especially when they are to be established quickly and on a large scale. These equipment, materials, curriculum, support system, personnel and management requirements are especially difficult to meet in developing countries-even if finance were available and barriers related to lack of interest among pupils and parents were overcome.

Youth unemployment may provide the political momentum behind the vocationalization trend, but there are long-standing justifications for "practical subjects" according to certain internationally influential concepts of general education which are related to political ideologies. "Educators" tend to stress these concepts more, whilst "trainers" and politicians tend to stress labor market relevance, sometimes leading to ambiguities within the curriculum (Jon and Kevin Lillis, 1987; Vocationalization of Education, Unv. of London, UK. p3) to prepare the technicians. This preparation is harmonized with the big changes and developments that happened in the end of this century in a lot of fields.

In addition, many people believe that academic education leads to a disdain for manual labor, thus exacerbating the difficulties of absorbing school leavers into the work force. Academic secondary education has been diversified in an attempt to equip students with "practical skills" knowledge of how to make or do things and to create positive attitudes towards blue-collar work.

The importance of vocationalisation of education, seen from an American viewpoint, is very well discussed in The Encyclopedia of Educational Research (Mitzel, 1982: 2002-2012)

2.1.4 Administration and management of the education system

Galal et al (1996:20-21) record that the Ministry of Education (MOE) is responsible for all matters of policy, except for higher education, planning, budgeting, implementation and follow-up. It has the responsibility (amongst other issues) for determining curricula, textbooks and educational aids and identifying the necessary levels of teaching staff. It also communicates with various universities, higher institutes, other ministries, organisations and institutions of the State (whether production or service ones), which represent the general activity of the State in economic and social sectors. It is important that the MOE educational plans can move in parallel with the plans of these organisations and can be consistent with them.

The MOE also is responsible for the statistical and economic assessment of the educational process in the country, and for issuing yearly reports.

UNESCO (1999) notes that, at the regional level, the Educational Directorates in the Governorates (regional government areas) are responsible for all practical matters pertaining to the schools in their areas (including appointment and placement of staff, school health care issues, etc.). They study the environment of the governorate and its particular educational needs, and suggest those projects that will be consistent with these needs. Technical secondary education is thus administered and controlled at this level of government.

> They also undertake the executive procedures of educational policy in the governorates and supervise the educational process in all pre-tertiary stages in their areas. They participate in developing administrative and technical structures and in implementing procedures and communications. They look after youth education, and develop the athletic spirit within and outside schools, and co-operate with both governmental and non-governmental institutions and bodies working in the field. (UNESCO, 1999)

The Educational Directorates participate in the illiteracy eradication campaigns, co-ordinate the enrolment policy and are responsible for the establishment and general management of general and technical secondary schools. They also open new schools, determine the dates of vacation periods and school timetables and supervise the application of the curricula assigned to them by the MOE. Finally, they administer the examination for the Primary School Completion Certificate and the Preparatory School Completion Certificate within the governorate.

The Ministry of Al-Azhar Affairs looks after the educational policy and plans of the Al-Azhar schools, colleges / institutes and university. These form a separate system of education, state funded but with a special relationship with government, with schools very similar in many ways to the aided denominational schools of the UK.

> The Al Azhar school system is more or less identical with the secular system of basic education. The difference is that Islamic studies are given more emphasis. However, for ordinary school subjects, the curriculum is the same as for the secular schools.
>
> (Mahrouse, 1995:290).

In this, "...ordinary school subjects..." does not include technical education, which is not available under the Al-Azhar curriculum.

A separate Ministry of Higher Education supervises higher education programs.

2.1.5 Structure and organisation of the education system

The official duration of the school year is 34 weeks at the primary level and 32 weeks at the preparatory and secondary levels. The academic year is divided into two terms separated by a mid-year vacation lasting two weeks.

Pre-School Education

Kindergarten is an optional educational stage lasting two years from the age of 4 to the age of 6. Much of the kindergarten phase is independent of the state system. Enrolment is determined by the rules and regulations established in the Ministerial Decree No. 154 (1988). In excess of 75% of children (both boys and girls) attend kindergarten for the full year.

Basic Compulsory Education

Compulsory basic education starts at the age of 6 years and continues for eight years (i.e. to age 14). It includes the primary cycle (five years) and the preparatory cycle (three years). These are in separate schools in the state system, but are merged in some private schools (Soliman, 1998:17). Primary attendance rates ate given by UNESCO (2003: 118) as 87% for boys and 83% for girls.

Secondary Education

Secondary education is compulsory up to the student's 16th birthday and lasts a minimum of three years. It has both general and technical pathways for the students; these operate in separate schools. Technical education (covering the industrial, agricultural and commercial areas) is offered at two levels: the level of preparing technicians in three-year technical secondary schools; and the level of preparing trainers or chief-technicians in five-year technical secondary schools. Both technical routes may exist within the one school (Abo Zid, 1997:39-41). The details of technical schools are discussed later in this chapter. Table 2.1 shows the joining age in the Egyptian governmental schools.

Table 2.1: The joining age in the Egyptian governmental schools

	Number of years	Age* of joining	Age of finishing
Primary stage	6	6	12
Preparatory stage	3	12	15
Normal secondary stage	3	15	18
Technical secondary (3yrs)	3	15	18
Technical secondary (5yrs)	5	15	20

* The age of the students is calculated at the 10^{th} of October of every year.

Higher Education

Higher education includes university education, and non-university higher education (in the form of institutes). These are mainly state run, but there is a small private higher education sector, including universities.

The length of studies ranges between four and five years (or six in such faculties as medicine). There are 14 universities in Egypt, twelve of which are affiliated to the Supreme Council of Universities (SCU), the other two being highly specialised institutions.

There is also a government-supported Open University by which students who have missed the chance of completing their education can do so through correspondence courses. Typically, in excess of 20,000 students are enrolled, with the number continuing to grow at approximately 10% per annum (UNESCO, 1999:16).

2.1.6 The educational process

The pre-primary education stage aims at achieving the comprehensive development of pre-school children and preparing them for joining basic education. The pupil-teacher ratio is 26:1, and the average number of pupils per class is 36; data refer to 1996/97 (Ministry of Education, 1998: 3).

With primary education, the State has a priority to provide basic education for all children aged 6 years upwards. Parents are obliged to have their children educated for a period of eight years – though parents are no longer punished for their children's non-attendance. The governors administer the decisions necessary for regulating attendance. The governors do the selection of places and in the case where there are vacant places children may be enrolled at the age of five and a half years provided this does not overload the assigned class size (UNESCO, 1999:12; Adel, 1987:40).

> In accordance with the Ministerial Decree No. 71 of 1993, the primary school cycle is divided into two levels. The first level involves the first three grades, during which a child acquires the basic skills of reading, writing, math and religious education. The second level involves the fourth and fifth grades, and aims at the child's functional use of the basic skills previously acquired in everyday life activities for fear of a relapse into illiteracy. (UNESCO, 1999:12)

Senate (1998) draws attention to the fact that, to achieve the aim of this cycle, the Ministry of Education has focused on the evaluation tools regarding pupils, with attention to their overall development. The point is made that evaluation should not be confined to using achievement tests but, in addition, it should include oral performance tests according to the nature of the educational experiences offered. Thus, developing examination systems should not be confined to measuring the information content learned by heart, but should go beyond that to the measurement of the pupil's ability to deduce, relate, synthesise and criticise. This is important in scientific and technical subjects in particular. At the end of this cycle, students are awarded a Primary Certificate.

In the primary cycle students are assessed through two written examinations, at the end of years three and five respectively. Such summative tests are organised by the educational administration (i.e. they are not internal school exams). There are no grades given for activities (internal tests, coursework, etc.) throughout the school year. In the formal examinations students are assessed through written examinations held at the end of the academic year and set at the governorate level. Successful students are awarded the Primary Certificate. At the primary stage, the pupil-teacher ratio is 25:1, and the average number of pupils per class is 44 (Higazi.2000:15).

In Egypt, between the primary and secondary phases there are three years known as 'intermediate' or 'preparatory' education. This is very similar to the middle school system in parts of the UK. These schools have a common curriculum for all students. Again, at the end of these years the students have to do a formal examination run by the governorate, leading to the Preparatory Certificate. At the preparatory stage, the pupil-teacher ratio is 21:1, and the average number of pupils per class is 41. (The data refer to 1994/95, the most recently available complete data. This also applies to subsequent data in this chapter).

There is an alternative system of education at this stage for students with special educational needs in the form of Preparatory Practical Schools (Hyde, 1978:87). These deal with students who have conditions of blindness, deafness, with speech problems or who have been classed as 'mentally defective'.

Secondary education aims at preparing students for practical life while, at the same time, preparing them for higher and university education. It was noted in the previous section that general and technical secondary education are separated.

At the general secondary stage, students have two written exams, one at the end of the first school term and another at the end of the second school term, as the academic year is divided into two school terms. There are no yearly work marks for students. In addition, there are practical tests for some subjects (chemistry, biology, physics and the practical fields). For the second and third grades, students are given the General Secondary Stage Certificate Examination, which is administered in two stages – the first of which is at the second grade and the second is at the third; the total of both exams comprises the students' result. At the end of these exams, students are awarded a General Secondary Stage Certificate. All students who join general secondary schools have to study the same subjects in the first year. When they join the second year they are divided into scientific and non-scientific sections according to their will. The scientific section leads the students to scientific faculties, while the non-scientific section leads them to the rest of the faculties. Both of the second year and the third year represent the main and the final national examination known as "Thanawya ama". These years are important for the students, because if they do well they can join higher education. The students study six days a week. Friday is always free. The day starts at 8 am until 2.30pm. The timetables are not the same in all classes. That depends on the number of teachers in the schools and the number of classes, because most teachers teach the three years together. Each lesson is 45 minutes (Razik and Zaher, 1992:95).

Technical secondary education operates with similar class times and with parallel regulations, but with an examination system that recognises the applied nature of the studies.

At the general secondary stage, the student-teacher ratio is 14:1, and the average number of students per class is 40. At the technical secondary stage, the student-teacher ratio is less generous at 17:1, and the average number of students per class is 38. (This data refers to the academic year 1994/95.) It must be noted that these class sizes are averages and in practice a particular class could be as high as 60 or more. This presents particular difficulties in the technical secondary sector. Table 2.2 shows the growth of this sector and the increase in class size over four decades.

Table 2.2: The number of schools, classes and students in the technical education sector from years 1952-52 and 1994-95			
Years	Schools	Classes	Students
1952-53	29	432	11141
1994-95	385	20915	757628

2.1.7 Laws and other basic regulations concerning technical education

Educational policy in Egypt relies on democratic constitutional principles, which specify its general framework and determine its basic features. These principles are the following (Ministry of Education, 1998; translated from Arabic):

> The State recognises education as a right and supervises all levels of education. Primary cycle education is compulsory and the State attempts to extend the duration of compulsory education to other cycles. The independence of universities and scientific research centres is guaranteed. This in turn will link education to the production sector and society's needs (Article 18).
>
> Education in all the State institutions is free at all its different levels (Article 20).
>
> Eradication of illiteracy is a national duty that necessitates the mobilisation of all the people's potentialities to realise it (Article 21).

Two constitutional principles govern education, equal opportunity and equality, as mentioned in the following articles:

> The State supports equal opportunity for all citizens (Article 8).
>
> Citizens are equal before the law. They are equal in general duties and rights. There is no distinction among them because of sex, race, language, religion, or belief (Article 40).

2.1.8 Facilities for practical subjects

The teachers of practical subjects, such as Physics, Chemistry and Biology have a big problem in that there are no laboratories in most of the schools (not even in the technical secondary schools). Simple demonstrations are done in conventional classrooms where possible. There is a similar lack of tools and materials in the schools for practical work in technological subjects. That leads the students to learn their lessons in classrooms without doing any practice (Mahrouse, 1992:1941).

> The Book Sector of the Ministry of Education provides school textbooks for all stages of education from kindergarten until the end of the general/technical secondary education in a way that realises self-sufficiency in this field. The Book Sector of the MOE also provides school textbooks at all levels and assessment manuals (199 different books for a total of 162,962,500 copies in the academic year 1995/96.) Importing school textbooks and even translated foreign textbooks has stopped as they are now printed in Egypt. (UNESCO, 1999:18-19)

The Ministry has put forward a comprehensive plan to develop education through technology, considering that technology is not an end in itself but a means to the real end of educational development. This is very relevant to the technical education being studied in this research. Computer laboratories have been set up for showing multimedia programs. It is the most modern means of self-learning through the use of the computer as an educational aid. Multimedia labs have been established in 50 secondary schools distributed in seven governorates, but very significantly none of these are technical schools. This experiment is being generalised to 400 secondary schools, 200 preparatory schools, 200 primary schools and 200 kindergartens, and at this stage there is no plan again for inclusion of technical education.

Two hundred secondary and 50 preparatory schools are being equipped (1995-2005) with the necessary equipment for connecting these schools to the Internet, with the aim of encouraging the student and the teacher to keep up with sources of science and knowledge through the international information nets and thus developing self-learning ability.

2.1.9 Financing of education

The Egyptian government has "consistently allocated a higher percentage of GDP to education than the corresponding average in other developing countries at a similar level of per capita income" (Tabala, 1999:8; Galal, 2002:12).

> The government supplies most of the funds for education. Private funding of education is mostly in the form of tuition paid to private schools. Parents do not pay fees for their children to attend government schools. (El Baradei, 1999:23)

In the state sector parents do contribute a small sum each year towards tuition and books, and in technical secondary schools, some materials. It is variable between schools. It is for that reason that El-Baradei (1999:56) argues, using her term, the 'false entitlement' of free education in Egypt. She provides evidence that shows that the Egyptian households spend a significant percent of their income on their children's education.

However, the current government educational policy is aiming at bringing about an unprecedented increase in the financial allocations for the total education budget. Investment in education is a major priority, and in recent years the government has been successful in significant increases in provision. In addition, the government encourages public contribution to education and efforts in education (Shafik, 1996; 20)

2.1.10 Private education

The role of private education is to integrate with public education to raise educational services for citizens, in such a way that the services are amalgamated within the State's general educational policy. This concept calls on the State to supervise private education, to ensure that it complements the State's educational policy. The State therefore, through the Ministry of Education, encourages private education, licensing school establishments in line with the Ministry specifications for government schools, and creating an appropriate climate to promote private investment in educational projects. This private school system started principally in 1975.

Decree No. 306 of December 1993 (Ministry of Education, 1993) organises work in the field of private education from the beginning of the academic year 1993/94. Private schools are established to realise all, or some, of the following objectives:

- Assisting in the field of primary, general secondary, or technical education according to the set plans and curricula of the counterpart secondary schools;
- Expanding teaching foreign languages side by side with the set official curricula;
- Teaching special curricula according to a decision from the Minister of Education and agreement of the Supreme Council for pre-University Education.

Every private school should have a director, a headmaster, faculty staff, a financial and managerial body, and full-time workers having altogether the same competence, allocations and conditions as those set for counterpart official schools.

Private schools are required to establish an internal guideline pertaining to course work, in accordance with the Education Law No. 139 of 1981 and its amendments (Ministry of Education, 1981). In addition, the school determines its own tuition fees, school activity fees, as well as other fees, according to the school budget schedule. Private schools follow the same conditions and rules as government schools do regarding admission, transfer and enrolment applications.

Full statistics on private education are collected every ten years. In primary education, the number of schools in the academic year 1995/96 was 1,130 (533,403 pupils). In preparatory education, the number of schools in 1995/96 was 649 (138,778 pupils). As far as private commercial education is concerned, the number of pupils was 123,063 in 1995/96, due to a limitation introduced in government schools in this subject area.

Through the approval of the Minister of Education, it is possible to license private schools to add some studies to the original schedule, if there are justified technical reasons. Each private school is committed to teach the original curricula set in counterpart official schools. Revision of supplementary study books is carried out by the Ministry to ensure their validity.

The examination system at private schools applies the same rules followed at counterpart state schools.

Councils of parents and teachers, and student unions are established in private schools according to the ministerial decrees applied in counterpart state schools. Pupils at private schools at all levels are obliged to reimburse the medical insurance fees, according to Law No. 99 of 1992 and its related decrees. Educational directorates still continue to apply the care system in their areas to guarantee the continuity of the health and safety for students in these areas.

Staff performance in private schools is evaluated according to the system followed in state schools. Training of teachers and educational leaders at private schools is conducted at their expense. This type of training should be under the supervision of the educational directorate concerned. The Ministry is planning to give private education teachers the chance to enjoy the advantages of training abroad, training in computer usage, and holding in-service training sessions.

Educational directorates and zones ensure the supervision and the evaluation of private schools located in their areas in all aspects, as in state schools. They follow the same rules adopted for counterpart state schools.

From the viewpoint of this research, however, the technical subjects are very obviously missing from private education. The reason is that private education is expensive, and technical education done well requires workshop space, small classes and a good supply of materials, tools and equipment, all of which are expensive and will affect school fees. The employment prospects of students having undergone technical training are poor, and the rewards are low compared with careers in medicine, engineering, etc. Parents are unwilling to pay for private education where the benefits to the student are so poor.

2.1.11 Adult and non-formal education

There are several types of non-formal education institutions in Egypt.

- Literacy classes affiliated to the MOE through the Organization for Literacy and Adult Education. The number of literacy classes in 1995/96 amounted to 45,539, with a total of 992,476 learners. With a view to achieving higher rates, a plan was prepared for enlisting 150,000 teachers to eradicate illiteracy by the year 2000.

- Literacy classes affiliated to other organizations: the Ministries of Defense, Interior, Culture, Agriculture, Labour, etc
(UNESCO, 1999:25)

There are 'One-Class Schools' for the education of women. Egypt has known this kind of education for a long time. They used this kind of education for worthy individuals, especially for females in the countryside (Hyde, 1978:84). The traditional age-group for this non-formal system is 8-14 years. By 1996, there had been constructed 550 one-class schools plus 906 temporary such schools, for a total of 1,456 schools with 15,806 learners.

There is another type of education in the countryside. One hundred Community Schools have been created with the collaboration of UNICEF.

> This project aims at providing education for all, through satisfying basic needs for education and making these schools accessible to certain poor classes that are deprived of educational services in rural areas, especially in small villages and hamlets. (UNESCO, 1999:62)

It has already been noted that there are two kinds of industrial education in Egypt – vocational and technical education (Galal et al, 1996:24). At preparatory level the vocational education is delivered through the non-formal route.

> ...Special Vocational Training Systems linked with literacy programs, i.e., Rapid Vocational Training for 16-20 years old, or vocational training catering to basic education drop-outs aged 12-18 years, who spend seven months in training centres plus two months on production sites. (Abdel Maksoud.1999:21; translated from Arabic)

There are also...

> ...Vocational training centers affiliated to various ministries (MOE, Supreme Council for Youth and Sports, Agriculture, Social Affairs. Abdel Maksoud.1999:21; translated from Arabic)

...and also Multipurpose Adult Education Centres aiming at eradicating illiteracy, Supplementary Study Centres are affiliated to the MOE, Literacy Programs for special groups such as handicapped citizens, and Advanced Programs exist for Adult Education.

The Ministry of Higher Education supervises a number of non-university higher education programs through several councils.

An adult literacy curriculum implementation takes 18 months divided into two levels, and the programme involves 456 study hours for each level (16 study hours per week). Textbooks are the same as those prescribed for the primary stage, and the curriculum includes the following subjects: Arabic, arithmetic and geometry basics, general culture (which involves religious, social, health and scientific elements) and vocational training (covering carpentry, plumbing, wood painting and tailoring for men, and sewing, knitting and food industries for women). However, this level of vocational training is for general educational purposes only and does not provide an adequate background for working as a tradesman.

2.2 The Technical Education System in Egypt

2.2.1 A Brief History of Technical Education in Egypt

Technical education in Egypt is of a very old history, maybe the oldest among all Arab countries. It first started long before there were any technical schools. The crafts were practised in three places: home, workshops and temples. These crafts in Egypt were inherited in the same family, and passed from father to sons from generation to generation. Over time, technical education faced a lot of improvements and decline affected by political conditions, both locally and intentionally, until we reached our present time in which the technical secondary education is seen by the Government as one of the very important factors of economic improvement (Senate, 1998:18; Morsy, 1987:39)

The country had always paid a lot of attention to improving human resources and settings, as well as developing the technical and vocational educational system. There are 1081 technical and vocational secondary schools at present in Egypt. This shows the importance of this kind of education and the increasing need of it (Arab Organisation, 1997:111).

In the 18th century a new national system appeared briefly called the "technical school". This system included all members in Egypt of the same craft who aimed at preparing new generations of young men to occupy the same craft and to master the inherited skills. This "technical school" was also responsible for development of the craft area. But this system did not last for long and disappeared with the appearance of new skills and crafts that were brought to Egypt with the French occupation in 1798 (Abo Zid, 1997:29).

In the first half of the 19th century King Mohammed Ali wanted to establish a strong army that would enable him to form a large empire. Thus, he made a reformation in all the fields: agricultural, industrial, and commercial. This reformation required him to establish a new kind of education that would graduate well-skilled workers. He thus used the factories that were already present to train these workers (Williamson, 1987:60).

From 1805 until 1829 the factory was the only available place for training these workers as well as being the place of production. There was just one school in existence for the training of agricultural and technical specialists (Sharaf El Den, 1995:18)

In 1829, in King Mohammed Ali's reign, the first technical school in Egypt was built followed by several additional ones, as well as naval schools and the military schools (Motawaa, 1989:61). This was the first technical school in any Arab country (Arab Organisation, 1997:110) By 1887, this school was regarded as a secondary school, to be joined by pupils who had finished the preparatory stage (El Fiky, 1977:115-116). There were nine workshops in this school. In 1889, another governmental school was established in El-Mansoura, called "the technical art school", with a 3-year study system (Sharaf El Den, 1995:19).

Motawaa said (1989:59-61) in the beginning of the 20th century technical education in Egypt witnessed some further developments. Nine technical schools were built, distributed all over the country, to graduate workers and craftsmen. The study in these schools extended for four years and anyone that was capable of reading and writing and had some basic calculation skills was able to join in. In 1904, another technical school was built in Alexandria and the El-Tawfeek technical school was built in Cairo through the Catholic Documentation Society, as well as another one built afterwards by that society in Boolak in 1909 .

The period from 1911 till 1929 is considered as a particularly nourishing age in the history of technical education, due to national awareness and citizens' contribution in spreading education in general. A lot of technical schools were then built through other charitable societies (and some philanthropic individuals) until the number of technical schools reached 21. The duration of study was then expanded to five years.

In 1929 the technical schools changed their regulations, accepting only students who had finished their primary stage of education. These schools, having a better-educated input, could also decrease their years of study from five to three. A new system was also introduced allowing the top students who graduated from these technical schools to continue studying for two further years to become practical teachers in the workshops. The new system was called the "Secondary Technical Department". This system interestingly parallels similar developments in technical education in the UK (Motawaa, 1989:61)

From 1936, preparatory technical schools were built. These were for students who had completed the primary phase of education. The study in these schools was for two years, to teach the students some simple handcrafts. In 1938, these schools were modified to three years (Ministry of Education, 1970:8).

In 1937, the government decided to change the technical education system in Egypt. It divided the 25 technical schools that were present in that time into seven districts covering the whole country; and increased the study years again to five years to qualify the students to be professional workers in the following specialisations: watch repair, carpets, fabrics, plumbing, engraving, commerce, cars, electricity (El-Meligi, 1987; Abd El Hamed, 1991:22).

Other efforts were exerted towards the technical education and its improvement in Egypt, until the Secondary Education Law was issued in 1951, which divided the secondary education into two sections: general education and technical education. Then another law was issued to regulate the technical education separately (Sharaf El Den, 1995:19). Technical education was divided into four sections:

(a) Technical preparatory schools, to graduate technicians with an intermediate proficiency level – the study in these schools was for three years, accepting students who had finished their elementary primary education.

(b) Technical secondary schools, to graduate technicians with high proficiency – the study lasts for three years; students can join these schools after the three-year preparatory schools. Students finishing these technical secondary schools could join the university, but only under certain limiting conditions.

(c) A technical teacher institute: to graduate technical schoolteachers.

(d) Private practical and scientific studies for people occupying various crafts to improve their skill proficiency level (Ministry of Education, 1956:3-5).

Hopwood added (1982:34-58) that, after the 1952 revolution, the new government paid much attention to developing the educational system in general in Egypt, including also technical education, especially after making education free for all students. The new improvements were as follows:

1) Making the primary stage obligatory for all the students, lasting for six years starting from any age between 6 and 9 inclusive.
2) Making the preparatory stage last for three years (general preparatory, technical, commercial, agricultural, or girls technical), and
3) Making secondary education last for three years (general secondary, technical, agricultural, or commercial) (Ministry of Education, 1970)
4) The next significant change was in 1970...

In 1970 a law was issued specifying the secondary stage as the only stage responsible for producing and graduating the "skilled worker". Students joining the stage were accepted only from those who have passed the preparatory stage successfully. This law also introduced a five-year system to graduate well-skilled "technicians". It also introduced the idea of continuous study, allowing those who finished the secondary stages to become practical teachers. In 1981, this law was modified to a new law which states that the secondary education system will graduate the well-skilled "technicians" in the fields of industry, agricultural, and trading, whereas, the five-year system will graduate "trainers" and "chief technicians".

(Ministry of Education, 1970, Law 37 translated from the Arabic)

In 1987, it was decided to build three-year technical preparatory schools accepting those who have failed to pass the primary stage or those who have failed in the first year of the general preparatory stage. During these school years the students were to study a practical syllabus as well as the theoretical subjects (Sharaf El Den, 1995:20).

In 1989, a law was launched allowing secondary stage students to transfer from the general secondary education system to the technical education system on the basis of interest at the end of the second year. It also gives the opportunity for secondary stage students who have used up their lifelines of passing the general secondary certificate examinations, to join the technical secondary education system. Then, in 1990, it was agreed to build three-year experimental technical secondary schools accepting students who have finished the technical preparatory schools (Abo Zid, 1997:34)

In terms of the present research, the writer would draw attention to the complexity of the present system of technical education in Egypt, and to the frequent changes in its recent history in terms of structure, regulations, and numbers of students and teachers. Table 2.3 briefs the development of the technical education in Egypt.

Table 2.3: The development of technical education in Egypt	
1837	Introduction of 'technical education stages of development'.
1844	The establishment of the first vocational school during King Mohamed Ali's reign
1868	This school was converted into workshops in Mohamed Ali's reign
1885	The vocational school came to existence once again in Kedewy Ismaeel's reign
1906	This school was devoted for industries and arts, and a governmental workshop was established in Bolak
1910	An administration for technical vocational education was established
1911-1929	A governmental workshop was established in Assuit
1935	19 governmental schools were established
1938	Technical preparatory school were established
1948	Technical primary schools were established
1953	Those who had secondary technical diploma could attend evening studies to get a general certificate equivalent to higher education
1956	Decree no. 22 discussed the appropriateness of the technical education with the philosophy of the society and the government's concern with the industry
1970	The first law for vocational education was issued
1978	The cabinet decree no. 157 was issued regarding the establishment of the comprehensive secondary schools
1981	Law no. 139 was issued regulating the basic education, general secondary education and the vocational education (technical, agricultural and commercial)
1990	The cabinet decree no. 277 was issued concerning the complementary studies to prepare practical teachers for the technical education
1991	The cabinet decree no. 63 was issued concerning the preparation of technical teachers for the basic education stage
*Data based on Senate (1998: 19) and Abd El Hakim (1993: 485-486).	

The issue that has not changed in Egypt, in common with many other countries, is the lower status of technical education in comparison with more academic and abstract studies. (Perhaps Egypt should consider the benefits of providing both types of secondary education to a child within the one school.) It is seen that this status is explicitly built into the system, technical education being for the failures on other routes. Such an attitude is unfortunate.

2.2.2 Aims and national goals of technical education in Egypt

The main general aim of technical and vocational education in Egypt is to produce well-trained human resources at different levels to meet the needs of the production and service sectors, as well as other needs of the labour market. This aim has two levels of goal: national educational goals and specialised vocational goals (Burns et al, 1982:94; Sharaf El Den, 1995:81).

The national goals for technical education are stated clearly in a number of sources, as well as in the Ministry literature (Senate, 1998:13-17; Sharaf El Den, 1995:62-68).

1) Comprehensive development of the students, especially concerning their sense of belonging to their country as well as building the Egyptian personality.

2) Developing an objective mentality, a vivid scientific outlook and a full ability to solve problems relying on scientific thinking. This also helps in developing the ability to adapt with new and different environments and situations.

3) Developing a positive perspective towards handcrafts, as well as setting and developing its regulations and ethics.

4) Coping with the scientific and technological revolution.

5) Contributing in the establishment of technical education.
   (Ministry of Education , 1956: 3-5– translated from the Arabic)

2.2.3 The specific objectives

The above principles have been expressed by the Arab organisation in specific terms as a target for the whole Arab nation to aspire to in terms of technical education. The aim is to express educational strategy goals, which are:

- Building the Egyptian personality, creating a productive society and achieving a thorough improvement in different fields.
- Preparing skilful and well-trained technical workers.
- Increasing the technical education contribution in the development of the society.
- Qualifying the students with skills and facilities that can meet them with the requirements of production; as well as preparing them to join higher education. These skills are: creativity, innovation, mastering their work, acquainted with the different tools, preparing work plans, being able to give a correct cost-estimation for the job.
- Elevating the standard of the continuous technical education.
- Qualifying the students work experience, knowledge, technical and practical skills to improve their technical abilities.
- Linking the technical education plans with comprehensive improvement plans and improving its curricula to cope with economic improvement needs. This includes increasing co-operation between technical schools, service sectors and commercial and industrial chambers.
- Making them able to use tools and equipment according to technical ways and regulations of industry safety and training the students to install, process and maintain them.
- Developing their ability to prepare executive designs, to read technical terms and engineering designs and to set detailed steps of processing order to decrease the costs of production.
- Improving the students' ability to perform their work effectively to face the work field continuous and changeable requirements.

(Arab Organisation, 1997:111-113 – translated from the Arabic)

2.2.4 Special characteristics of the technical education curriculum

Technical education in Egypt has its unique characteristics, in addition to the ones shared with general secondary education. These unique characteristics are represented in acquiring skills of different crafts, both traditional and modern. Thus the objectives of the psychomotor domain (Bloom,et al, 1956:206) are prevalent in this kind of education in addition to the two other educational domains that Bloom sets, namely; the cognitive domain (Bloom et al, 1956) and the affective domain. The most important features of the technical education curriculum, according to ministerial documents are...

- Its ability to translate the technical education objectives that are concerned with preparing the students and qualifying them to the required performance in work and production fields.

- To grant a real interaction between the technical education and the labour market and its requirements according to plans. The curricula rely, in achieving this goal, on the nature of the tasks required from the graduates to perform in the production and service organisation.

- The flexibility and ability to cope with the fast non-stop progress in technology and means of production.

- Takes into consideration the importance of making the applications and practical side more prevalent than the theoretical one in order to acquire different skills that are required in this kind of education.

- Takes into consideration the necessity of preparing the students, mentally and ethically, to be good citizens capable of serving their country.

(Ministry of Education, 1995: 3-4; Senate, 1998:140)

The above points are very important to show the idealism of the management of technical education, but it is noted that as yet there is a long way to go to accomplish the desired high standard.

2.2.5 Types of technical education in Egypt

The detail of the present-day (2003) technical institutions is as follows (Ministry of Education, 1994; National Center For Educational Research and Development, 2001: 10).

Technical preparatory schools

The purpose of these schools is to commence preparation to graduate workmen with normal skills. Students who fail academically in the primary schools have another way to continue their study; they are transmitted to agricultural or industrial preparatory schools to study only agricultural or industrial subjects respectively for three years. Students who finish this stage go to the corresponding agricultural or industrial secondary schools for three years. Students who achieve high scores in the last year of the agricultural or industrial secondary schools may join higher education.

Entry regulations of the technical preparatory schools in Egypt

Study lasts for three years. Those who are accepted in the first year should fulfil the following conditions:

1) The student should have successfully completed the primary stage or anything equal to it (six years).
2) In the first year the student should be between 12 and 14 years of age.
3) The student should successfully pass any sanitation* system tests.

* The word 'sanitation' is used in this thesis as the best translation of the Arabic word that is used to describe the whole of the water system in a property: it covers water supply input, household plumbing systems, waste water systems and sewerage.

4) He should succeed in the placement test made by the school he is applying to, to test his vocational readiness. (Senate, 1998:125-139)

Of those who pass these tests, younger students will have first priority to be accepted.

Subjects taught in the technical preparatory schools in Egypt

Subjects taught in this stage are: Religion, Arabic, History and Geography, National studies, Foreign language, General science, Accounting principles, Mathematics and Geometry, Engineering drawing, Technical mathematics, Technical drawing, Science for industry, and Workshops (Ministry of Education, 1989: 14-16).

On top of these subjects, schools practice free-school activities (i.e. extra-curricular activities) in such a way that would suit the environmental and students' conditions. These activities are practised outside the school.

After meeting with the consulting council for technical education, the Minister of Education regulates the distribution of the subjects taught in each year of study, the number of lessons, the maximum and minimum marks of the exams, as well as the duration of the examinations.

Examinations in the technical preparatory schools

Senate (1998) gives the regulations for examinations and progression in the technical preparatory schools as follow, loosely translated. A written examination is held for students to pass to the following year for those only who have 60% and more of the total sum of marks for workshop subjects. The grade/marks of this subject includes the average daily marks of the year's work plus the average marks of the practical exercises and work that students carry out during the whole year.

Students must also have, at least, the minimum marks for each branch of the workshop subject. Students do not pass to the following year unless they have the minimum grade for each subject and for each branch, and what is not less than 50%, of the total marks for the written subjects.

Those, whose marks are less than 60% in this subject or have failed in any of its branches, will not be allowed to attend the final exam, and they will be considered to have failed this year whatever their excuses might be. The last exercise in each technical subject has 25% of the marks assigned for the practical exercises and work.

The final exam has 75% of the maximum grade for each subject. The year's work has the remaining 25%.

If the student gets 50%, at least, of the total sum of marks of the maximum grade for written subjects in the final exam, and has failed in only one written subject, he will pass to the following year conditional on his not having failed to pass in this same subject in the previous year.

At the end of the final year in the technical preparatory schools, the Ministry of Education holds a general exam – a written exam for the scientific subjects and a practical one for the workshops. Those who pass will have a certificate called "The Technical Preparatory School Certificate". Those who fail to pass this general exam once, and as a result are dismissed, can reapply for the exam from outside the school. The maximum number of successive times to apply for this exam in such a case should not exceed two.

Technical secondary schools

On the other hand, students who have low scores in the general preparatory schools are transmitted to either technical schools, agriculture or business schools according to their scores. Yet, any student who acquires high scores in the general preparatory stage and wants to join any of the technical secondary schools may do so. Technical secondary schools are divided into separate schools for boys and schools for girls. Technical secondary schools are divided into three types: (National Centre for Educational Research and Development: 2001.12-17)

- 3-Year Technical Secondary Schools
- 5-Year Technical Secondary Schools
- 5-Year Experimental Technical Secondary Schools

All these schools accept the same (low) grades. Joining them depends on interviews done within each school.

Students who finished the preparatory stage with low scores that do not allow them to join the general secondary schools can join the 3-year technical secondary schools. Study in these schools is divided into nine main sections, with forty-two specializations. These nine technical sections are:

- Machinery and Mechanics: Machine fitting and installation – machine operating – shaping and welding metal – forming moulds – metal moulding.
- Naval industry: Building ships – ship engineering.
- Vehicle formation: Cars – agricultural tractors.
- Electrical Works: Electronics – computers.
- Wood work: Furniture – wood crafting
- Metal work: Metal furniture – metal welding – crafting metal.
- Fabrics: Knitting – Garment tailoring – carpets – weaving.
- Architecture: Concrete work – plumbing – building – carpentry and joinery – plastering – masonry.
- Decorative works.

After successfully finishing the three years study, students are granted 'The Three-Year Technical Education Diploma'. Graduates of these schools are qualified to work as *technicians*. Students successful in 3-year technical schools may transfer to suitable 5-year schools to continue study. Architecture sections in the 3-year technical schools, which are the core interest of the present research, include the following specialisations:

- Building
- Sanitation Construction (Plumbing)
- Carpentry
- Plastering
- Concrete
- Moulding

The subjects taught in the sanitation construction (plumbing) section in the 3-year technical secondary schools are shown in Table 2.4 below.

Table 2.4: Subjects and number of lessons per week taught in the 3-year technical schools				
Subjects		**Year One**	**Year Two**	**Year Three**
Academic Subjects	Religion	2	2	2
	Arabic	3	3	3
	English	3	3	3
	Humanities	1	1	--
	Mathematics	2	2	2
	Physics	2	2	--
	Physical Education	1	1	--
	Total	**14**	**14**	**11**
Technical Subjects	Technical Drawing	4	4	6
	Architecture Drawing	3	--	--
	Technological Subjects	4	4	4
	Industrial Safety	1	1	--
	Mechanics & Concrete	--	2	2
	Industrial Planning	--	1	--
	Measurements	--	2	2
	Small Project Planning	--	--	2
	Total	**12**	**12**	**16**
Practical training (Architecture section)	Sanitation Construction			
	Total	**20**	**18**	**19**

It is worth noting that students in all six sections of the architecture section study the same academic and technical subjects, but only differ in their practical training according to their specialization.

A second choice for students with low grades in the preparatory stage and unable to join the general secondary stage is to join the 5-year technical secondary schools. On completing the study in these schools, students are granted 'The Five-Year Technical

Secondary School Diploma (Chief Technician)'. The study in these schools is divided into seven sections as follows:

- Machinery and Mechanics: Mechanical engineering – machine operating – metal moulding
- Naval industry: Naval engineering – ship building.
- Vehicle formation: Car engineering – agricultural tractor engineering – heavy duty vehicle.
- Electrical work: Electrical Engineering.
- Electronics: Electronic engineering – computers.
- Fabrics: Weaving – knitting – garment tailoring.
- Architecture: Building – plumbing – carpentry and joinery – plastering – masonry – concrete work.

Graduates of these 5-year technical secondary schools are qualified to work as 'chief technicians' or as 'supervisors of the technicians', or they may leave after 3 years to work as 'technicians'.

In these 5-year schools there are the same departments in the lower years, but with advanced specialisation in electrics, metalwork, decoration, architecture (which includes plumbing, the focus of this research), car mechanics, or air conditioning. Each of these departments consists of many sections. The girls' schools do not offer architecture, car mechanics, metal work or electrics; students who succeed in the 5-year technical secondary schools and the 3-year technical secondary schools may join higher education. (See Abo Zid, 1997:36; Sharaf El Den, 1995:21-22; Senate, 1998:23-26.)

The third option for students finishing the preparatory stage, with low grades hindering them to join general secondary schools, is to join the 5-Year Experimental Technical Secondary Schools. Study in these schools is divided into two sections: Building Construction and Sanitation Construction. These schools aim at graduating practical teachers for teaching in the workshops of the three-year technical schools, other wise known as 'trainers' (Burns et al, 1982:86). On completing the study in these schools, students are granted 'The Five-Year Technical Secondary School Diploma (Trainer)'.

Regulations for the technical secondary schools in Egypt

The technical secondary stage has three years of study (Senate, 1998:29). To be accepted in the first year of these schools the students should either:

a) Have successfully passed the exams of the general preparatory stage, and pass the tests that the technical secondary schools assigns, or

b) Have successfully passed the exam of the technical preparatory stage, with the conditions of getting at least 75% of the total marks of the written subjects and passing the tests that are assigned by the secondary technical school.

Students joining the first year should not be older than 17 years old and should pass the physical and medical (to decide whether the students are fit or not to carry out the practical tasks) examinations assigned by the school.

70% of the total population of the first year is taken from those who had low grades in the general preparatory stage hindering them to join the general secondary education, whereas the remaining 30% is taken from those who have finished the technical preparatory schools. Priority in acceptance is given to those younger in age and the best total marks of the tests assigned by the technical schools.

The students are graduated with the particular abilities relevant to their future employment. Said (1985:13-22) and the Ministry of Education (1970:3-4) give these in general non-specific terms as:

1. To read designs and executive configurations.
2. To read the guides of equipment installation, operating and maintenance.
3. To choose correctly the manual tools, use, and maintain them.
4. To know how to operate machines and equipment.
5. To customise the work field and improve the way the equipment is dealt with.
6. To keep an eye on the operating conditions of the equipment through reading the measurement, protection and control devices.
7. To execute the principles of industrial safety and its instructions.
8. To execute the instructions of the equipment according to their configurations, and to present a report to the supervisor.

However, these are ideals and the writer has noted in practice that students completing courses often do not possess these abilities.

2.2.6 Curricula in the technical preparatory and secondary schools

The schools teach professional curricula which are divided into theoretical technical subjects for three days a week and practical technical subjects for three days a week (Senate, 1998:19-40). Students in Egypt are taught for six full days per week – Friday being the free day.

In addition to these technical subjects the students also study Arabic, English, Maths, Physics, Chemistry and Religion, but these follow different curricula from the general secondary schools.

The students in any one class are not normally divided into sub-groups. They usually go to the workshop all at the same time and as one group. But sometimes, when they go to the workshop, they have to be divided into groups – that depends on the kind of exercise, as well as if there are enough tools and materials, and on the requirements of subject. For example, in large-scale practical work such as fitting a bath, space might be a limiting factor (see Abd El Hakim, 1993:485-486).

2.2.7 Assessment in the technical secondary schools

Students in technical education are evaluated according to two principles. Firstly, the year's course work and monthly tests that they have during the year. The theoretical subjects are evaluated at the end of every semester, but the theoretical subject teachers may make some additional internal tests every month; these tests are not important to the main scores of the students. The main scores are calculated only from the exams at the end of semesters. Due to the fact that these tests, which are made by the teachers, are not important for the final score students frequently do not attend them.

Secondly, are the oral, practical and written exams at the end of the year. The practical subjects are also evaluated at the end of every semester. At these tests the students in the workshops are given an exercise and they have to do it in a given time (Sharaf El Den, 1995:88).

The percentage of the students' attendance during the academic year should not be less than 75% of the total sum of lessons assigned for each of the practical subjects, regardless of the reason of being absent. This is considered a condition to enter the final exams.

Students who fail in two subjects or more have the chance to attend a second chance exam. Students, who did not attend the first time exam in all or some subjects provided that there is an excuse accepted by the school, can attend the second chance exam in these subjects provided that the student had not failed in more than two subjects in which he was examined. The student can only remain in the same year for a maximum of two years. Students who are dismissed from the technical schools for failing more than twice in the same year have a final chance to apply for the same exam from outside the school for one more time. Very few fail to the extent of exclusion from the system, even though this is the lowest category for students to move into.

Rules for entering the second chance test apply in the following situations:

a) Those who have acceptable excuses for not attending the first time. These students are examined in all subjects.

b) Students who have acceptable excuses for not attending some of the subjects in the first time; conditional on that that they did not fail in more than two subjects in which they were examined. Those students are also examined in all the subjects.

c) If the student does not attend one or two subjects and succeeded in all other subjects, or if he does not attend one subject and failed in another subject then, in this case, he attends the second chance exam only in the subjects he did not attend or the ones he failed in.

d) Students, who failed in one or two subjects the first time, provided that they have succeeded in the total sum of marks for the examination subjects, are examined in the subjects they failed in.

e) Students who failed in the total sum of marks in the first time, as well as failing in one or two subjects, are examined in the subjects they failed in.

f) The subjects that have different branches are considered as one whole. If the student fails in one subject, he has the right to choose another subject in which he has succeeded to complete the marks needed for the total sum of marks.

g) Students, who fail in the total sum of marks the first time, provided that they succeeded in all subjects, will be examined in one or two subjects, according to their choice, to complete the marks needed to make them reach the minimum total sum of marks.

In the last two cases, the highest score of the subject in either the first time or the second time is the one calculated for the student. The second chance test marks for the diploma supplant the first marks where applicable, even if lower.

This detail of second chance examining is included here because of its importance in a subject area in which the students have low ability.

2.2.8 Means of joining higher education

Qualifying conditions for progress to higher education

Graduates of the 3-year technical schools and both types of 5-year technical secondary schools have the opportunity to join higher education through the following venues:

Students who obtain scores more than 75% in the theoretical subjects can continue their higher education through joining two-year or four-year technical institutions or technical sections in faculties of education. It should be pointed out that the students' workshop scores are not added to the final scores, which decide their career. All the emphasis is given on the theoretical subjects. These students, on obtaining the minimum grade of 75%, have also the opportunity to join a university faculty of engineering (after having to pass additional exams in English, Maths, Physics, Chemistry, Dynamics and Statistics). It is worth noting that students of both types of 5-year technical school are included in these exams (Ibrahim, 1999: 31).

Those who do not want to join the faculties of engineering, preferring a career in education, or those who get scores between 60% and 75%, can join the faculties of education to become teachers in technical secondary schools, on a four-year training courses. These teachers are trained to teach both theoretical and practical aspects of their specialization and training is included for teaching in the 5-year schools. Students who get a score between 50% and 65% may join a two-year or a four-year institution (but not a university faculty). After completing the study in these institutions, and if the students get a score of 75% or more, they may join a faculty of education or faculty of engineering.

It should be noted that the number of technical school graduates having the ability to join faculties of engineering is extremely small.

Technical secondary students who get scores lower than 50% cannot join any of the faculties or institutions. They have to take up employment.

Technical institutes for teachers

This route applies to the preparation of graduate teachers for technical schools. Following on from a 3-year course in a technical secondary school, students have an option to enter higher education for a further two-year course. This may, or may not, be in the same 5-year school.

In co-operation with the UK and for the preparation of teachers for the technical field, the Ministry of Education established 5-year specialist schools. The first was the

Cairo technical school in Elkoba (with mechanics, electricity, electronics, and car mechanics) with first graduation in 1978-79. The Ministry also established El Zawia El Hamra School (for textiles and embroidery) with the first group graduating in 1984-85, and the Dar Elslam architectural technical school to qualify graduates in the different architectural specialisations. The first group graduated in the year 1985 (Senate, 1998:25).

2.2.9 Problems facing technical education in Egypt

There are several key problems facing technical education in Egypt. (These are extracted and translated from Arabic sources (El Hashamy, 1993:11; Sharaf El Den, 1995:159-167; Senate, 1998:41-43)

1) The technical education students can join it according to the marks they get, and not according to their wills or desires; disregarding if the field is really in need or not.

2) The number of students is beyond the capacity of the buildings. This leads to the increase of the class density and the impossibility of carrying out practical exercises by every student.

3) The multi-shifted system of the schools (more than one shift in the school day), resulted in decreasing the daily hours of study and negatively affected the standard of study and practical exercises in the school.

4) There is a shortage of equipment and tools. The training hours are few because of the huge number of the students.

5) The available tools and equipment are not modern ones, the fact that leads to the graduation of students below the required standards of the labour market.

6) The curriculum does not match modern requirements. The cultural subjects exceed the technical ones.

7) Till now anyone can work in any craft without having the license to do so. This leads to a lot of intruders who cause financial losses because of their lack of experience. Moreover, they take the place of the technical graduates in the work field.

8) There are no syndicates to gather craftsmen who belong to the same craft. The presence of such syndicates would raise their living standard as well as the social perspective of them. The syndicates will also have the craftsmen committed to certain rules and regulations.

9) There is no supervisory workforce with good communication and financial oversight (Sayed, A., 2000:3).

2.2.10 Technical education in Arab countries

Three examples are used here: Yemen, Saudi Arabia, and Jordan, to show how these countries differ from Egypt.

Technical education in Yemen

Technical education in Yemen started in the 50's when the first technical Institute in Aden was established during the British colony. After the unification of the country, more attention was given to this kind of education and a new authority for Vocational and Technical Training (GAVTT) was created to take care of the technical education in the country (Said, 1985: 13-14).

Recently there are 5 technical institutes under the responsibility of a Ministry of Technical Education and Vocational Training (MTEVT). Two new independent community colleges were also established two years ago, with several 3-year educational programs. A third community college is underway, to be established in the island of Socatra. The higher council of the community colleges supervises these community colleges (El-Zaemey, 2001: 1).

In the early 90s, the Ministry of Education decided to establish a community college system that proposed to be dynamic and meet the needs of development sectors in Yemen. A Loan was secured from the World Bank to establish two community colleges. Partner institutions in USA provided technical support aimed to develop academic programs and train the Yemeni staff. Educational programs of the first two community colleges in Yemen were developed after a labour market survey. The curriculum was designed to be similar to that of the USA community colleges, where a student has to complete successfully two years to get the Diploma.

However, technical education in Yemen faces some constraints. El-Zaemey (2001: 2) groups them as follows:

1- Quantities:

- The number of students intended to enter into the tertiary education is too big (130,000 students in the year 2001/2002).
- The limited number of existing technical education institutions, cannot absorb more than 2% of the secondary school graduates (and the university can accommodate up to 35000 students per year).
- There is a limited number of qualified technical teachers.

2- Qualities:

- Most educational programs have not been developed and updated and have become irrelevant to industry's needs.
- Technical teachers do not get the necessary upgrading in their knowledge and therefore they are considered backward in comparison to the technology used by the market.
- Labs and workshops (ex. Mechanics) do not represent the standard of technology used by the market.

In many other respects the systems in Yemen are very similar to those in Egypt.

Technical education in Saudi Arabia

The first vocational-technical school in Saudi Arabia was established in 1950. The school, known as an intermediate industrial school, offered a three-year course of study for graduates of elementary school. In 1960, the first secondary industrial school was opened. During the 1960s, with the country's development due to the oil discovery, technical education and vocational training expanded to cover other related areas, such as technical supervisor's programmes (Alandas, 2002:4-22).

Vocational-technical education and training has continued to gain importance in Saudi Arabia. In 1980, after a thorough study of human resource requirements and the vocational-technical education situation, the government decided to combine all vocational-technical training centres and schools that had been scattered throughout different governmental agencies into one government-run agency known as the General Organization for Technical Education and Vocational Training (GOTEVT).

Stemming from the government's realization for the need of a higher level of vocational-technical education, the government established technology colleges. By 1999, ten technical colleges located throughout the country were established. That growth indicates that there is a marked change in how vocational and technical education are viewed in Saudi Arabia. The status is higher than in Egypt.

However, although vocational-technical jobs are among the highest-paying jobs; many of these jobs remain unfilled. There is currently a clear shortage of technical and vocational manpower in almost every economic sector. There is a gap between workforce needs and trained personnel. The main reason for this is that few Saudis have the necessary training for these types of jobs, and few are seeking this type of important training. The identified reasons for the students' avoidance of these jobs is tied to the social codes that consider manual workers a lower class than office workers. This view of manual work negatively affects the students' attitude toward manual jobs (Alandas, 2002). The attitudes are the same as in Egypt, but the economic pressures are different. Currently about 2,000,000 Egyptians are employed in Saudi Arabia, mainly in lower status employment categories.

Technical education in Jordan

A World Bank report describes the situation in Jordan as follows:

> The mandate for providing publicly funded technical and vocational education in Jordan, is currently assigned to the Ministry of Education, the Vocational Training Corporation, and the Community Colleges managed by Al Balqa' Applied University. While the system has historically been characterized by low levels of institutional co-ordination, duplication of programming, and weak linkages to the labour market, recent developments arising from the establishment of the Economic Consultative Council and the work of a national Technical and Vocational Education and Training (TVET) Task Force, has created the potential for increased focus and improved efficiency. A strategic issue arises with respect to the TVET Council. This issue is the need to establish an agreed set of policy objectives for the sector. The most fundamental of these is whether the system is to be social demand driven or employment demand driven. It is apparent that there are presently divergent perspectives in the country with respect to this issue and, without resolution; the work of the Council cannot be effective. (World Bank, 2001:3)

The World Bank report notes that the public and private TVET providers in Jordan, along with student representation, "are working in the dark" in terms of their knowledge of the labour market. They note "...collaboration between the National Centre for Human Resources Development and the Department of Statistics is currently focusing on this issue". The report says that a national 'Occupational Classification System' has been agreed, new employment surveys are being started, and a 'Human Resources Development Information System' is currently being created (World Bank, 2001:4).

As with Egypt, there is a lack of understanding of the nature of the problems involved in designing solutions to the problems.

Said (1985:12-14) makes a useful comparison between the systems of technical education in the Arab countries (which have strong similarities with Egypt) and in developed countries. This sets the scene for the comparative element of the research described later between the work of a successful plumber in Egypt and his counterpart in the UK. Said's statement is accurate and comprehensive and is quoted in full.

- The means used in Egypt and all Arab countries in general are still traditional and limited and mainly relying on the teacher as the core of the educational process. While the developed countries use different ways of teaching and training, and sets the student as the core of the educational process.
- Most of the developed country curricula include a document, which guides the teacher by general instruction and the best ways to achieve their goals. In the Arab countries such notes are not clear.
- In the developed countries qualified practical trainers and supervisors are used in practical training in real work fields. In the Arab countries most of the failures in the summer practical training are due to the inefficiency of the trainers.
- The fields of practical training in the developed countries vary. In Germany, it takes place in companies or special departments for training – while, in the Arab countries they are very limited.
- The teacher in the Arab countries uses general methods of training and teaching with no variations. While, in the developed countries, the optimal method of teaching obliges the teachers to use various ways according to the students' readiness, abilities, and grasping speed.
- Abroad, the vocational schools and institutes qualifying courses afford the applied programs that help the students and the teacher in the educational training process. In the Arab countries, those means are few and, even if they are afforded, they are not well used.
- The developed countries use computers vastly for educational and training purposes. However, computer usage in the Arab countries is very limited.
- Passing the final exams grants the "Technical Education Certificate" in the Arab countries, whereas in the developed countries, there are various levels of certificates based on how qualified the student is in his study and training.
- Education and training in developed countries depend on technical sufficiency. Thus, one of its principles is the prior determination of the required learning results. The evaluation procedures are closely

associated with these results and able to examine them. This is not applied in the Arab countries.

- There is certain mastery, in the developed countries, in technical or educational sufficiency and it differs according to each specialisation and the level of qualification that the student acquired. Thus evaluation in the developed countries is "criterion referenced" while it is "norm referenced" in the Arab countries.
- In the developed countries, they make use of the results of both the "formative evaluation" and the " summative evaluation" either in general performance or in skill acquisition. While, the Arab countries are relying mainly on summative evaluation when granting the certificate.
- In the developed countries, the teacher is no longer responsible for giving knowledge and skills only but he is also responsible for instructing and guiding the students to learn according to their abilities and tendencies. Some of the Arab countries began to use this principle. However, they did not exert efforts in teacher preparation as needed.
- The technical educational system in the developed countries has resorted to co-operation with developed factories to afford chances for the students to practise and to be trained. This also helps in decreasing the costs of the technical education. This is not followed in all the Arab countries. (Said 1985:12-14 – translated from Arabic)

2.2.11 Efforts to develop technical education in Egypt

> Developing countries need to improve productivity throughout the economy if they are to compete successfully in an era of rapid economic and technological change. This requires not only capital investment, but also a work force that has the flexibility to acquire new skills for new jobs as the structures of economies and occupations change. The level of competence of a country's skilled workers and technicians is centrally important to the flexibility and productivity of its labor force. Skilled workers and technicians enhance the quality and efficiency of product development, production, and maintenance (World Bank.1991: 1)

Accordingly, there has been useful co-operation between Egypt and Germany to develop technical education and to benefit from the German side in linking the technical schools with production and service sectors to achieve a dual education and to upgrade equipment in technical schools through a project called 'Mubarak-Kohl' (after the leaders' names) launched in 1991. The Mubarak-Kohl project specifically aims at elevating the standard of technical education. Improving technical education installations establishes the link between the school and the technical institution and invests these institutions with a partnership to train students and to upgrade their technical abilities (Senate, 1998:34). The project also aims at training the teaching staff to raise the performance standard as well as characterising crafts and setting their promotion regulations.

However, this project has met several obstacles. Dar and Gill (1998) report these obstacles as follows. Unreasonable expectations on both supply and demand sides are perhaps the most important constraint. While international experience shows that technicians are less than 10 percent of the workforce in most manufacturing industries, government and business aims for twice this ratio. Another constraint they mention is related to the quality of students: vocational education students consider themselves as having 'failed already'. Finally, Dar and Gill (1998) add that while the German dual system relies heavily upon private financing, Egyptian firms are less willing to make such investments, mainly because the private sector does not foresee immediate benefits.

There has been another co-operation with the American International Organization for Assistance (USAID) and the British Council, hindered by the 2003 Iraq war, in preparing a study plan and curricula for use in the advanced technical schools in the 5-year study system. There are other aid grants to Egypt like the Korean aid, which helped in supporting the technical school workshops with equipment and tools.

2.3 Teacher training in Egypt

This shorter section gives the foundation information for the teacher education dimension of the empirical research – topics that are not fully separable in Egypt. Helwan University has one of the largest teacher education faculties preparing teachers at all levels and for both general and technical sectors.

2.3.1 Pre-service training

In Egypt teacher training takes place in faculties of education in universities. All teacher preparation courses are of four years. In addition to achieving the appropriate school leaving academic scores, teacher trainees are required to pass a personal interview conducted within the faculty in which they will receive their training (Abd El-Gelil, 1999: 10). The following section describes the different venues of teacher preparation in Egypt.

Kindergarten and primary teacher training

The training of kindergarten (all female) teachers is provided at faculties of education in nine universities related to the Ministry of Higher Education. Female students who complete their study successfully are granted the B.Sc. degree.

By 1995/96, there were 23 faculties of education responsible for training teachers at the primary tier of basic education. In addition, separate faculties of Basic Education were also established (Ministry of Education, 1999(b): 22).

Teacher training for general preparatory and general secondary education

There are 27 faculties of education across Egypt to train teachers of the preparatory tier of basic education and teachers of general secondary education. Based on the internal assessment and personal interviews carried out in the faculties of education, the students can be trained to teach the following subjects: Arabic, Foreign languages, Mathematics, Science and Social science.

During the first two years of the study the students are introduced to principles of education and psychology, principles of teaching and basic culture courses. In the final two years of their study, students must successfully complete courses in methodology, educational psychology, comparative education and social psychology beside specialised courses.

Students perform microteaching seminars in the third and fourth years. These seminars provide the students with the opportunity to practice lessons and to receive evaluation and feedback from peers. Students also perform practice teaching in schools, third year student practice in preparatory schools; whereas fourth year students practice in secondary schools. Teaching Practice is done only in the second semester in the third and fourth year. The first half of the semester is spent in the faculty doing microteaching and peer teaching. Successful students in the fourth year are granted a B.A. in Arts and Education or B.Sc. in Science and Education according to their specialization (Abo Klela, 1991:23).

Training of technical education teachers in the four universities

Four universities in Egypt offer this training. Only successful graduates of either three-year or five-year technical secondary schools can join this section in faculties of education. The same conditions for accepting teachers for the preparatory tier of basic education and teachers for general secondary education apply to candidates of this section. Upon completion of the four-year technical training programme in the faculties of education, students are qualified to teach both theoretical and practical subjects in the technical secondary schools. The following tables show the study plan of the courses offered to students of the technical architecture section at the Faculty of Education, Helwan University, as presented in the annual report of the Faculty for the year 2000 (Helwan University, 2000:42). It should be noted that the hours indicated in the tables are per week.

Table 2.5: Study plan for Year 1 of the technical architecture section			
First term	**Hrs**	**Second term**	**Hrs**
1. Physics	4	1. Arabic	4
2. Chemistry	4	2. Mathematics	8
3. Architecture drawing	8	3. Mechanics	8
4. Building construction	5	4. Architecture drawing	8
5. Construction workshops	6	5. Building construction	5
6. Educational sciences	4	6. Construction workshop	6
7. English	4		
8. Arabic	4		
9. History of architecture	2		

Table 2.6: Study plan for Year 2 of the technical architecture section			
First Term	**Hrs**	**Second Term**	**Hrs**
1. Mathematics	6	1. Descriptive Geometry	6
2. Architecture Drawing	6	2. Architecture Drawing	6
3. Building Construction	5	3. Building Laws	4
4. Quantities and Specifications	6	4. Structures	4
5. Concrete Workshop	6	5. Concrete Workshop	6
6. Arabic	4	6. Arabic	4
7. English	4	7. English	4
8.Testing Construction Materials	4	8. Building Construction	5

Table 2.7: Study plan for Year 3 of the technical architecture section			
First Term	**Hrs**	**Second Term**	**Hrs**
1. Architecture Drawing	4	1. Computer	2
2. Arabic	4	2. Architecture Drawing	4
3. Building Construction	4	3. Decorative Drawing	2
4. Quantities and Specifications	6	4. Sanitation Construction	4
5. Structures	4	5. Educational Psychology	2
6. Teaching Methods	4	6. Sanatorium & Electric Workshop	4
7. Sanitation & Electric Workshop	4	7. Education & Social Problems	2
8. Education Foundation	4	8. History of Education	4
9. Land Survey	4	9. Curriculum & Education Media	4
10. Practice Teaching	4	10. Practice Teaching	4
11. Development Psychology	4	11. Building Construction	4
		12. Location Practice	---

Table 2.8: Study Plan for Year 4 of the technical architecture section			
First Term	**Hrs**	**Second Term**	**Hrs**
1. Building Construction	6	1. Architecture Drawing	4
2. Educational Psychology	4	2. Practice Teaching	4
3. Land Survey	6	3. Sanitation Construction	8
4. Hydraulics	4	4. Technical Construction	2
5. Comparative Education	4	5. Education Foundations	4
6. Practice Teaching	4	6. Curriculum & Education Media	4
7. Teaching Methods	4	7. Quantities and Specifications	8
8. Decorative Drawing	2	8. Psychological Health	4
9. Architecture Drawing	4	9. Industrial Safety	4
10. Computer	2		

However, there are a number of issues that should be borne in mind regarding the allocation and employment of the graduates of the technical architecture section. The researcher had concluded these issues according to personal experience as a technical education student, technical architecture section graduate and then a university lecturer in the Faculty of Education - Technical Architecture Section. These issues are as follow:

- University faculty (B.Ed.) graduates of the technical architecture section are only allocated in technical schools to teach the theoretical subjects.
- Despite the difference in qualifications, the faculty university graduates (B.Ed.) do not supervise the work of the practical teachers (five-year technical secondary schools graduates) in the school workshops.
- In both university teacher training and in the schools engineers (B.Sc) also teach the theoretical subjects as well as B.Ed. graduates. Sadly the B.Sc. lesser trained teacher is seen as having higher status than the B.Ed. teacher.

2.3.2 In-service training

In-service training in Egypt developed as the result of the shortage of teachers as the Basic Education lengthened, and became free and legally compulsory (Galal and El-Begawy, 1999: 20).

The General Education System

The continuing teacher preparation courses are aimed at training graduates of faculties other than education to become teachers. These candidates join education training courses full-time for one year or part-time for two years. During these courses candidates are introduced to the same educational and methodological courses as those studied by first and second year faculty of education students. Candidates who complete these training courses successfully obtain a General Diploma in Education and are appointed as preparatory schoolteachers. Candidates who obtain good grades in this General Diploma of Education may apply to take postgraduate studies in education (Gafar, 1999: 25).

The Technical Education System

> In-service training is organized by the General Directorate for Training (GDT), which supervises six centres. In the academic year 1995/96, 165 programs were implemented for a total of 17,521 participants. Such training can also be decentralized in departments of outlying directorates. A number of bodies and agencies work side by side with the GDT to provide in-service training. (UNESCO, 1999:20)

In order to maintain numbers and quality of teachers the Ministry of Education has been organizing international training courses. Teachers can be sent abroad to be trained with grants offered from overseas agencies and institutes, primarily USAID. Other incentives are also provided to teachers wanting to improve their training.

2.3.3 Issues in post-initial teacher employment

Work Load

Teachers' workloads differ from one phase to another: 24 class sessions per week per teacher in the first three grades of basic education and 21 class sessions per week per teacher in the other grades of basic education. Due to the abridgement of the primary education cycle, most teachers actually have a workload reduced to less than that stated above. Consequently, other activities are assigned to them.

The teaching workload in all types of secondary school is 18 sessions per week for the ordinary teacher and 12 for the subject head teacher (the equivalent of the UK head of department or senior teacher). At the higher education level (tertiary) it is 14 hours for an assistant teacher, 12 hours for ordinary teachers, 10 hours for assistant professors, and 8 hours for professors.

> In summary, teacher's workload is heavier in the lower stages of education. Furthermore, basic education teachers mainly work in rural areas, since 67.1% of primary schools are located in the countryside. These teachers do not receive any special compensation. (Senate, 1998, 60)

Promotion

Shihata (1999:30) comments that the teachers' career development in Egypt is not dependent on the results of their students. They are not penalized for the poor performance of the students.

> Promotion to the position of preparatory school headmaster, preparatory school director, secondary school vice-principal, or secondary school headmaster, requires the candidate to obtain a high pedagogical qualification, or an appropriate higher qualification, together with spending three years in the lower position, and attending a given training programme. Promotion to the position of a secondary school director requires spending one year at least in the first bracket, level C, together with obtaining the higher, or appropriate, educational qualification (UNESCO, 1999:60).

Distribution of Teachers

The distribution of both trained and untrained teachers to the various educational zones is done centrally to satisfy the needs of every governorate in accordance with the numbers of pupils in each stage. But the distribution of teachers to the administrations and divisions within any particular governorate is done at the governorate level. (National Centre for Education, 2001:22)

Teachers' Income

Teachers' salaries are based on a national salary scale that does not include the private schools. The salaries are low and follow a rigid civil service code (Galal and El-Refaie, 2000). Increases in salary are related to years of experience on a limited incremental scale similar to that of the UK and to academic and teaching qualifications. Salaries thus increase with higher qualifications and longer years of service. But the level of the public spending on education in Egypt is facing -0.11% annual growth rate (Ali, A. 2002:21).

Chapter 3

The Social, Economic, Historical And Technical Context Of The Research

3.1 Introduction

Egypt has a long history in innovation in the management of water resources, and in the technology of its distribution. Egypt is known as the 'Land of One River'. Without this River Nile, Egypt would have no civilisation. The management of the use of water is thus central to the life of the people, and the skills of its use have been important for several millennia (El-Kady, 1999:125).

This chapter will therefore highlight the social and economic issues in Egypt that relate to this important resource, in order to see the context of those who are to be trained as plumbers. This chapter will then provide a brief historical account of plumbing in Egypt. As the present research is also concerned with plumbers in the UK, a brief insight of the history of plumbing in the UK is also presented. The chapter concludes with a technical section dealing with research literature studies in the field of plumbing.

The purpose of this is to produce a contextual map to help in the interpretation of the empirical research findings and put them into a correct Egyptian culture and context.

3.2 The geographic and climatic context of the study

3.2.1 Location

Egypt has a unique geographical position as the historic land bridge between Asia and Europe across to Africa. It is situated in the northeast corner of Africa and includes a small part of Asia; this part is Sinai, separated from African Egypt by the Suez Canal. A major road tunnel under the Suez Canal now connects the two parts, and a freshwater supply from the Nile has also recently been ducted under the canal for use in the Sinai (AQUASTA, 2001).

Egypt stands at the centre of the Old World. And it borders the Mediterranean Sea and the Red Sea, with Sudan to the south and Libya to the West.

The total area of Egypt is about 1,001,450 sq. km., with a land area of 995,450 sq. km., the difference being water – the Canal, Nile Delta, etc. – though there has been an international dispute with Sudan (very recently resolved) over a barren area of 20,580 sq. km. at the international boundary. Its land boundaries total 2,689 km – the Gaza Strip 11 km, Israel 255 km, Libya 1,150 km and with Sudan 1,273 km. The terrain is a vast desert plateau interrupted by the Nile valley and delta (Hopkins,1969: 62-63). There is a coastline of 2,450 km. There is a maritime claim of 24 nautical miles and territorial sea extending 12 nautical miles that includes an area of oil exploitation. (SIS and Encyclopedia.1997)

3.2.2 Climate and land usage

Water management and its technology depend very much on climate. Egypt has a desert climate: hot and dry in the summers with a mean summer temperature of 27°C, and with moderate winters – with rainfall increasing nearer the coastlines. The mean annual temperature is 20°C (El Quosy, 1994). However, there is substantial variation with location. During summer, temperatures are extremely high, reaching 38°C to 43°C with extremes of 49°C in the southern and western deserts. The Mediterranean coast has cooler conditions with 32°C as a maximum (Barakat, 1999). Evaporation rates in Egypt are thus generally high and affect water management issues. Rainfall is concentrated almost entirely in two months of each year: mid-December to February.

Regarding traditional land use, the Nile valley and the Delta (in the north) are the most densely populated parts of Egypt because of the availability of managed and distributed water supplies. The inhabited (and agriculturally used) area constitutes only 6.0% of the total area of the country. Arable land constitutes 3%, permanent crops 2%; meadows, pastures, forest and woodland are non-existent. The other 95% is desert. It is estimated that irrigated land has an area of 25,850 sq km (1989 estimate). Water management affects all these issues (El-Shaer, 1994(a); El-Shaer, 1994(b); El-Shaer, 1995).

New cities are being built in new areas (i.e. desert) but these require new sources of water. Expansions of existing populated areas require either new local sources (e.g. underground water) or transport (including piping) from traditional sources.

3.2.3 Water Resources in Egypt:

Formerly called the Ministry of Irrigation, the Ministry of Public Works and Water Resources (MPWWR) is responsible for national water resources and is the only body to authorise use of water from the Nile, canals, drains, and groundwater sources. The ministry also has full control over works built to discharge water into canals, drains, and the Nile. MPWWR is authorised to assess and extract penalties if its orders are not obeyed (FAO, 1993).

There are at present three main kinds of water resources in Egypt. These resources of water are: rain water, ground water, and surface water. Each resource has its limitations on use, whether these limitations are related to quantity, quality, or cost, (Rofail and Zabran, 1994). By surface water we mean rivers, seas, oceans, and lakes (Hadar, 1988). This section will deal with these resources in moderate detail, to illustrate the shortage of water and the importance of its good technical management, distribution and use.

(a) The River Nile

The ever-true expression of Herodotus, the great historian, that "Egypt is the gift of the Nile" indicates the nature of life that has dominated the Nile valley since the dawn of Egyptian history. In no other country in the world does a single waterway play so important a role in the socio-economic development of a nation as does the River Nile in Egypt (Saleh, 1999; Ezzat, 1999).

The Nile is the major surface water in Egypt, the life blood of Egypt. For eight hundred miles or more, from Wadi Halfa to the southern approaches to Cairo its six-mile wide valley is virtually the only inhabitable land (Ezzat, 1994).

The Nile river is the main source of water for Egypt. Under the 1959 Nile Waters Agreement between Egypt and Sudan, Egypt's share is 55.5 km^3/year (Hvidt,1995: 13-15). The 1959 Agreement was based on the average flow of the Nile during the 1900-1959 period, which was 84 km^3/year at Aswan. Average annual evaporation and other losses from the High Dam lake were estimated to be 10 km^3 /year, leaving a net usable annual flow of 74 km^3/year, of which 18.5 km^3/year was allocated to Sudan and 55.5 km^3/year to Egypt. Internal surface water resources are estimated at 0.5 km^3/year. This brings the total (actual) surface water resources to 56.0 km^3/year (Howell and Allan 1990; CAMPAS, 1993)

The water of the Nile in Egypt has been the main source of drinking water in Egypt since the area was first populated. Many efforts were made to save this water through many projects to control the floods to meet the needs of irrigation, which is the basis of the earliest Egyptian civilization (Shibl, 1971). The means of control have become steadily more sophisticated, "Khedive Mohamed Ali" built a barrage in 1843 at the apex of the Nile Delta south of Cairo to raise the level of the Nile water (Othman, 1994).

However, it is worth noting that there is a concern regarding the impact of future climate change on water resources in Egypt. Conway and Hulme (1996) attempted to assess the magnitude of potential impacts of these climate changes.

> The figures are used to estimate changes in the availability of Nile water in Egypt by making assumptions about the runoff response in the other Nile subbasins and the continued use of the Nile Waters Agreement. Comparison of these availability scenarios with demand projections for Egypt show a slight surplus of water in 2025 with and without climate change. If, however, water demand for desert reclamation is taken into account then water deficits occur for the present day situation and also 2025 with and without climate change. A revision of Egypt's allocation of Nile water based on the recent low flow decade-mean flows of the Nile (1981-90) shows that during this period Egypt's water use actually exceeded availability. The magnitude of 'natural' fluctuations in discharge therefore have very important consequences for water resource management regardless of future climate change. (Conway and Hulme, 1996)

Concerned with the same issue, Strzepek et al (1996) conclude that the "complete impact of climatic changes in the Nile cannot be fully predicted with confidence", as some models forecast increased flows, while others project significant decreases. However, the Nile River flow is extremely sensitive to ambient temperature and rainfall changes, and it is possible that the effects of climatic fluctuations on the country's available water supply would be severe.

b) Rain Water

Egypt is one of the driest countries in the world (Shibl, 1971). Although it lies within the extremely arid area of North Africa and South West Asia, the Northern coastal zone is strongly influenced by the Mediterranean climate (Barth and Shata, 1987). The amount of rain that Egypt receives annually is very scant and is limited to the delta region, North of Cairo (Shibl, 1971: 37). Rainfall on the Mediterranean coastal strip decreases eastward from 200 mm/year at Alexandria to 75 mm/year at Port Said. It also declines inland to about 25 mm/year near Cairo. Rainfall occurs only in the winter season in the form of scattered showers (El Arabawy et al, 1998).

During the normal rainy season in winter the amount of water available in Sinai is 10 billion m^3. During the abnormal rainy seasons in winter, which occur once every five years, the amount of water available exceeds 15 billion m^3. When Egypt is affected by the monsoon winds (which is repeated at least once every 10 years) the amount exceeds 20 billion m^3 and surface run-off may reach 5 billion m^3, which produces noticeable effects in the Eastern Desert and in South Sinai (Barth and Shata, 1987). Because the amount of the rain water is not large, Egypt and most of the Arab countries do not use the rain water for drinking but they send it to the sewerage (Hadar, 1988).

c) Ground Water

By ground water is meant the water stored underneath the ground. It is believed that it represents 97% of the total amount of soft water in the world, whereas all the rivers and lakes in the world represent the remaining 3%. This calculation excludes the snow in both the North and South poles. This ground water is formed from the water of the rain, rivers and lakes that penetrates the ground until it reaches the impervious levels of ground, where it accumulates and is stored (Hadar, 1988; Sherif, 2000).

The volume of underground water entering Egypt from Libya is estimated at 1 km^3/year. Internal renewable groundwater resources are estimated at 1.3 km^3/year. This brings the total renewable groundwater resources to 2.3 km^3/year (Abou Zeid and Rady, 1992). The main source of internal recharge is percolation from irrigation water, and its quality depends mainly on the quality of the irrigation water. In the northern part of the Delta, groundwater becomes salty due to seawater intrusion.

About half of the Delta contains salty groundwater (Ahmad, 1993). The "Nubian Sandstone aquifer", located under the Western Desert and extending to Libya, Sudan and Chad, contains "important non-renewable fresh groundwater resources" already developed in the oasis of the new valley. Large irrigation schemes pumping water from the Nubian aquifer are under development in the southwestern part of the country (Farid, 1999).

3.2.4 Water resources and demand

Water resources in Egypt are becoming scarce. Surface-water resources originating from the Nile are now fully exploited, while groundwater sources are being brought into full production. Egypt is facing increasing water needs, demanded by a rapidly growing population, by increased urbanisation, by higher standards of living and by an agricultural policy which emphasises expanded production in order to feed the growing population (Hvidt, 1995). Some estimates have suggested that the share of fresh water per capita will drop from 949 m^3/year in 1998 to about 337 m^3/year in 2025 (Khedr, 2002).

Tables 3.1 and 3.2 show available resources and demands respectively. Comparing between the resources figure in 1990 and demand figure for 2000 (Abou Zeid and Rady, 1992), it is seen that if the resource had not been increased, there would have been a major shortage of 5.9 billion m^3. Saving of leakage losses and the installation of effective plumbing systems in all properties is thus very important. The skill of the plumber who fixes the systems is significant in this – another mark of the importance of this research.

Table 3.1: Water resources at 10-year intervals (in billion cubic meters per year)		
Sources	1990	2000
River Nile water	55.5	57.5
Groundwater	2.6	4.9
Agricultural drainage water	4.7	7.0
Treated municipal sewage water	0.2	1.1
Saving flow water management programmes	-	1.0
Deep groundwater (deserts)	0.5	2.5
Total	**63.5**	**74.0**
(Source: Abo Zid, 1992).		

Table 3.2 Water demands at 10-year intervals (in billion cubic metres per year)*		
	1990	2000
Irrigation	49.7	59.9
Municipal uses	3.1	3.1
Industrial	4.6	6.1
Navigation and regulation	1.8	0.3
Total	**59.2**	**69.4**
*Source: (Abo Zid, 1992).		

It is seen that municipal uses (including domestic) is only a small proportion of the total water use, which is dominated by agricultural use.

3.2.5 Environmental issues

Current issues in the environment are listed (Word Bank, 2000:6) as including (i) agricultural land being lost to urbanisation and windblown sands; (ii) increasing soil saltiness below the Aswan High Dam; (iii) desertification (especially of poor grade agricultural land); (iv) oil pollution threatening coral reefs, beaches, and marine habitats; (v) other water pollution from agricultural pesticides, untreated sewage, and industrial effluents; (vi) water scarcity away from the Nile that is the only perennial water source; and (vii) rapid growth in population overstraining natural resources. Natural environmental hazards include periods of drought; subjection to frequent earthquakes, landslides, volcanic activity; and a hot, driving windstorm called 'khamsin' that occurs in the spring. Egypt is, however, party to many international environmental agreements including those on Environmental Modification, Hazardous Wastes, Marine Dumping, Wetlands and Climate Change.

The likely challenges to the sustainability of water resources in Egypt are stated to include salinity, waterlogging, and the decline in fresh water as a result of the continuous discharge of (usually) untreated domestic and industrial wastewater into the Nile. Agricultural drainage water affects the salinity of the main river downstream and in the delta. The quality of water in the river decreases gradually towards the delta and the coastal plains (Louw, A. et al, 1999). Also likely to make pollution worse is the use of chemical fertilizers, which has increased fourfold in the last two decades, partly in response to the Aswan High Dam's reduction of the flow of silt downstream. Also…

> The use of herbicides to control submerged weeds in canals and water hyacinths in drains (which, if uncleared, can choke irrigation systems) has caused serious environmental hazards. (Tebbutt, 1999)

Scarcity of fresh water resources and protecting them from pollution is an environmental issue that concerns all Egyptians, and threatens the sustainability of the development of Egypt. As the population grows, and the economy expands, holding the amount of water constant intensifies the problem of fresh water availability (El-Gohary, 2002). Protecting this limited amount of fresh water is crucial to sustain the development of the nation. Lack of proper sanitation schemes in some of the human settlements, particularly in peri-urban and rural areas is the major constraint (Hamdy, 1999).

3.2.6 The basis of the economy

The vocational education that is the focus of this research has to be seen in the national economic context. Egypt has one of the largest public sectors of all the Third World economies. The government owns most industrial plants in Egypt. (In the context of this research, however, it must be noted that a majority of plumbers work in the private, rather than the government, sector.) The situation is complex.

> Over-regulation has held back technical modernisation and foreign investment. Even so, the economy grew rapidly during the late 1970s and early 1980s, but in 1986 the collapse of world oil prices and an increasingly heavy burden of debt-servicing led Egypt to begin negotiations with the IMF [International Monetary Fund] for balance-of-payments support. Egypt's first IMF standby arrangement, concluded in mid-1987, was suspended in early 1988 because of the government's failure to adopt promised reforms. Egypt signed a follow-on program with the IMF and also negotiated a structural adjustment loan with the World Bank in 1991. In 1991-93 the government made solid progress on administrative reforms such as liberalising exchange and interest rates but resisted implementing major structural reforms like streamlining the public sector. As a result, the economy has not gained momentum and unemployment has become a growing problem. Egypt probably will continue making uneven progress in implementing the successor programs with the IMF and World Bank it signed onto in late 1993. In 1992-93 tourism plunged 20% or so because of sporadic attacks by Islamic extremists on tourist groups.

The situation is much worse since the 11 September 2001 attacks on the USA and the Iraq war.

> President Mubarak has cited population growth as the main cause of the country's economic troubles. The addition of about 1.4 million people a year to the already huge population of 60 million exerts enormous pressure on the 5% of the land area available for agriculture. (World Fact Book: 2003)

The national product (GDP) has a purchasing power equivalent of \$139 billion (1993 estimate) – \$ refers to US dollars throughout. The national product real growth rate is 0.7% (1999 estimate) and the national product per capita is \$2,400 (1993 estimate). All this combines with a high consumer prices inflation rate of 11% (1993 estimate) to show the difficult economic situation (World Fact Book: 2003).

Commodities are mainly crude oil and petroleum products, cotton yarn, raw cotton, textiles, metal products and chemicals, with main trade partners in the Eastern Europe, US and Japan. Imports of \$10.5 billion (financial year 1993 estimate) include significantly machinery and equipment, foods, fertilisers, wood products, durable consumer goods, and capital goods. There is an external debt of \$32 billion (March 1993 estimate). The industrial production growth rate is only 0.4% (financial year 1992 estimate). The main industries are textiles, food processing, tourism, chemicals, petroleum, construction, cement and metals all with demands on the water supply system.

Agriculture accounts for 20% of the GDP and employs more than one-third of the Egyptian labour force. Though very dependent on irrigation water from the Nile, Egypt is the world's sixth-largest cotton exporter. Other crops produced include rice, corn, wheat, beans, fruit, and vegetables. The country is now not self-sufficient in food and this must also be seen in terms of a rapidly expanding population. Livestock in the agricultural sector mainly comprise cattle, water buffalo, sheep, and goats. The annual fish catch is about 140,000 metric tons – the Nile, Mediterranean Sea, Red Sea, and Lake Nasser all carry good stocks.

Egypt is the recipient of considerable international economic aid. The largest contributor is the US, with the UK and other western contributors also large. There are smaller elements of support from OPEC bilateral aid and (former) communist countries.

The currency is based on the Egyptian pound (£E) (subdivided into 100 piasters). The exchange rate against the US dollar was L.E. 3.33 per US$ with the August 2000 rate. The fiscal year runs 1 July - 30 June. Immediately prior to submission of this thesis (November 2003) the rate had fallen to L.E. 6.25 per US $.

3.2.7 The labour market

There is a total active labour force of 17.4 million (1996 estimate). By occupation these comprise agriculture 40%, services (including government) 38% and industry 22% (1990 estimate). The unemployment rate is 9.4%, 1996 estimate (Assad, 1999: 7).

Like many other countries, the Egyptian government now are selling governmental sectors to the public – in this case 49% of the government sector. We must note that there is a shortage of skilled labour, partly because of the 2,500,000 Egyptians who work abroad, mostly in Saudi Arabia and the Gulf Arab states (1993 estimates) for higher wages (Rizk, 1999: 32).

There is no system of estimating the number of persons presenting themselves as plumbers, but these are amongst the worst paid of trained tradesmen.

3.3 A social history of plumbing

The present section briefly tackles the historical background of plumbing in both Egypt and the UK, the two countries representing the core of the present study. An explanation of the term 'plumbing' is provided first.

3.3.1 Definition of plumbing

Plumbing was defined as, "The art of casting and working in lead, and applying it to building purposes; especially, the business of furnishing, fitting, and repairing pipes for conducting water, sewage, etc." (El-Bakary, 1994:247).

The systems of pipes and fixtures that bring water into building and waterborne wastes away are also called plumbing. The pipes themselves are normally concealed behind walls and floors. The fixtures such as sinks, bathtubs, showers and toilets, are attached to the pipes and are visible in various rooms of homes, office buildings, factories, and other types of structures (Compton Interactive Encyclopaedia, 1997).

3.3.2 The back ground to plumbing in Egypt

The Ancient Egyptians were very skilful in many fields. For example, they were pioneers in the field of plumbing. To set the context of this research it must be emphasised that any present-day inadequacies are not part of the very long tradition of innovation and excellence of water control and management in Egypt. The following is a brief historical account of the history of plumbing in Egypt (theplumber.com, 1989).

By 2500 B.C. the Egyptians were pretty adept with drainage construction, accentuated by the significance that water played in their priestly rituals of purification and those affecting the burial of the kings. According to their religion, to die was simply to pass from one state of life to another. If the living required food, clothing and other "accoutrements of daily life", so did the dead.

Archaeologists have discovered bathrooms in some tombs. Egypt's pyramid-temples show the skill of the ancient construction workers. The earliest pyramids were built from 2660-2500 B.C.

Excavators of the mortuary temple of King Suhura at Abusir discovered niches in the walls and remnants of stone basins. These had metal fittings for use as lavatories. The outlet of the basin closed with a lead stopper attached to a chain and a bronze ring. The basin emptied through a copper pipe to a trough below. The pipe was made of 1/16" beaten copper worked to a diameter of a little under 2". A lap joint seam hammered it tight.

Also found within a pyramid temple built by King Tutankhamen's father-in-law at Abusir, was a brass drainpipe running from the upper temple along the connecting masonry causeway to the outer temple on the river.

Figure 3.1:
A stone bath with plastered sides and drain.
Just below the outlet of the bath, water drained into a vase perforated at the bottom and cemented into the earth.

During the construction of the pyramids, in the temporary 'cities' where the workers lived, there were good examples of water storage and use – for example in the use of flowing water for the toilets and for hand washing.

Excavators discovered a tomb, which supposedly contain the body of Osiris. It contains a deep moat containing water that surrounds all sides of the figure of the god on his throne. After 5,000 years, water still fills the canal through underground pipes from the River Nile.

The ancient Egyptians were early developers of piped systems and had techniques of making copper alloys. Their pipes and fittings were very crude. Like the Mesopotamians, they used clay pipes made from a combination of straw and clay. First it was dried in the sun, and then it was baked in ovens.

In Egypt the noria, or Egyptian wheel, became in common use. It consisted of a chain pump comprising a number of clay pots carried round and round by a wheel, to raise water from one level to another.

The early Egyptians were skilled in working metals. They melted metal in a crucible over a super-hot fire, fanned with blowpipes made of reeds tipped with clay. The *molten* metal was poured out and allowed to cool, then beaten out with smooth stones into sheets of the required thickness. It was then cut to shape.

Other examples of their craftsmanship are found in bowls of beaten copper on which they cast double spouts. Originally only the pharaohs used copper basins.

By comparison, in the UK developments came very much later, usually driven by health needs. The high rainfall, the different social context and the spread out rural population did not require advanced water supply systems until the larger conurbations began to develop.

3.4 Previous research work on plumbing

Ideally this section should have been devoted to the empirical research studies implemented on plumbing in Egypt, the core country of the present research; however, as mentioned in Chapter 1, thorough investigation done by the researcher revealed a complete lack of empirical research publications in this field in both Egypt and UK. Accordingly, the researcher sought research studies on plumbing elsewhere. The following is thus a discussion of some relevant literature.

There is considerable syllabus development research in colleges in the UK and USA in particular. However, most of it is unevaluated and refers to a very small population (e.g. one college or one city). Most of this is of no value to the current research, but might provide models for when the present research in this thesis is later taken and applied in syllabus development.

The reason for the lack of research probably relates to the low status of the subject, and the fact that universities have not had any responsibility in this area until the 1980s/1990s. Two PhD studies are, however, worth noting.

Stemming from the increasing and continuous changes in the fabrication, shaping, assembling, and processing of materials, it becomes essential that skilled craftsmen maintain updated knowledge related to the occupation. Thus, Cipriano (1979) conducted a PhD study at the University of Connecticut of which the main purpose was to determine to what extent the plumbing work-related classroom instruction, which consists of related mathematics, science, and drawing, was perceived to be applicable and appropriate in terms of content and time. It was based on USA apprentices' perceptions. It is apparent that the present study shares one of its aims with that of Cipriano.

A major conclusion of Cipriano is cited as follows:

> The importance of work-related instruction was recognized by both employers and employees as being important in improving performance on the job-site.

Cipriano also concluded that related mathematics, science, and drawing not only must meet the needs of the individuals, but also must meet the needs of the employer in term of improved production and quality products. Updated knowledge and concepts should be introduced in the curriculum. Also, in order to complete a specific job process at the work site, the work related knowledge applicable to the manipulative skill should be taught.

Chang-Yen (1992) implemented a PhD study to assess the effectiveness of the National Plumbing Competency Test (NPCT). The study assessed the perceptions of plumbers, supervisors, and vocational educators regarding the effectiveness of such testing in theory and practical aspects.

According to Chang-Yen an occupational competency test requires an individual to

> … perform job-like tasks required of a craftsman or skilled technician within an occupation according to industrial standards of speed, accuracy, procedures, etc…the test is administered under well-controlled conditions to measure the individual's job proficiency through his/her ability to perform actual or job-like tasks.

The study concluded that the test was not working effectively to meet its required aim. The study, among its recommendations, recommended revising or rearranging the task list and test items on a regular basis and update the tests to reflect competencies and performance standards for the plumber occupation to meet the societal needs. The study also recommended analysing reliability and validity of the test items to improve the test and construct an efficient test item bank.

Chapter 4:

Research design and methodology

4.1 Introduction

In the previous two chapters of this study, a theoretical framework related to the educational system in Egypt (with particular emphasis on the technical education system); and the social, economic, historical, and technical context of the research has been established. The purpose of this chapter is, first, to establish a theoretical and conceptual model for the study and to show how and what research has been needed in order:

(a) To find out the real state of Egyptian plumbing education in regard to the training, proficiency and financial and other rewards of Egyptian plumbers (in comparison with those of UK plumbers), and

(b) To determine the characteristics and attitudes of technical educators and students in Egypt in this field.

Through these two general strategies, methods of laying foundations for improvement of the technical education curriculum of Egyptian plumbers are sought. In order to achieve these aims various quantitative and qualitative methods of research were followed. These are described below.

This chapter therefore consists of three parts. This first part deals with the methodological approach adopted in the present research study. The second part describes a preliminary study carried out in Egypt prior to commencement of this research study in the UK. Part three details the design of the main study which includes: (a) the quantitative (questionnaire) (Verma et al,1999:177) studies and the qualitative (interview) research studies of practising plumbers in Egypt and the UK, (b) the qualitative study (interview) with the Egyptian technical teachers and their interaction with architectural (plumbing) students in the technical secondary schools, (c) the quantitative study (questionnaire) of the study with the Egyptian technical secondary students, and (d) the design and use of the vocational interest inventory implemented on the Egyptian technical students.

4.2 The methodological approach

There are several research models that have been introduced and practised by many social researchers. These types of social research are not mutually exclusive. Researchers usually employ more than one type of research in a study in order to best serve the goal(s) required. Accordingly, the present research study is considered to be a descriptive, comparative and exploratory research. The following is a justification of the type of the present research study.

- *Descriptive research*

> Descriptive research aims to describe social systems, relations or social events, providing background information about the issue in question as well as stimulating explanations. (Sarantakos, 1998:6)

The present research is thus descriptive in the way it describes and provides background information about the teaching process of the Egyptian secondary technical education students.

- *Comparative research*

> … is interested in identifying similarities and/or differences between units at all levels. (Sarantakos, 1998:7)

The present research is fulfilling this through drawing a comparison between Egypt and the UK in regard to the working conditions, requirements and status of plumbers in both societies.

- *Exploratory research*

> This research is usually undertaken when there is not enough information available about the research subject. In certain cases it is undertaken in order to provide a basis for further research. (Sarantakos, 1998:7)

In the light of the absence of any information or studies about the status of teaching plumbing technical education students in Egypt; and deriving from the aim of the present study of providing valid and reliable data for further development in the field, the present research is classified as an exploratory research.

The present research adopts the previous research types through using a combination of qualitative and quantitative data gathering methods. However, there are a number of difficulties associated with the use of the data gathering methods, which the present research has taken into account. Among these difficulties are the problems of reliability, validity and ethics. The following is an explanation of the researcher's attempts to overcome these difficulties.

4.2.1. Validity and reliability

Measuring instruments have at least two important properties of interest to social researchers (1) validity and (2) reliability (Black and Champion, 1976:221).

> Validity is an important key to effective research. If a piece of research is invalid then it is worthless. Validity is thus a requirement for both quantitative and qualitative research. (Cohen, Manion and Morrison, 2003:105)

Validity is a methodological element not only of quantitative but also of qualitative research (Gronlund and Linn, 1990; Miles and Huberman, 1994; Lancy, 1993). Both qualitative and quantitative researchers aim to seek validity in order to strengthen and secure their research finding. Some researchers use other terms to refer to "validity". Miles and Huberman (1994), as cited in Sarantakos (1998:80), use "credibility", "trustworthiness", and "authenticity" instead in discussing qualitative research. In general all these terms implement a similar meaning which is: "Does the instrument (method) used measure what it is supposed to measure?". Black and Champion (1976:223) point out that in social sciences it is somewhat difficult to establish the validity of many types of measuring instruments.

The following are the three principal categories of validity, with the advantages and disadvantages of each of them as regarded by Black and Champion (1976: 224-234).

Content validity or face validity is exclusively a logical type of validity that any given measuring instrument may have. For any given test or measuring instrument to have content validity, the researcher must endeavour to ensure that the instrument contains a logical sampling of items from the so-called "universe of items" that presumably reflects the characteristics to be measured and correspond with it in some consistent fashion. One of the important problems associated with content validity is that it is subjectively determined; what one person regards as high content validity may be regarded by another as low content validity. It depends on the quality of judgment of the researcher. Another problem concerns the reality of defining the "universe of items" from which the measuring instrument will be drawn. However, it is considered to be easy to apply and is not time consuming. Content validity may also be applied without using statistical procedures.

In the present study, content or face validity has been accomplished to a great extent in:

i. the design of the questioning techniques in the preliminary study described in the next section of this chapter,
ii. the design of the questionnaire for UK and Egyptian plumbers,
iii. the design of the measuring instruments for the teachers' study,
iv. the design of the measuring instrument for the students' study
v. the planning of the vocational interest inventory.

A second category comprises predictive and concurrent validity. Predictive validity is defined by the simple correlation of behaviour predicted by a measure with behaviour subsequently exhibited or expressed (Sarantakos, 1998:78-9). A high correlation or relationship between the prediction and the result means that the measure appears to have predictive validity. Concurrent validity differs from predictive validity in that the scores of behaviour are obtained simultaneously with the exhibited behaviour. Concurrent validity is 'assumed if the findings are supported by already existing empirical evidence' (Sarantakos, 1998:78). One of the major problems underlying predictive and concurrent validity is that simply observing a numerical association between a test score and some actual individual or group behaviour is no guarantee that the measuring instrument is valid. Another problem concerns the researchers' interpretation of exhibited behaviours by a respondent as representing the predictive behaviour. Though numerical in its statistical interpretation, the methods are liable to bias if not carefully carried out.

Black and Champion (1976:232) also state that...

> ...if the researcher has direct access to the sample under investigation and can observe their behaviours for a prolonged period, predictive validity would be a likely choice.

Since the present researcher did not have ongoing access to the plumbers, teachers and students in the sample under investigation; then predictive validity did not apply to the present study.

The third category, construct validity is generally determined through the application of, for example, factor analysis to a measuring instrument. Factor analysis is a statistical technique designed to determine the basic components of a measure. A serious disadvantage as seen by Black and Champion is that construct validity utilises statistical procedures that frequently exceed the scope of the average researcher's abilities. This method was used in the plumber skills analysis.

Black and Champion conclude by saying that...

> ...each of the three types of validity functions in a different capacity. It is difficult to make a generalization to which is the best to use under any circumstances. Depending on the particular interests and objectives of the researcher, each type may provide him with advantages the others do not offer. (1976:233)

It is a major difficulty to determine the degree to which validity exists when taking into account some social and/or psychological phenomenon.

> For the validity of a measuring instrument to be supported, it must be demonstrably reliable. (Black and Champion, 1976:235)

Thus, the second important test property is reliability. The reliability of a measuring instrument is defined as the ability of the instrument to measure or produce consistently the phenomenon it is designed to measure (Cohen, Manion and Morrison, 2000:117). Reliability is equivalent to consistency (Sarantakos, 1998:82; Black and Champion, 1976: 234; Payne, 1992).

Social quantitative researchers are interested in achieving *internal reliability* and *external reliability*. Internal reliability means "...consistency of results within the site of the test. External reliability refers to consistency and replicability of data across the sites..." (Sarantakos, 1998:83). Qualitative researchers employ other forms of reliability as increasing the variability of perspectives in research (Sarantakos, 1998:84). In that respect Drew, Hardman, and Hart (1996:169) suggest a number of steps that if applied by a qualitative researcher, better reliability of the research could be obtained. In regard of the internal reliability they provide the following steps:

1. Use of low inference descriptors.
2. Use multiple researchers wherever possible.
3. Create a careful audit trial (record of data that can be followed by another scholar back for conclusion to the raw data).
4. Use mechanical recording devices where possible.
5. Use participant researchers or informants to check the accuracy of perception.

As for the external reliability, they provide the following steps:

1. Clearly specify the researchers' status or position so that readers know exactly what point of view drove the data collection.
2. Clearly state who informants are; and how and why they were selected or chosen.
3. Carefully delineate the context or setting boundaries and characteristics so that the researcher can make judgements about similar circumstances.
4. Define the analytic constructs that guide the study (framework used in design and deductive analysis).
5. Specify the data collection and analysis procedures.

The present research used a number of strategies to increase and measure reliability; these are described in the following chapters.

4.2.2. Ethical issues

The main ethical dilemma that the social researchers face for whom there are no absolute right or wrong answers is, using Cohen, Manion and Morrison's term (2000:60), the cost/benefits ratio. Frankfort-Nachmias and Nachmias (1992) explain the ratio as a conflict between two rights:

> The right to research and acquire knowledge and the right of individual research participants to self-determination, privacy and dignity.

In order to protect the participants' right to privacy, the researcher in the present study had sought to fulfil both anonymity and confidentiality.

Frankfort-Nachmias and Nachmias (1992) say that

> The obligation to protect the anonymity of research participants and to keep research data confidential is all-inclusive. It should be fulfilled at all costs.

Cohen and Manion (1995:366-67) write "...the essence of anonymity is that information provided by participants should in no way reveal their identity". Confidentiality, on the other hand, implies that although researchers know who has provided the information or able to identify participants from the information given, they will not make the connection known publicly (Cohen, Manion and Morrison, 2000:62). Confidentiality in the present research was fulfilled through replacing the names of the three geographical areas in Egypt by Areas A, B and C. similarly, the names of the participating schools were replaced by numbers.

4.3 Triangulation of research methods

The use of two or more methods of data collection is what called "triangulation". As Cohen and Manion (1989:269) state, this helps validate the findings.

> Triangulation techniques in social sciences attempt to map out, or explain more fully, the richness and complexity of human behaviour by studying it from more than one stand point and, in so doing, by making use of both quantitative and qualitative data. (Cohen, Manion and Morrison, 2000:112).

Cohen and Manion (1995:236) mention six principal types of triangulation:

> 1. Time triangulation: this type attempts to take into consideration the factors of change and process by utilising cross-sectional and longitudinal designs.
>
> 2. Space triangulation: this type attempts to overcome the parochialism of studies conducted in the same country or within the same subculture by making use of cross-cultural techniques.
>
> 3. Combined levels of triangulation: this type uses more than one level of analysis from the three principal levels used in the social sciences, namely, the individual level, the interactive level (groups), and the level of collectivises (organisational, cultural or societal).
>
> 4. Theoretical triangulation: this type draws down upon alternative or competing theories in preference to utilising one view point only.
>
> 5. Investigator triangulation: this type engages more than one observer.

6. Methodological triangulation: this type uses either (a) the same method on different occasions, or (b) different methods on the same object of the study.

In the present study the researcher used two principal kinds. The first one is space triangulation. Space triangulation was applied in the present research study through applying similar data collection methods across three different geographical areas in Egypt to obtain a variation of teachers and students. Similar data collection methods in Egypt and the UK compared the differences between the plumber populations, but this is not strictly triangulation. The second kind of triangulation used is 'methodological triangulation'. This is the main method of triangulation used in the present research. It applies at different levels, both in overall strategy and in each sub-section of the research. To achieve methodological triangulation…

(i) Studies were made using three sources, plumbers, teachers and students, in identifying shortcomings of the present system and in identifying future needs,

(ii) Questionnaires, interviews, and observation were all used in the preliminary (Helwan) study,

(iii) Separate qualitative and quantitative techniques were used in the main study, and

(iv) A vocational interest inventory was used to provide further descriptive information and to give a reliability measure for the students.

The following section tackles the second part of the chapter, which is devoted to discuss the preliminary study.

4.4 The preliminary research study: the Helwan study in Egypt

4.4.1 Context of the preliminary study

The researcher is a lecturer in the Curriculum and Educational Methods Department of the School of Education at the Helwan University in Egypt. As part of my work there this research (El Kersh, 1997) was conducted prior to coming to the UK and commencing the formal part of the PhD study.

4.4.2 Purpose of the preliminary study

This preliminary study is presented as an exploratory survey. According to Richterich and Chancerel (1980:60), the conduct of a preliminary study supplies us with three types of information:

1- knowledge of the population, including each category to which people belong,
2- hypotheses for the main study; and
3- objectives of the main study.

Since the technical schools aim to provide society with talented technical hands able to comprehend the modernity of the labour market, the researcher conducted a study to measure how these graduates are capable of dealing with the market requirements and to fulfil the mission and duties asked of them. This study included a number of interviews, questionnaires and observations; Section 4.4.4 discusses these instruments in detail.

The problem of the preliminary study has as its special focus the issue of 'cost estimation' – just one element of the course presented by the three-year technical schools. There is some lack of connection between this cost estimation study, and the plumbing workshops' curriculum, but it proved valuable for the purposes of trying out industrial contact methods and in seeing some of the research issues involved.

4.4.3 The sample

The researcher attempted to cover the two main places concerned in technical education; the place of preparation (i.e. the schools) and place of practice (i.e. the work locations). The study required seeking opinions concerning the graduates: from the employers on one hand, and from the teachers on the other hand. For the same reasons as described in the main research, the preliminary study focused on the training of plumbers. The preliminary study sample included:

A) The sample from the practice field: -

32 engineers and 11 work site supervisors were included, in an attempt to know how well the graduated technical students are qualified in 'Cost Estimation' and 'Sanitation Installation' to join the labour market. These engineers and supervisors were sampled from three of the biggest construction companies in Egypt.

B) The sample from the preparation field: -

30 teachers and 9 instructors (specially of architectural subjects) – in an attempt to know the adequacy of the syllabus in promoting the graduates with the ability of accurate observation, finding out relations, connecting these relations with

requirements. This is as well as doing precise measurements and performance of necessary operations in the installation, beside the deduction of results based on the available information, data and their applications in new situations. These teachers and instructors were sampled from four technical architectural schools across three areas, two of which are located in Area A, one in Area B, and one in Area C.

Area A was chosen because it is a developing industrial city, which ranks top in industry, science and technology, when compared with other cities of similar size. It is the centre of the provincial politics, economy, science and technology, and education. Area A is also one of the specific cities for comprehensive reform of the economic system and one of the social development cities in Egypt. Area B was chosen as a big city in Egypt enclosing many rural districts. Area C was chosen as an example of the new built cities away from the capital. The researcher aimed to see whether new teaching techniques and trends are being applied there as compared with the traditional ones.

4.4.4 Research Instruments

Three research tools have been used in the preliminary research:

1- A questionnaire for teachers, instructors, engineers and supervisors;

2- An interview schedule for teachers, instructors, engineers and supervisors;

3- An observation schedule for work location.

These research instruments are used together to triangulate the data-gathering techniques. Table 4.1 illustrates the preliminary study sample.

Table 4.1: Preliminary study sample			
Participants	**Questionnaire**	**Interview**	**Total**
Teachers	25	5	30
Instructors	5	4	9
Engineers	22	10	32
Supervisors	7	4	11
Total	59	23	163

The teachers' and instructors' questionnaire

In the pilot study, the teachers' and instructors' questionnaire was implemented in two schools, one in Area A and one in Area B. The questionnaire consisted of four sections. The questions in the questionnaire were all open-ended. Although the researcher was aware that open-ended questions would take longer time than the closed questions, it was chosen in order to gather as much information as possible from the participants concerning the topic. The following is a paraphrase of the ideas included in the questionnaire, which was in Arabic.

1. The first section sought demographic information about the teachers' and inspectors' age, experience and qualifications.
2. The second section inquired about the problems encountered in class, out side the class and in the workshop.
3. The third section investigated the degree of connection between the theoretical and practical (workshop) sides of curriculum, as well as the degree of connection between the curriculum and labour market
4. The final section asked for the teachers' and inspectors' suggestions, if any, for means of overcoming the problems they face and means of developing the technical education field in Egypt.

The engineers and supervisors questionnaire

The engineers and supervisors' questionnaire was similar to that of the teachers and the inspectors' in that it contained four sections, all of which had open-ended questions. The following are the ideas included in the questionnaire.

1. The first section gathered information from the engineers and inspectors concerning their age and working experience.
2. The second section explored their opinion regarding the plumbing section graduates, and the extent to which these graduates are capable of coping with the labour market.
3. The third section in the questionnaire asked for the engineers and inspectors preference of working with a plumbing section graduate or a non-qualified plumber but who possesses an experience in the field.
4. The final section asked for the engineers and the inspectors' suggestions for means of developing the plumbing section graduates in order to cope with the developing labour market.

The engineers' and supervisors' interviews

Powney and Watts (1987), as cited in Verma and Mallick (1999:122) define the interview as…

> …a conversation between two or more people where one or more of the participants takes the responsibility for reporting the substance of what is said.

Verma and Mallick (1999:122) add that it represents an interaction between three elements: the interviewer, the interviewee and the context of the interview including the issues or questions raised in the interview.

In the Helwan study, six questions were presented to the respondents to obtain a view of the nature of the problems. The questions were thus very open-ended, allowing freedom to explain their views on the nature of the failings that exist within the Egyptian plumbing industry. However, to ensure that the conversation was conducted with efficiency in the use of the time of these mostly senior and very busy people, a semi-structured design was used. The following is a paraphrase of the ideas originally presented in Arabic.

1. The first stage questions were to identify an employee and to record personal details in the area of job description, years of experience (overall and within the company) and the type of work done using that person's skills within the employing company.

2. The second stage was to find out the employees understanding of the work of the company, by asking the employee for a description of the company, its specialist strengths and preferred type of work and its overall size.

3. This was followed by interview of senior management (normally the head of department or section in the company) to ascertain the accuracy and completeness of the data obtained in the above. This was then followed by collection of the central information required by the research, which is the identification of problems encountered by the companies in terms of employee weaknesses. Both free response

and prompted ideas were used. In the latter, twelve specific problem areas were used (e.g. jointing, estimating, reading of plans, etc.) to supplement the free responses. It is this stage that provided the results for detailed analysis.

4. Finally, the engineers and supervisors were asked of their own experience and qualifications.

The teachers' and instructors' interviews

The teachers and instructors semi-structure interview followed the same open-ended technique as the engineers' and supervisors' interviews. The interview included five questions asked in Arabic to assure clarity and maximum degree of self-expressing. The following is a paraphrase of the ideas included in the interview.

1. The first part covered the suitability of the taught syllabus to the labour market requirements, as well as skills that students acquire by the time they graduate.
2. The second part was to find out the availability of facilities, resources and equipment in the schools.
3. The third part inquired about the difficulties encountered in class and workshops.
4. Finally, the last part sought demographic information about the teachers and instructors.

The observation of the work locations

The observation schedule included visits to three locations. The researcher was fortunate in that during the implementations of the preliminary study there was major construction work at the university location in Egypt. Accordingly, this was chosen as one of the observation locations. Permission letters had to be sought for the other two outside campus locations. These sites were under the supervision of one of the biggest construction companies in Egypt. Each location was observed on a daily basis, except Fridays, for a week.

The observations undertaken by the researcher were semi-structured, non-participant, natural and open. They were non-participant observation because the researcher was not a part of the environment being observed. The observations were natural as they took place in their natural settings. The observations were also open, as the identity of the researcher as well as the purpose of the observation was known. The observations were semi-structured as it was organized and planned in advance but with possibility of some changes.

The main aim of the observations was to understand the extent to which the practicing plumbers are capable of coping with the demands of the job. The researcher gathered information about the plumbers' ages, qualifications and experience. The researcher also observed the plumbers' work sequence and their completion of the jobs. Attention also was given to their quality of finish of tasks and tidiness and cleanliness of location left behind. The results of the observations were recorded manually.

4.4.5 Results of the preliminary study

The subject matter dealt mainly with what is called 'Cost Estimation', that is the estimation and calculation of effective wages, and the cost of the projects done by the employees. This subject requires a lot of information and training to perform calculation operations, with the skill of reading a drawing, sequencing operations concerning the establishment of the work, and the ability to predict the form and the specifications of the required product.

The evaluation of the product's cost requires the individual to possess a mental awareness of all the information related to the materials, the evaluation and steps of operating, in order to facilitate the performance of calculation of the total cost. The training syllabus should have provided them with experiences that include some interactions and relations that place the learners in a state of thinking and practising the skills that deal with these requirements of the labour market.

The technical architectural secondary schools provide students with a number of subjects but presentation is likely rather to be done in separate ways – among these is the technical (engineering) drawing, the technology of sanitary installation, cost estimation, industrial safety, beside the professional training in the school workshop.

The research thus linked theory with practice in the workplace.

The meetings with the engineers and supervisors revealed that the content of these two subjects (theory and practice of cost estimation are listed as two subjects) does not lead to the graduation of a technician who is capable of performing accurate estimation of the work. Neither the engineers nor supervisors considered the individual students to have a suitable background for further individual on-the-job training. In addition, the plumber training lacks behavioural targets in such a way that each teacher could seek to achieve quality from them from a personal perspective.

The teachers and instructors had also confirmed that the content of the subjects taught had not been developed or modified for a long time. Besides, the projects required to be performed by the students do not follow a logical order, along with an insufficiency of geometrical drawings that deal with the operations and exercises of sanitary installations. The engineers and supervisors also reported that sometimes the employee might even miss ordering necessary materials, and be obliged to suspend the work until these materials are purchased. This is beside the failure of some graduates to be able to deal with some kinds of materials that are currently in use. This may also cause a waste of the companies' money and of the employers' time.

The teachers and instructors in the preparation sample had referred this curriculum failure to several factors such as the lack of integration between the school subjects, and the separation between the theoretical and practical subjects, as this separation and lack of the integration prevent any utility from it (Babbie, 1995:131-137). Accordingly, any syllabus needs to be planned in the light of the general plans and needs of development of the country, whether in the economic or social field. The promotion of this level of technical education cannot be achieved unless by a very full evaluation of the underlying requirements of the syllabus.

Upon the examination of the implementation of the subject of Cost Estimation in practice, it was found that it is taught to all the specialities of the architectural field since it deals with the study of measurements, numeration, etc. And, through the determination of the technical specifications for each of the items included in the construction of any geometrical work, and the determination of its importance in order to have suitable fixed prices for them – it also allows the student to read the executive drawings, and to understand the code of operating in technical terms

The teachers and instructors also believed that the time allocated to teach the subjects is not sufficient to acquire the skills needed. Beside the lack of co-ordination between the subjects within the adopted plan, the instructors revealed that the topics included in the curriculum do not keep up with the progress achieved in the labour market, and do not provide the necessary skills to perform sanitary installations or the calculation of their cost.

The observations of the work locations yielded that in regard to 'industrial safety' the workers were in their casual clothes. They did not have either helmets or safety shoes on. In regard to their performance, the observation revealed that they were using traditional, basic equipment. Final check ups are done by the engineers to assure the completion of tasks but there is no close supervision throughout the stages of the work, the engineers relies mainly on the plumbers experience of accomplishing the tasks.

The findings are thus

1- There is no link between the theoretical subjects and the practical subjects

2- The labour market needs are not adequately developed in the students

3- The curriculum, by not being changed, now lags behind practice in the workplace.

4.4.6 Implications of the preliminary study for the next research stage

The subject of sanitary installation and plumbing work, with both its theoretical and practical parts, is concerned with providing the skills and experiences necessary to carry out operation such as the installation and execution of technical operations at work sites. It is also the subject that presents to the student of the architectural section (sanitary works) a basic understanding of the sanitary installations in the buildings. This subject introduces the necessary materials required, the modality of installation, its connections, fixation, the determination of paths, methods of jointing, maintenance, check-up, along with the ability to comprehend any new achievements in the field.

The deficiency of the outcomes is obvious, in spite the importance of these two subjects for the qualification of graduates to work in great companies that have special departments for sanitary works, or to be involved in individual projects. This is at a time when technological progress is accelerated, producing more tools, new procedures and new equipment in the field.

This preliminary study has revealed that, in spite the fact that duties have been given to the graduates of the technical secondary school, with a responsibility to accomplish some sanitary installations and to calculate the total value of cost for these works under the supervision of the site engineer – yet the graduates do not possess sufficient ability to write down the cost estimation of the elements in a satisfactory way nor even to write down an accurate list of the needed materials. Nor can they perform the executive procedures. This leads to charging the client for more materials than needed, and in a way that huge quantities are left unused to cause a waste of money.

It is from the preceding that the researcher estimates that the promotion of the level of graduates requires the necessity to integrate the syllabuses of estimation and the programme of sanitary installations in a way that they both complement each other, and fuse to form an integrated subject. But this does not apply only to these two subjects – it applies throughout the training programme.

This will require the re-consideration of the syllabus of estimation in a way that will be in conformity with what the students fulfil in the syllabus of sanitary installation. This must include the operations taking place in the labour market after graduation, along with dealing with any developments in the field of materials and equipment. This is so that the technical architectural secondary school graduates are aware of how to improve their actual level.

In order to liberate this manpower to have an effective role in industry or self-employment, all the education efforts must focus on developing the energies of the students to the best possible level and to concentrate on quality and not just on quantity, so as (i) to improve proficiency in work and (ii) to have access to further educational opportunity to follow up ongoing industrial and technological evolution (El-Lakany, 1995:190).

The corollary, from the result of the preliminary study, is evidence that the need is not to know the main positive and negative features in the present curricula, nor to try to amend the present situation on the basis of present knowledge, but to build a new conceptual understanding for education in the plumbing field. As well as finding the fundamental skills needed by technical school graduates of the plumbing field, there is also need of a certain potential type of technical education teacher, capable of offering, sustaining and maintaining these requirements. This has important initial teacher training implications. It also became clear that a change of the social image of the technical education graduates should be made (Abou Zeid and Attallah, 2000:267).

Therefore, the researcher in the present study has attempted to understand the main needs of the plumbers in their training, in the labour market on location as practising plumbers, and to place these understanding alongside studies of current classroom perspectives. The next section describes the strategies for achieving this end.

4.5 The main study: design of the quantitative study of the characteristics of practising UK and Egyptian plumbers

4.5.1 Introduction

> The questionnaire is a widely used and useful instrument for collecting survey information, providing structured, often numerical data, without the presence of the researcher, and often being comparatively straightforward to analyse. (Wilson and McLean, 1994:3)

Thus, the questionnaire is a useful tool to gain detailed information about activities, training, attitudes, etc. that can be applied directly to plumbers in the UK and Egypt.

Questionnaires, as methods of data collection, have strengths and weaknesses. Sarantakos (1993: 225-225), Munn and Drever (1999:2-5) and Cohen and Manion (1995:283) listed the advantages that most researchers consider significant. Among these advantages, the questionnaire was used in the present research in order to seek:

- An efficient use of time in the light of the limited available time that was allocated for the data collection;
- Anonymity of the respondent to assure the ethical issue in the study;
- The possibility of a high return rate within the limited time available;
- Questionnaires can be completed at the respondent's convenience.

However, the researcher was aware that questionnaires also possessed the following limitations, among others.

- They do not allow probing, prompting and clarification of questions.
- They do not offer opportunities for motivating the respondent to participate in the survey or to answer the questions
- It is not possible to check whether the question order was followed.

The researcher's need was to try to get sufficient details about plumbers in the UK and Egypt. This comparative aspect came from the possibility that curriculum import might be a good starting point for the improvement of Egyptian syllabuses. But there is a problem in comparing between the histories of this craft in the two countries.

Although technical skills were developed 5000 years ago in Egypt, before the rest of the world, yet there is now a gap between Egypt and the UK that is not is Egypt's favour. The UK was chosen (a) for research convenience, (b) as it is one of the eight biggest industrial countries in the world, and (c) its technical education system is well developed and has been under scrutiny in recent years.

So, this comparative study might offer the Egyptian government, through a clear and detailed picture about the present status of the technical education in UK in the field of plumbing, an option of using curriculum transfer as a means of future rapid development.

From an initial survey the researcher found some significant differences between Egypt and the UK. First, there are now no technical education secondary schools in the UK dealing with the type of skill development under consideration. In order to get qualified in technical trade skills one must join colleges after secondary school or after a preparatory course in an adult education centre. Second, there is a significant difference in the curricula used to prepare and qualify the students in both countries as a plumber. Thus it would not be practical to adopt UK technical curricula (or those of another developed country) unchanged into Egypt. Certain adaptation would need to be made to them in the light of the Egyptian educational system.

To know more about the history of technical architectural education in Egypt and UK the researcher used a tracer study. The researcher did that by looking in educational history books and in theses through the Internet.

4.5.2 Selection of the plumbers sample

The sample was selected from the labour market in both countries, Egypt and UK. In Egypt the researcher selected the sample from the main plumbers' shops (both wholesale and retail customers) in Areas A and B, thus covering both areas of domestic and industrial plumbing. The plumbers that took part in this questionnaire were chosen as they entered the shops. The same strategy has been used in the UK; the researcher visited two plumbers' supply centres in the Manchester area (Stockport and Salford).

The data was collected from 41 UK plumbers and 42 Egyptian plumbers. Within the time available for data collection the above numbers represent relative success against an ambitious target of 50 in each country. Subsequent analysis indicates that the sample was sufficient.

4.5.3 Difficulties Encountered

In selecting the samples in Egypt and the UK the researcher encountered a lot of difficulties; these difficulties are as follows:

- Difficulties in the UK…

In seeking to find examples of sample selection in previous research, the researcher did not find relevant theses covering comparative technical education in the UK and Egypt. In addition, there are no recent UK theses dealing with plumbing curricula.

This might be because, among university and colleges staff, the topic has previously not been regarded as a sufficiently important point for research.

A second difficulty was that plumbers did not have time to spare to answer the questionnaire. To solve these problems the researcher contacted many plumbers to get an appointment with them. But it was very difficult because they were always so busy. Some of them asked me to pay for their time – up to £7 an hour – and still the appointment was too difficult to arrange. There was particular difficulty in contacting plumbing companies around Manchester.

Finally, the researcher managed to get access to the previously mentioned two plumbing wholesale parts centres, where meetings with practising plumbers could be undertaken while they waited for their supplies. Interviews there extended over a period of more than two months. A poster (Appendix 6) hung near the counter asking the plumbers if they could help me, by sparing a few minutes of their time, or during their free time. On some occasions they would arrange a time and come back to meet me. This idea resulted in 44 plumbers completing questionnaires from the two centres in 65 days. (Three were discarded because they did not answer enough questions for inclusion in the analysis.)

The sample is thus neither random, not specifically structured, but constitutes an opportunity sample in an area where access has proved especially difficult. The subsequent analysis indicates that a very good range of ages, qualifications and experience are included and that responses to questions covered a very good range.

The bias problem therefore would appear to be much less than might be feared (see Chapter 5).

Despite the fact that the researcher managed to fulfil the questionnaire sample; yet the researcher is aware of the risk of bias of the sample in this method. That bias could result from questioning only (a) confident plumbers and (b) those that were able or willing to come.

- Difficulties in Egypt…

Similar problems were also encountered in the Areas A and B. First, some of the plumbers thought I was a tax inspector and were reluctant to give accurate information. As in the UK, most of them were very busy.

While doing the questionnaire the researcher found out that most of the plumbers in Egypt were literate, but required that the questionnaire be administered verbally, with the researcher recording the answers. This procedure consumed a lot of time. (A similar procedure was used in the UK, with the researcher recording answers as the plumbers read the questions; but for the reason in the UK that the respondents seemed to find this a more relaxed and informal procedure.)

There were a lot of security letters to sign before entering any company in Egypt, unlike the case in the UK. Unlike in the UK, there is no list of the plumbers' names in the country because there is no union, government registration or other central organisation for plumbers in Egypt.

There are no wholesale plumbing centres in Egypt, comparable with the Plumb Centers or others in the UK; all the component supply shops in Egypt are privately owned small businesses.

Areas A and B, where the research was conducted, are heavily populated with around 33 million citizens. The researcher found it very difficult to identify the sample members from all those unknown plumbers in the area. The sample was again therefore an opportunity sample. In order to solve these problems, the researcher showed them his national ID card to get them assured of his status in order to answer the questionnaire; the card shows the occupation of the holder, in addition to the name, date of birth, address and photograph.

Because they were so busy, the researcher had to go to many of them on location where they were working. The researcher obtained the necessary security letters in order to visit the construction companies to be able to meet the plumbers.

One of the major issues that could affect the outcomes of the questionnaire in Egypt is that in the Egyptian culture, unlike the British, and especially with the low-educated and illiterate sector, working men are not used to the idea of filling in questionnaires. This idea does not appeal to them. They have a feeling of insecurity, based on the inadequacy of their education, towards filling in paper documents. They, thus, tend to give the answers expected from them, rather than the truth. This could very probably lead to bias.

The final sample used included 83 plumbers (42 Egyptians, 41 English).

4.5.4 Areas to be questioned

In the following section a description of the implemented questionnaire is given. The questionnaire was re-designed a number of times according to my supervisor's directions and suggestions, until a final version was reached, see Appendix 1. The questionnaire was designed to be administered by the researcher with each plumber individually. It includes six parts. Parts 1, 2, 3 and 4 included both open and closed questions. Parts 5 and 6 were entirely pre-coded.

Part 1: About yourself and your work

The first part consists of two questions. The first question inquired about the plumbers' age in order to know the range of ages at which they start and quit the job. This question also aims to know the average age and age distribution of the sample of working plumbers in Egypt and the UK.

The second question is a closed multiple choice question and tries to detect the scale of work in which these plumbers are engaged.

Part 2: About your training qualifications and experience

Question 3 is a list of qualifications to enquire about the plumbers' certification and to identify how far these qualifications are related to the job. The list contained UK and Egyptian qualifications placed in rank order, arranged in order after discussion with the supervisor and investigation of the levels of qualification. Questions 4, 6, 7 are closed-ended to draw a picture of the plumbers' social and technical background. Question 5 asked the plumbers to state their years of experience; this could then be compared to their age.

Part 3: About your work as a plumber

Questions 8 until 11 are open-ended covering the financial side of the job and the earnings. This is important in comparing between their income and each of their age, experience, qualifications, and the number of family members they support. From this comparison a picture of their standards of living can be drawn. This part also aims to see whether many people are attracted/interested to work as plumbers. The figures for the UK were collected in pounds sterling (£UK) and the figures for Egypt were in Egyptian pounds (£E). Though comparisons can be made in terms of exchange rate, these are not the full picture because of very big differences in the costs of living.

Part 4: About your interest in your development

Questions 12 till 19 list four questions to explore how far these plumbers are keen on developing their knowledge of materials and techniques used in their job as well as their sources of supplies. This part can be related to and compared with the financial information gained from Part Three.

Part 5: About your skills

This part consists of 18 major skills that most plumbers should be capable of using. The choice of the skills included in this list was based on literature reading and a number of theses and curricula in different developed countries (Gregory, et al, 1994). For each of these skills the participant plumbers were required to choose whether they were trained for it, where it was gained (in an educational institution or on the job), as well as how often they had used the skill in the last six months. This section helps us to judge the working standard of the plumbers. From this section also the reality of skills provision in the schools can be detected. An important relation between the place of a skill provision and the frequency of its use will help to find out how far the schools on one hand and location sites on the other provide plumbers with their necessary skills.

Part 6: About your (advanced) knowledge

In the last section of the questionnaire, the training of the plumbers is tested about four mental skills related to the job, all as relevant to plumbing (reading plans and blueprints, mathematics, physics and legal regulations). The plumbers are asked to choose from the four areas. This part is added to establish a full picture of both practical and theoretical knowledge possessed by the plumbers.

The questionnaire concluded with an open-ended question enquiring about any other skills that the plumbers could possess and that have not been mentioned in the questionnaire.

4.5.5 Translation issues

It was important to use the same questionnaire in both countries to make the study comparative and to be sure what differences exist between the systems in the two countries.

A translated version of the English questionnaire was conducted in Egypt. Two-way translation was done to establish validity. The writer did the first (forward) English-Arabic translation. The translated Arabic version was validated and revised by an English-Arabic translator in the Faculty of Arts (Middle Eastern Studies Department) of UMIST. A second translator independently translated the Arabic (backward) to English. The researcher and an Egyptian colleague specialised in teaching English as a foreign language compared the two English versions. There were no differences of meaning. Possible confusion was however noted in the technical terminology of Question 20, where the translators had no experience. These were amended and double-checked for accuracy.

The result of this particular translation must be as accurate as possible because the research makes comparisons between equivalent responses in the two languages.

4.6 The main study: the qualitative study of the background attitudes and abilities of practicing technical teachers

4.6.1 Introduction

Together with questionnaires, interviews make up the survey method, which is one of the most popular techniques in social research. As Kvale (1996:14) remarks, an interview is an interchange of views between two or more people on a topic of mutual interest.

4.6.2 Accessing the schools

In order to fulfill the ethical issue of the research, the researcher in the present study sought permission of the Egyptian Education and Cultural Bureau in London (the governmental body supervising Egyptian students in the UK). Four months later the approval letter was received. The letter was forwarded to the Head of Technical Education Sector in the Ministry of Education. Despite the fact that there was a four months wait for this, it was found that on arriving to Egypt it would be necessary to obtain permission for each of the schools from the educational sector which each school follows because the researcher is not one of the school staff. This procedure would have taken at least another month.

This fact, and due to time (as well as financial) constraints, led the researcher in the present study to seek the assistance of a former colleague working in one of the technical secondary schools to implement the data instrument across the four sample schools participating in the present research. Further details of accessing the teachers within the participated schools are dealt with in Chapter 6.

4.6.3 Selection of the Teacher Sample

The teachers' sample included all the plumber section teachers in the four architectural technical secondary schools in the three areas. These four technical secondary schools were chosen because they were accessible for interviewing and comprise the only ones to contain plumbing sections. One school offered a five-year programme, the other three the basic three-year program. This sample was chosen for convenience, travel to distant schools not being possible, but these were fully representative of the various patterns of plumber education in Egypt.

Due to the absence of a detailed list available in Egypt of the architectural technical secondary schools containing each department and section within theses schools, the researcher followed the following sequence of stages to obtain his sample.

First, the 1994/95 Statistical Register of the technical secondary schools in Egypt (the most recent available at the time of data collection) was used to obtain general national data of the total number of the technical secondary schools (see Chapter 2). During the duration of implementing the plumbers' questionnaire in Egypt (see Chapter 5), the researcher made his own list of the architectural technical secondary schools that contain plumbing section in Area A, B and C. The researcher also obtained estimated statistics of the numbers of teachers and students in these plumbing sections.

The collected data revealed that out of the 8 five and three-year technical architectural secondary schools available, only four contain a plumbing section. Accordingly, the researcher decided to include all technical secondary teachers in the plumbing section in these four schools. The participating schools and the number of teachers in the plumbing section are shown in Table 4.2.

The target was 100% in each school, but some (very small) omissions occurred due to timetable issues. There were no absences due to illness and no refusals. It is thought that these omissions do not relate to the questions and therefore the omissions are treated as random and ignored.

Table 4.2: Teachers' main study sample by status

Area	Schools	Promoted teachers	Teachers	Total
Area A	School 1	2	3	5
	School 2	2	3	5
Area B	School 3	4	3	7
Area C	School 4	1	4	5
Total		9	13	22

4.6.4 Areas to be questioned

The modified interview schedule (Yusof, 1997:137) included five sections (see Appendix 2 for a translated version). Section 1 was a demographic section about the teachers, their teaching experience and qualifications. Section 2 dealt with teaching-related issues such as workloads and specialisms. Section 3 was concerned with the available school facilities in classrooms and workshops. Section 4 covered the teaching methods adopted in the classrooms. The final section asked for the teachers' suggestions and recommendations to improve the current technical education curriculum and teacher preparation courses. Each of these areas gives indication of teacher activity in a way that can be linked to student answers to parallel questions in the student research.

The schedule included a mixture of closed and open-ended questions. The detailed interview schedule is discussed in Chapter 6.

4.6.5 Translation Issues

The interview schedules for the teachers were first designed in English and then translated into Arabic.

A two-way translation was implemented to achieve validity. The researcher translated the teachers' interview schedule with the help of two Egyptian Ph.D. students in the United Kingdom. The schedule in Arabic was shown to an Arabic speaking academic in the UK, and sent to colleagues at Helwan University, who all commented favourably. No changes were requested or necessary. Special attention was given in translation to issues of differences between the two countries such as qualification names and currency.

Two different PhD students did a back-translation. There was no difference of meaning although alternative wording arose. The copy in Appendix 2 is the original, as used.

4.6.6 Difficulties encountered

There were no major problems with the teachers, except the reservations listed and described in Chapter 6 where the tactics for overcoming these problems are given.

4.7 The main study: the Quantitative Study of the Backgrounds Interest of Technical Education Students in Egypt

4.7.1 Introduction

The researcher attempted to collect data concerning the students. A questionnaire was chosen as the instrument to obtain data on a large sample in various classes of the same four schools as used for the teacher survey (Joseph., F., 1995:373) Most questions were closed-ended to make the answers focused on the topics chosen, to make response easier for students of this age group and ability, and to increase reliability of coding for computer statistical analysis. The small number of open-ended questions were simple enough for later coding of the answers for analysis.

4.7.2 Accessing the schools

The same procedures applied to get access to the teachers' schools (see section 4.6.2) were applied in this study.

4.7.3 Selection of the Sample

The students' sample had been chosen from the four technical schools with plumber sections in Areas A, B and C. Table 4.3 gives the sample distribution of the students, all of them in the third year of the plumbing section in technical secondary school. Further analysis is in Chapter 7.

Table 4.3: Students' main study sample by schools

		Frequency	Percent
Area A	School **1**	65	23.6
	School **2**	93	33.8
Area B	School **3**	66	24.0
Area C	School **4**	51	18.5
Total		**275**	**100.0**

4.7.4 Areas to be questioned

The students' questionnaire consisted of six parts. The questionnaire contained mainly closed questions (multiple choice and rating scales), which will be quick for the students to complete and straightforward to code for computer analysis. The detailed questionnaire is shown in Appendix 3.

Part 1 contained a number of open-ended questions seeking demographic information (age, etc.).

Part 2 covers the issue of the students' social background, their motivations and reasons for joining the plumbing section as well as their attitude towards the section.

These questions aim to draw a picture of the students' background and seeking links between these backgrounds and their reasons for joining the section.

Part 3 of the questionnaire explores the source, condition and abundance of the resources available for the students. The answers to these questions could then be compared to the students' attitudes towards the section.

Part 4 deals with teaching practice issues related to the theoretical side of the students' study. It also explores the students' opinion of the theoretical curriculum content. Part 4 concludes with an open-ended question asking for the students' suggestions, if any, to improve their learning process of the theoretical subjects.

Part 5 deals with the students' opinion on the workshops and the degree they benefit from it. Both parts 4 and 5 serve to present complementary pictures of the students' attitude and perception of their learning experience and conditions. Similar to part 4, Part 5 concludes with an open-ended question asking for the students' suggestions to improve the workshop sessions. Part 5 also possesses an open-ended question seeking any problems encountered in the workshop.

The final Part 6 of the questionnaire is devoted to the issue of assessment in both the theoretical and practical sides of the students' study.

4.8 The main study: the Vocational Interest Inventory

4.8.1 Introduction

Through the researcher's experience and as the result of the literature review, a problem was found regarding how the students join the plumber section. It was considered desirable that some measure of vocational interest should be made. Questions on this topic are also in the student questionnaire.

Choice of type of instrument was not difficult. With the large number there would not be much time to spend on this, and individual clinical methods (such as the Strong systems) were unsuitable. The Thurstone inventory, however, was appropriate. It is not difficult to guide a large number of students to complete the inventory simultaneously and independently (Price and Whipp, 1996:123). Details are given in Chapter 7.

4.8.2 Selection of the Sample

The student sample was identical to that of the student questionnaire. Once each whole class had completed the questionnaire, they were then immediately given the inventory for completion. This saved considerable research effort, and student time.

4.8.3 Translation Issues

For the present research, the researcher adapted the inventory version designed by Thurstone (1947) and modified by Whipp (1980). This is a vocational interest inventory originating in the USA but it was necessary to do a lot of changes to the inventory version to suit the Egyptian technical secondary school students, as Whipp had had to do for his UK research. The original Thurstone inventory was validated within a USA employment culture. The Thurstone-type of inventory presents each student with a grid, in each cell of which are two occupations. Of each pair the student is required to indicate a preference, from which more general interest preferences are derived. Many problems faced the researcher to achieve a new Egyptian version inventory. The three main issues were:

1. The translation of the occupations from English to Arabic to ensure the same meaning.
2. The economic difference between the Egyptian, British and USA societies. This economic difference between these societies led to different income levels for the same job.
3. Another, third, problem that also faced the researcher was the different cultural perspective among these societies towards the job titles.

In order to try and solve the first of these problems, the researcher did a two-way translation of the Whipp inventory with the help of two Arabic speaking professional translators. To overcome the issue of economic and cultural difference, the researcher chose job titles from Egyptian society equivalent in income and status to those in the Whipp inventory. The final version is shown in English translation in Appendix 4.

Other issues in translation and validity are discussed in Chapter 8.

4.8.4 Presentation

The grid was printed on one side of A4 paper, with 10 pt. type. This was considered to be sufficiently clear for the students, and there were no legibility problems reported.

A page with instructions was provided to each student but the information was also given verbally before the test started.

Chapter 5

The plumber questionnaire and data analysis

5.1 Introduction

The previous chapter presented the research design employed to reach (i) an understanding of the state of the present plumber labour market in Egypt and the UK, (ii) an understanding of the current state of skills, attitudes and opinions of graduated technical education students working as plumbers.

The present chapter is one of a series of Chapters 5 to 7 devoted to the analysis of the data resulting from the implementation of the various data instruments. The present chapter deals with the practical employment side of the issues represented in the questionnaire-based interviews that were carried out on the plumbers in both Egypt and the UK. Chapters 6 and 7 deal with the educational side: Chapter 6 deals with the interviews with the technical architectural secondary school teachers and Chapter 7 with the questionnaire for the technical architectural secondary school students, and the vocational interest inventory applied to these same students.

The questionnaire carried out on both Egyptian and UK plumbers covers two main areas (a) the categorisation of the plumbers according to their personal characteristics, employment, training, etc. and (b) a set of descriptions of their skills in terms of acquisition and usage. These two areas are divided into six parts, four and two respectively. The following is a discussion of the comparative outcome of these parts.

Before examining the samples it must be borne in mind that the nature of the two societies, of which the plumbers are part, affects the educational and cultural attributes of the plumbers. This, in turn, could affect the skills and level of performance. In this chapter the differences between these two samples are explored in an attempt to pinpoint the differences between the Egyptian and UK technical systems, which in turn might then enlighten thinking on how to improve on the current state of Egyptian plumber training. It is necessary to be cautious using 5% (and lower) levels of statistical significances in the large number of tests following because of the danger of a Type 1 and Type 2 error.

> 'Accepting the 0.05 level of significance' in rejecting the null hypothesis means that 95 times out of a 100 we are probably correct in our decision, but, 5 times out of 100, we run the risk of rejecting the null hypothesis when the fact is true.
>
> When the null hypothesis is rejected and it is actually true, we refer to a TYPE 1 error having been committed. The risk of committing a TYPE 1 can be reduced by setting our level of acceptance at a more rigorous standard or by increasing the sample size.
>
> The opposite of this case is referred to as a TYPE 2 error, that is, *not* rejecting the null hypothesis when, in fact, it should be rejected.
>
> Thus, as we decrease the possibility of making a TYPE 1 error, we increase the probability of making a TYPE 2. (Cohen and Holliday, 1979:121-122)

5.2 Demographics of age, qualification and employment (Part 1)

5.2.1 Age

Table 5.1 shows the minimum and maximum age in both samples. It should be pointed out that the ages of the UK plumbers were approximated to the nearest year (i.e. 16yrs + 9mths= 17 yrs). (This is to ensure consistency with the Egyptian custom of rounding to the nearest year, compared with the completed years British tradition.)

Table 5.1 the minimum and maximum age in the Egyptian and UK plumber sample					
Country	**Number**	**Minimum Age**	**Maximum Age**	**Mean**	**Standard Deviation**
Egypt	42	16	67	35.74	8.9
UK	41	17	65	41.05	11.93

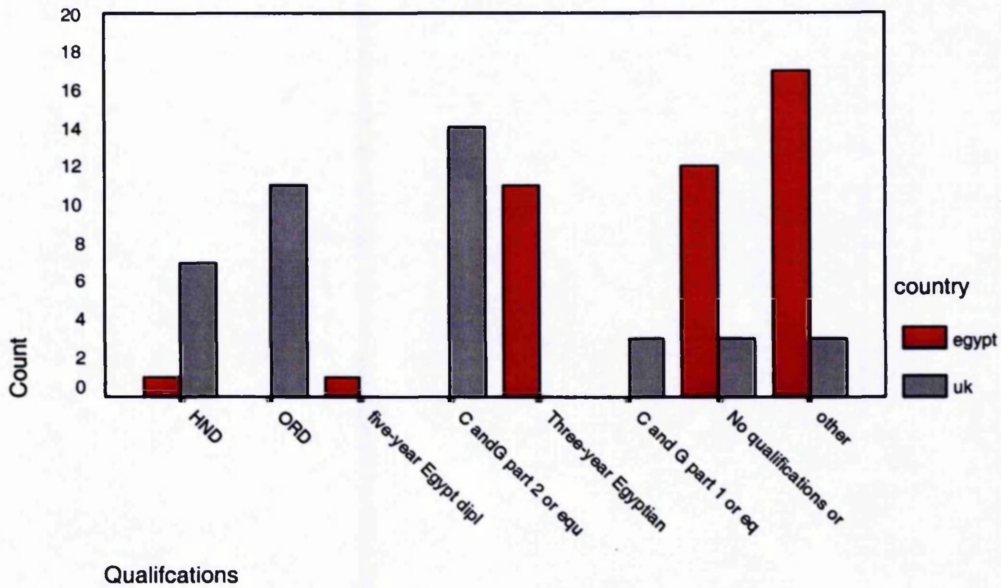
It becomes clear that the two samples are very similar in minimum and maximum ages. However, further analysis reveals that there is a difference between them in the age distribution. The majority of the Egyptian sample (71.4%) ranged between the age of 21 and 40 years. On the other hand, the UK sample distribution was more widely spread. Only 43.9% of the UK sample was in that range. The Egyptian sample median is 34; the UK sample median is 44, partly explained by the later career entry age. Table 5.2 shows this as a grouped distribution.

Table 5.2: The Egyptian and UK plumbers Age Distribution				
	Number		**Percentage**	
Age	**Egypt**	**UK**	**Egypt**	**UK**
≤20	1	2	2.38	4.88
21-30	11	9	26.19	21.95
31-40	19	9	45.24	21.95
41-50	9	11	21.43	26.83
51-60	1	9	2.38	21.95
60+	1	1	2.38	2.44
Total	42	41	100	100

It becomes clear that the null hypothesis, that there is no difference between the standard deviation and means of the Egyptian and UK age distribution is rejected at the 1% and 5% levels respectively (N_{UK}= 41, N_{Egypt}= 42, F = 9.449, p_{SD}=0.003, t =-2.294, df = 81, p_{Mean}= 0.025*, p <0.05). In the interpretation of other training and skills characteristics this difference in age profiles must be noted.

5.2.2 Qualifications

In order to analyse the effects of level of qualification on other attributes it was necessary to produce a list of comparative levels of training in Egypt and the UK. These form a crude ordinal scale with UK and Egyptian qualifications coinciding or interspersed, as shown in Graph 5.1, developed by the writer following consultation.

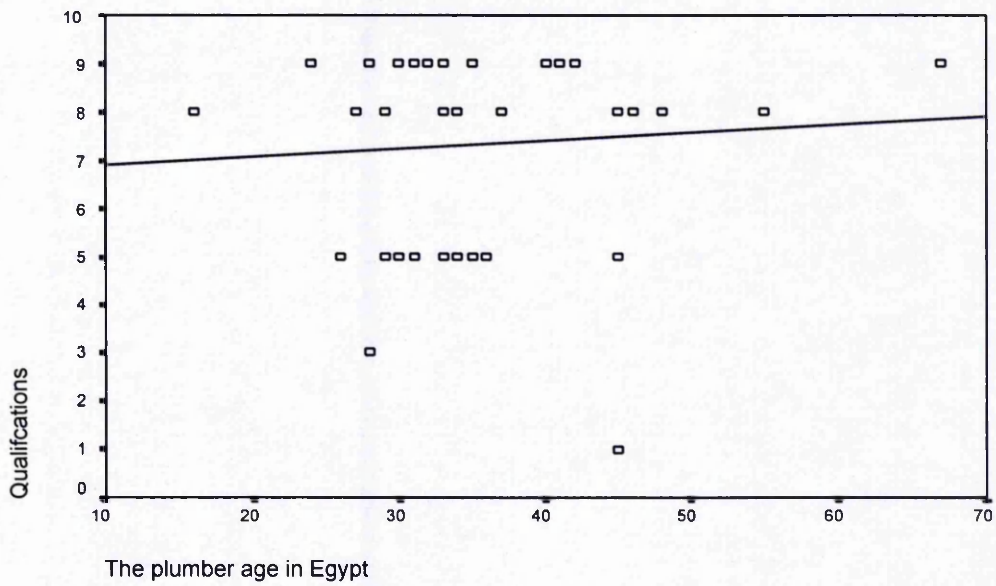


Graph 5.1: The description of the qualifications of Egyptian and UK plumber samples

Most members of the Egyptian sample, 69.1%, are not qualified as a plumber. But the majority of the UK samples, 85.4%, have a formal qualification in plumbing. However, many in both countries have qualifications for other trades, and the profiles of qualification levels in general is shown in Table 5.3.

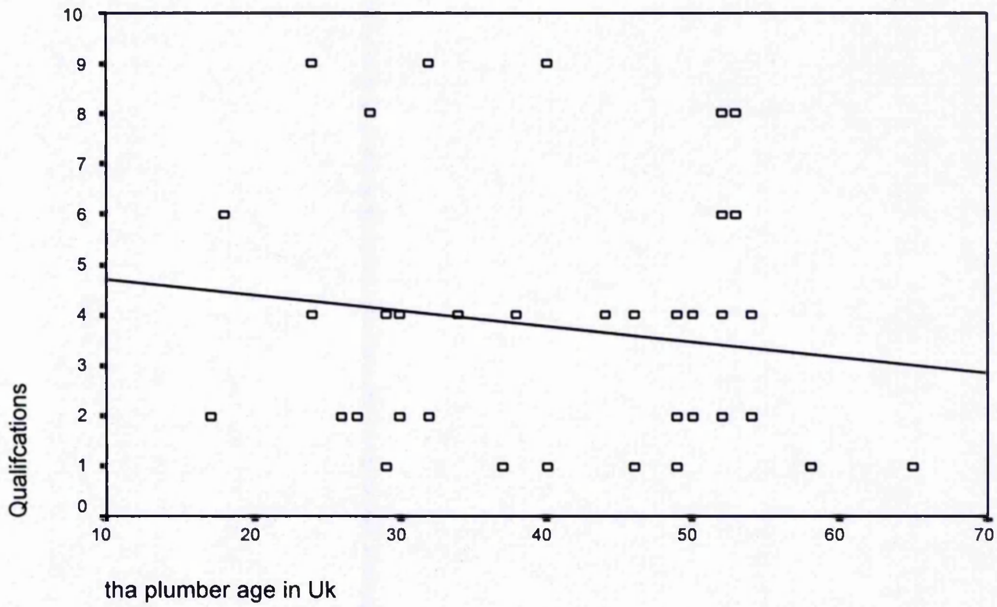
Table 5.3: The profile of the qualifications in the Egyptian and UK plumber samples				
Qualifications	Egypt		UK	
	N	%	N	%
1-Higher National Diploma (or equivalent)	1	2.4	1	17.1
2-Ordinary National Diploma (or equivalent)	0	0	11	28.6
3-Five-years Egyptian Diploma	1	2.4	0	0
4-C and G part 1 or equivalent	0	0	14	34.1
5-Three-year Egyptian Diploma	11	26.2	0	0
6-C and G part 2 or equivalent	0	0	3	7.3
7-No formal qualifications but presently apprenticed.	0	0	0	0
8-No qualification or formal training- just experience on the job.	12	28.6	3	7.3
9-Other qualifications not listed	17	40.5	3	7.3
Totals	42	100	41	100

On investigating whether there is a positive correlation among the Egyptian sample between increasing age and the increase in qualification, it becomes clear from Graph 5.2 that there is no statistical relation (N= 42, ρ= 0.022, sig.(2-tailed)= 0.892). Bearing in mind that in the next graphs the lower the numbers are on the qualification axis, the higher the qualification, it becomes clear that in the Egyptian sample the younger age, the more qualified they are. However, their qualifications are not necessarily related to the field of plumbing (Hair.1995:39).



Graph 5.2: The relation between qualifications and age in the Egyptian plumber sample

Similarly, the UK sample did not show a significant correlation between the age and the increase in qualification ($N=41$, $\rho= -0.105$, sig. (2-tailed) $= 0.514$). Despite the fact that none of the samples showed a positive relation in this respect, there was a variety of qualifications in the UK, see Graph 5.3. As mentioned above, the lower the numbers on the qualification axis, the higher the qualification. On looking to the UK sample, it becomes clear that the older participants in the sample are the more qualified they are. The lines shown on graphs 5.2 and 5.3 are least squares regression lines.



Graph 5.3: The relation between qualifications and age in the UK plumber sample

5.2.3 Employment

Table 5.4 illustrates that there is a difference between the two samples in regard to the nature of employment of the plumbers in Egypt and the UK. In Egypt the plumbers are either self-employed or working in a large multi-purpose contracting company, with the majority being self-employed (66%).

Table 5.4: Employment categories for the plumber in Egypt and the UK

	Egypt		UK	
	Frequency	Percent	Frequency	Percent
Self-employed	28	66.7	12	29.3
Employed in a small company (2-5 persons)	0	0	5	12.2
Employed in a company of 5 or more persons	0	0	13	31.7
Employed in big company	14	33.3	11	26.8
Other	0	0	0	0
Total	42	100.0	41	100.0

From the table, the labour markets in the UK and Egypt are clearly different and these differences are clearly highly significant (N=83, χ^2=24.752, df=3, sig<0.001).

None of the Egyptian sample formed a joint company with other colleagues. The reasons behind this fact, as expressed verbally by the Egyptian plumbers in the interviews, are as follows:

• Joining fieldwork depends mainly on personal contacts with people and places that need workers. It is even easier in the case of having relatives already in that field.

• The field of plumbing is open to anyone to join it, without having any suitable qualification or even without education at all. It is regarded as a job for those that have no education.

• The low economic level of the majority of the population leads parents to push their children to work in fields that have easy entry requirements rather than continue training.

As for the 33.3 % of the Egyptian plumbers who worked in large companies, their reasons for joining this sector were given as:

• Ensuring a constant income.

• Working in these big firms leads to expanding personal contacts, which in turn lead to extra external work and eventually to a better income.

• The field is open to anyone. It does not require a specific qualification. In fact all it requires for employment, is to be mentioned in the person's ID (National Identity Card). The means of having it stated in the ID, as mentioned by the plumbers and also through the researcher's investigation, is through the testimony of a person in the police station known as 'The Vocational Expert'. That person, who is supposed to evaluate through a number of oral questions the skills of any one wishing to be employed in any craft, does not necessarily have any formal qualification themselves. Sadly, personal contacts and bribery also occasionally play a role in this aspect.

Inquiring of the Egyptian plumbers about whether or not they would think of forming a small firm with some colleagues revealed an absolute dissatisfaction with the idea. The reasons were given as follows:

- The impossibility of deciding among each other the cost of the work required due to the unstable initial cost of the raw materials. This in turn could lead to financial problems.
- The difficulty of dividing the tasks among them and sticking to these divisions.
- The difficulty of coming to an agreement among them of whom to choose as a boss.

The researcher concluded that the reason for the above could be, as mentioned in Chapter 2, that there is no specialised organization (institution or syndicate) responsible for representing or employing plumbers.

However, the UK plumber sample was distributed across all types of employment , see Table 5.4. UK plumbers were able to form small firms for the following reasons:

- The possibility of establishing a firm with specified aims and standardised prices.
- The abundance of materials, tools and technology needed for the tasks.
- The presence of relatively fixed prices of the components and raw materials, which would reduce any attempt of cheating or fraud.
- The presence of technological means of communication and the relatively high literate standard of the plumbers.

• Relatively strict trading laws facilitate the distribution of tasks and responsibilities and provision of warranty of work (Hunter, 2002, Melville, 1999).

As with age, employment category differences must be considered in interpreting other differences, e.g. skills.

5.3 Training and background to experience and employment (Part 2)

5.3.1 Working experience

On examining the years of experience working as a plumber in both samples it is concluded that the minimum number of years of experience in the Egyptian sample is 4 years and the maximum is 54 years with a median of 17 years. On the other hand, the minimum number of years of experience in the UK sample is 1 year and the maximum is 40 years with a median of 23 years. Tables 5.5 and Table 5.6 provide further analysis of both the Egyptian and UK samples respectively in regard to the age by which the members of the samples in each of the countries started practicing plumbing in the labour market. It needs to be noted that the calculation of start age by subtraction involves rounding errors, and for example a given start age of 15 in the UK might in reality be the 16-year-old present school leaving age.

Table 5.5: The Egyptian plumbers sample start age*			
Start Age*	Frequency	Percent	Cumulative Percent
8	1	2.4	2.4
10	3	7.1	9.5
11	2	4.8	14.3
12	2	4.8	19.0
13	3	7.1	26.2
14	2	4.8	31.0
15	6	14.3	45.2
16	3	7.1	52.4
18	4	9.5	61.9
19	4	9.5	71.4
20	5	11.9	83.3
21	2	4.8	88.1
22	2	4.8	92.9
24	1	2.4	95.2
32	1	2.4	97.6
35	1	2.4	100.0
Total	42	100.0	

* Start age = Age - Years working as a plumber

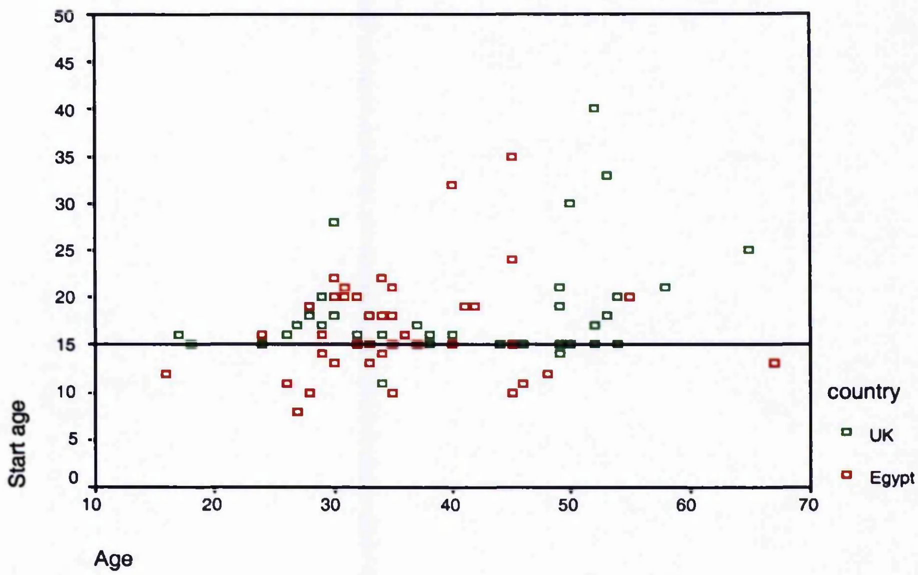
From the above table it is revealed that there is an occasion in the Egyptian sample where one participant claimed to have started working at the age of 8 years (presumably helping a parent or relative). This occasion represents only 2.4% of the sample, and there is no reason not to believe that it could occur on a larger scale across the Egyptian society where children frequently assist parents. 45.2% of the Egyptian sample claimed to have joined the labour market before the age of 16, presumably undertaking some part-time work during training or regarding school training as part of their career as plumbers.

Table 5.6 looks at the same investigation regarding the UK sample.

Table 5.6: The UK plumbers sample start age			
Start Age	Frequency	Percent	Cumulative Percent
11	1	2.4	2.4
14	1	2.4	4.9
15	13	31.7	36.6
16	8	19.5	56.1
17	5	12.2	68.3
18	3	7.3	75.6
19	1	2.4	78.0
20	2	4.9	82.9
21	2	4.9	87.8
25	1	2.4	90.2
28	1	2.4	92.7
30	1	2.4	95.1
33	1	2.4	97.6
40	1	2.4	100.0
Total	41	100.0	

From the above table it is revealed that, unlike the Egyptian sample, the youngest member of the UK sample claimed to join work at the age of 11 and only 36.6% of the sample joined work before the age of 15. The effect of rounding errors is noted, as are variations over % **5** of school leaving age.

Graph 5.4 illustrates the distributions.



Graph 5.4: The Age distributions of the Egyptian and UK plumbers' samples

5.3.2 Family effects

It should be noted that, although there are 10 Egyptian participants (see Table 5.7) whose fathers work as plumbers and 19 participants with another member of the family working as a plumber, there is no significant relation in the point biserial correlation between the start age of the Egyptian sample and whether or not their father was a plumber (N=42, r_{pb}= 0.021, sig. (2-tailed)=0.892). On the other hand, there was significance at the 5% level between the start age and having *another* member of the family working as a plumber (N=42, r_{pb}=0.342, sig. (2-tailed)=0.027).

Table 5.7: Cross tabulation between having father or mother working as a plumber and having any other family working as plumber in Egypt				
		Having any other member of the family working as a plumber		
		Yes	No	Total
Having father or mother working as a plumber	Yes	7	3	10
	No	12	20	32
Total		19	23	42

From this significant relation it can be suggested that having a member of the family working as a plumber could have contributed to the fact of encouraging the participants to join the labour market at an early age, maybe just accompanying that family member to offer help. The early age of joining the labour market could also be attributed to the low economic standard of the families and lack of support from the government, which leads the parents to push their children to join the labour market part-time or out of school at an early age.

In the UK there are seven participants whose fathers work as a plumber, for three of them another family member also works as a plumber, see Table 5.8

Table 5.8: Cross tabulation between having father or mother working as a plumber and having any other family working as plumber in UK				
		Having any other member of the family working as a plumber		
		Yes	No	Total
Having father or mother working as a plumber	Yes	3	4	7
	No	4	30	34
Total		7	34	41

There is significant relation (point biserial correlation) between the start age of working as plumber and having the father working as a plumber (N=41, r_{pb}=-0.317, sig. (2-tailed)=0.043). There is also a strongly significant relation between the start age of the UK sample and having another member of the family working as a plumber (N=41, r_{pb}=-482, sig. (2-tailed)=0.001). It should be noted that although the above relations are significant, the correlation had been negative because 83% of the UK sample had neither their father nor any member of the family working as a plumber.

Interpretation of these data must allow for the fact that in both Egypt and the UK there have been increases in school leaving ages over the periods of employment concerned.

5.3.3 Previous Work Experience

From Table 5.9, none of the Egyptian sample had practiced any other job during their life apart from plumbing. Data was not collected to identify those who had left plumbing for other trades. However, the figures reflect the stillness of the labour market in Egypt. Transfers between occupations within the Egyptian labour market are uncommon, compared with the UK, partly because of a scarcity of retraining opportunities.

Table 5.9: The plumbers' previous work in both Egyptian and UK samples				
Previous work	Country			
	Egypt		UK	
	Count	%	Count	%
Plumber only	42	100	30	73.2
Builder	0	0	2	4.9
Electrician	0	0	0	0
Other*	0	0	9	22.0
Total	42	100	41	100
*All were other building trades, excepting that of builder or electrician.				

The reasons for this could be the same as expressed earlier in the employment section. However, this also reveals that the plumbing job is regarded in Egypt as a life-long job fulfilling economic requirements.

From Table 5.10 it can be concluded that 69% of the Egyptian sample were influenced with a family member to join the field of plumbing.

Table 5.10 (a): Cross tabulation between the plumber previous work and having any member of the family working as plumber in Egypt sample.						
		The plumber previous work in Egypt				Total
		Plumber	Builder	Electrician	Other	
Having father or mother working as a plumber	Yes	10	0	0	0	10
	No	32	0	0	0	32
	Total	42	0	0	0	42
Having any other member of the family working as a plumber	Yes	19	0	0	0	19
	No	23	0	0	0	23
	Total	42	0	0	0	42

See Table 5.13 for comparable UK data.

Examining the employment changes in the UK plumber sample, see Table 5.9, shows that eleven of them had had different previous jobs. Of the three reasons behind changing employment to become a plumber, as mentioned by most of them, first was seeking a better income. Interview data showed that most of them had worked other jobs that did not require qualifications while studying to obtain a qualification in plumbing. Table 5.11 illustrates the gained qualifications of the UK plumber sample in these terms. A second reason for four of the eleven was that their fathers had been plumbers.

Table 5.11: Cross tabulation between qualify and previous working in the UK sample

Qualification	The plumber's previous work in UK			Total
	Plumber	Builder	Other*	
HND	6	0	1	7
ORD	6	1	4	11
C and G part 2 or equivalent	13	0	1	14
C and G part 1 or equivalent	2	0	1	3
No qualifications or formal training	1	1	1	3
Other	2	0	1	3
Total	30	2	9	41

*All were other building trades, excepting that of builder or electrician.

For those in the UK sample who had changed jobs, a Mann-Whitney U test was carried out to test the null hypothesis that there was no relationship between job change and qualifications held; t-tests were carried out similarly to examine age, years as a plumber, hourly rate and number of days worked per week. The differences of means are as might be expected: job changes relate to the younger plumbers, and those having changed have less experience. But the years as a plumber variable is only significant at the 5% level (N=41, t=2.053, df=39, sig.(2-tailed)=0.047) and then only if equal variances are assumed, not a reasonable assumption from the data (significance on Levene test for equality of variance is 0.052). Additionally those having changed jobs into plumbing earn more per hour and work fewer hours, but these differences are not statistically significant.

Table 5.12: Means and Standard deviations of four measures related to UK plumbers who have and have not changed employment				
	New or previous work	N	Mean	Std. Deviation
Age	A	30	42.73	10.751
	B	11	36.45	14.236
Years as plumber	A	30	25.07	10.055
	B	11	17.00	13.835
Hourly rate	A	24	7.84	2.281
	B	10	9.35	5.240
Working days	A	30	5.77	.858
	B	11	5.45	1.293
A= Those who have not changed employment. B= Those who have changed employment				

Of course, again, the sampling method did not access those who had *left* plumbing for financial gain.

The third reason for changing employment to become a plumber was because another member of the family was a plumber (Table 5.13). But, there is no significance between changing occupation into plumbing and having the father working as one (N=41, χ^2 = 1.996, df = 2, sig. (2-sided) = 0.368). However, there is significance at the 5% level between changing to working as a plumber and having one other member of the family in the same field (N=41, χ^2=3.963, df=1, sig. (2-saided) =0.046).

Table 5.13: Cross tabulation between previous work and having father or mother working as a plumber in the UK sample							
		The plumber previous work in UK				Total
		Plumber	Builder	Electrician	Other	
Having father or mother working as a plumber	Yes	3	0	0	4	7
	No	27	2	0	5	34
	Total	30	2	0	9	41
Having any other member of the family working as a plumber.	Yes	4	1	0	2	7
	No	26	1	0	7	34
	Total	30	2	0	9	41

5.4 Working Hours and Income (Part 3)

5.4.1 Working Hours and Days

Although in both samples the plumbers working days ranged between two and seven days a week, it is clear that the majority of the Egyptian sample (73.8%) work seven days a week in comparison to only 14.6% of the UK sample who work that number of days, see Table 5.14.

Table 5.14: The working days for both the Egyptian and UK plumber samples.				
	Egypt		UK	
Days	Frequency	Percent	Frequency	Percent
1	0	0	0	0
2	1	2.4	1	2.4
3	1	2.4	1	2.4
4	1	2.4	0	0
5	0	0	12	29.3
6	8	19.0	21	51.2
7	31	73.8	6	14.6
Total	42	100.0	41	100.0

Accordingly, there is a difference in the working hours profile of the Egyptian and the UK samples. Table 5.15 shows the comparative profiles regarding hours per day worked.

Table 5.15: A profile of working hours per day in the Egyptian and UK plumber samples.				
Hours per day	Egypt		UK	
	Frequency	Percent	Frequency	Percent
4	1	2.4	0	0
5	0	0	0	0
6	0	0	0	0
7	0	0	1	2.4
8	16	38.1	7	17.0
9	17	40.5	21	51.3
10	1	2.4	9	22.0
11	1	2.4	0	0
12	6	14.3	2	4.9
Total	42	100.0	40*	97.6*
* Missing data = 1 (2.4%)				

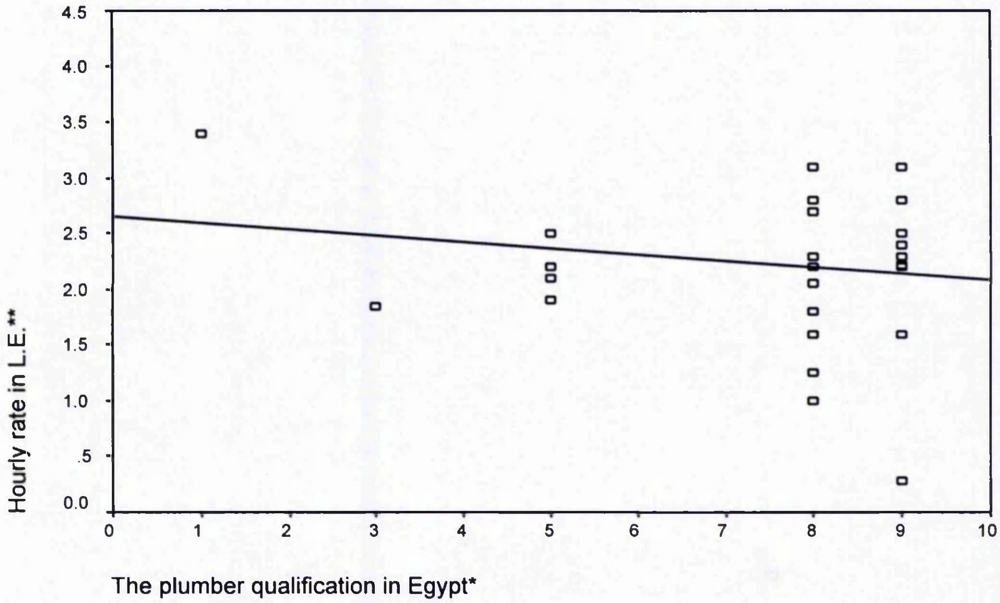
The higher rate of days and hours worked by the Egyptian sample could be referred back to the fact that 66.7 % of the Egyptian sample is self-employed. Being self-employed in Egypt implies a cultural dimension where it is very common for a plumber to be called out anytime for a job, even from his home if the shop is closed. This is true for many self-employed UK plumbers in the sample, but not to the same extent. Moreover, there is another dimension to working seven days a week, as expressed by the Egyptian plumbers in interviews; working all the week's days does not imply the actual performance of the jobs seven days a week, but it includes opening the shop and waiting for customers or going round seeking them.

In the UK sample the number of working days normally refers to actual jobs that are paid for. This fact also partly explains why, despite the longer working hours and more working days of the Egyptian sample, their mean hourly income is less than that of the UK sample. Another important reason could be the huge difference in the way the two societies regard repair and maintenance jobs. In the UK, buying new equipment could be sometimes less expensive that having it fixed or repaired. This is due to the high cost of manpower in the society. On the other hand, manpower in Egypt is one of the cheapest things one can obtain.

The mean of working days in Egypt was 6.5 days and the mean of working hours per day was 9 hours, whereas the mean of working days in the UK was 5.7 days and the mean of working hours per day was 8.8 hours. The null hypothesis that there is no difference between the Egyptian and UK means in each case is robustly rejected for the number of days worked ($N=83$, $t=3.688$, $df=81$, $sig.<0.001$) but not for the working hours. On interview, the UK sample noted that their paid working hours include fixed break and lunch times, whereas the Egyptian sample mentioned that there is no specific time for breaks or lunch.

5.4.2 General issues of income

The distribution of qualifications with income is fairly uniform in both countries – see Graphs 5.5 and 5.6. The lines are least-squares regression fits.

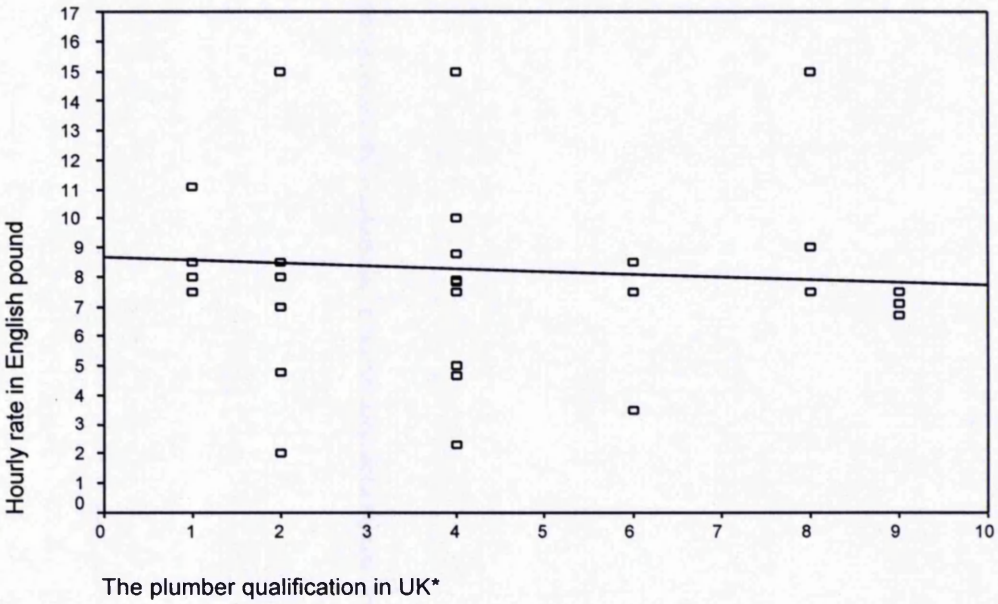


Plumber qualifications in Egypt*
1= Higher national Diploma (or equivalent)
3= Five-years technical secondary certificate
5= Three-year technical secondary certificate
8= No qualification or formal training- just experience on the job.
9= Other qualifications not listed

**L.E.: Egyptian pounds

Graph 5.5: The relation between the hourly rate and qualification in the Egyptian plumbers sample

From the above graph it becomes clear that the higher and more specified the qualifications of the Egyptian plumbers' sample, the higher their income. However, this relation is not significant (N= 42, ρ=-0.029, sig. (2-tailed)= 0.856).



Plumber qualifications in UK*
1= Higher National Diploma (or equivalent)
2= Ordinary National Diploma (or equivalent)
4= C and G part 1 or equivalent
6= C and G part 2 or equivalent
7= No formal qualifications but presently apprenticed.
8= No qualification or formal training- just experience on the job
9= Other qualifications not listed

Graph 5.6: The relation between the hourly rate and qualification in the UK plumbers' sample

From the above graph it also becomes clear that the higher and more specified the qualifications of the UK sample in the field of plumbing, the higher their income. It should be noted that this relation also as determined by a Spearman correlation coefficient is not significant (N= 41, ρ= - 0.160, sig. (2-tailed) = 0.365).

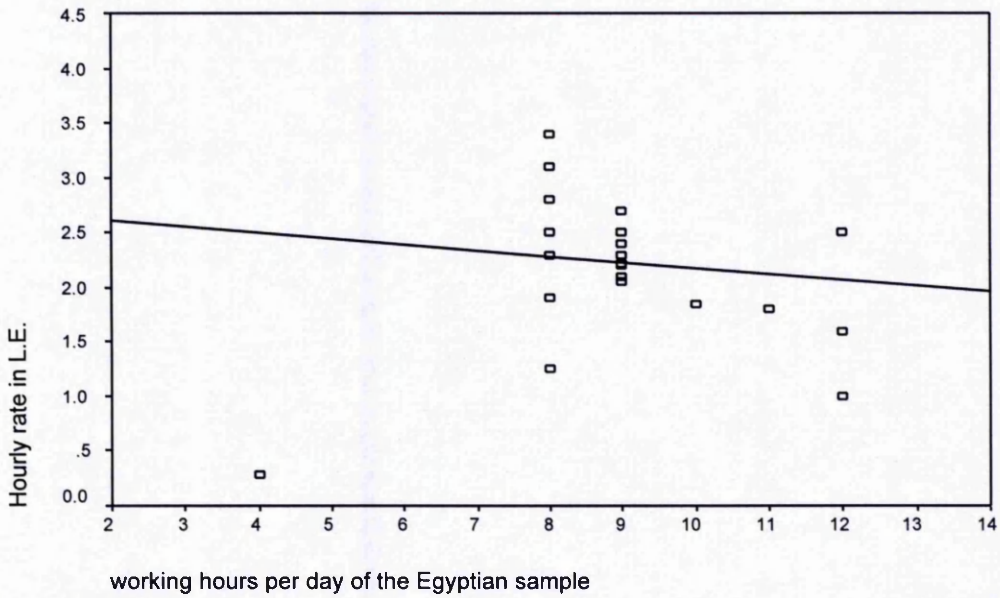
On investigating the relation, in both UK and Egyptian samples, between the numbers of working hours, number of working days and the hourly rate of pay, two null hypotheses are made…

(i) The income per hour is not dependent on the number of hours per day worked, and

(ii) The income per hour is not dependent on the number of days per week worked.

In interpreting the data following the uneven distributions and relatively low correlation coefficients must be noted.

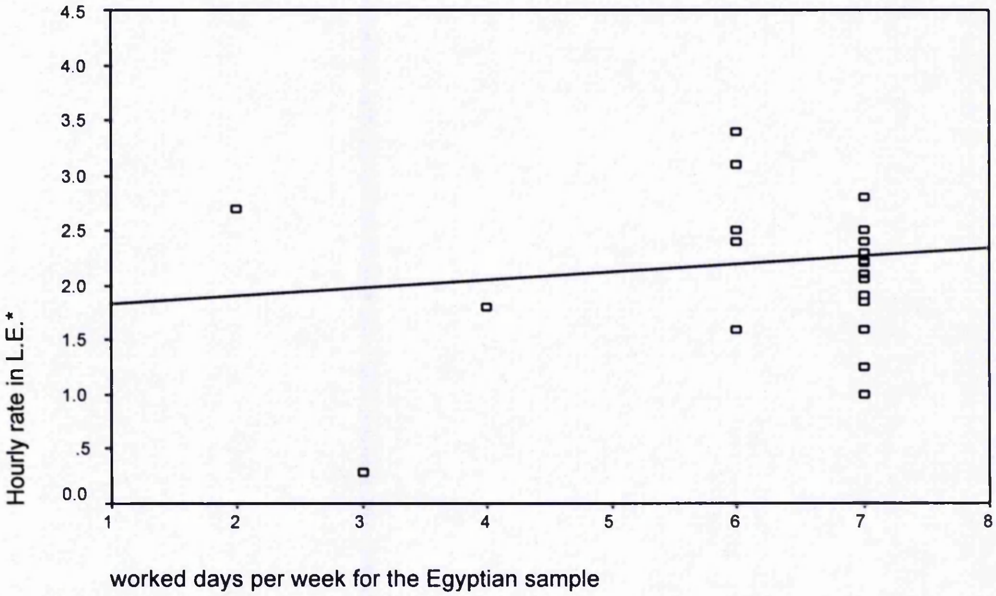
It becomes clear that in the Egyptian sample there is a significant negative correlation between the increase of the working hours per day and the income per hour ($N=42$, $\rho=-0.378$, sig.(2-tailed)=0.014); see Graph 5.7. The reason for this could be related to the previously mentioned means that the Egyptian plumbers take in seeking customers, additional hours worked being in non-income generating activity.



*L.E.: Egyptian pounds

Graph 5.7: The relation between the hourly rate and worked hours per day in the Egyptian sample

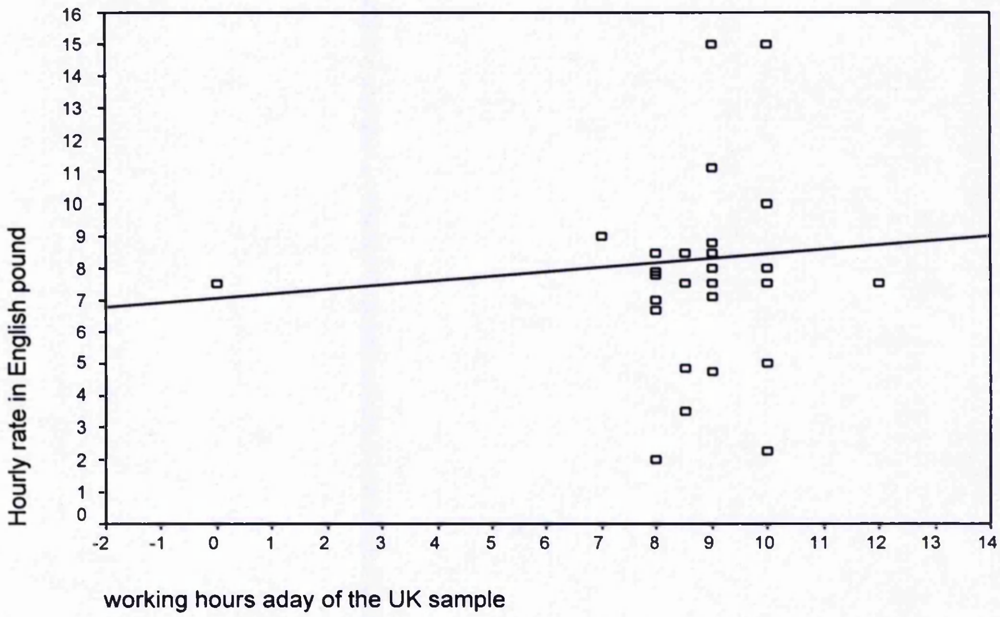
On examining the relation between the number of working days and the income of the Egyptian sample it is clear that it is not significant (N=42, ρ=-0.208, sig.=0.186). It becomes clear from Graph 5.8 that there is a 60 Egyptian pence increase in the income over a period of seven days (equivalent to six English pence). However, this slight increase in their weekly income does not have a great implication on their budget.



*L.E.: Egyptian pounds

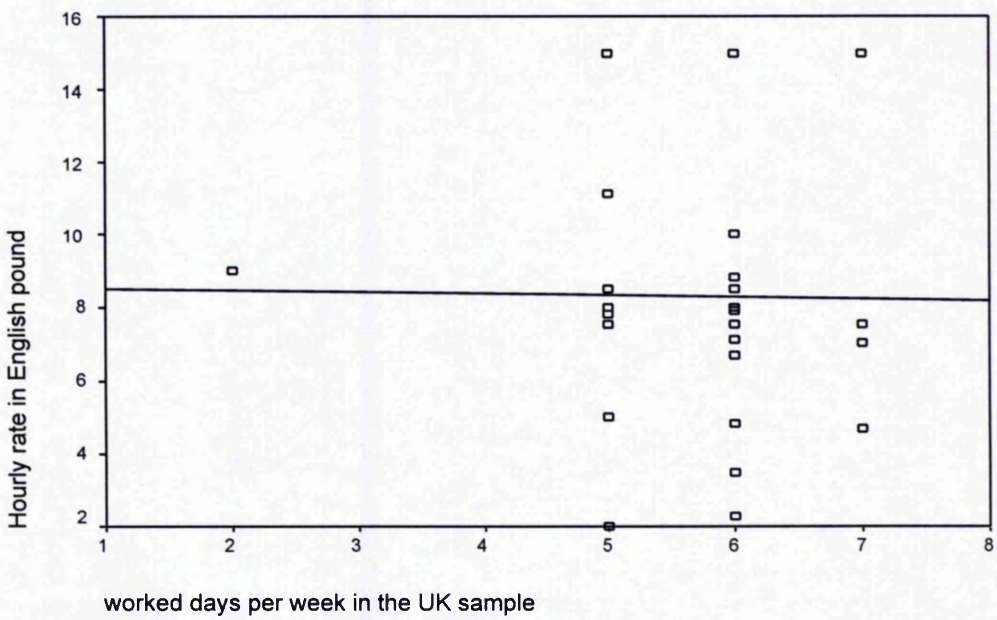
Graph 5.8: The relation between the hourly rate and worked days per week in the Egyptian plumbers' sample

Similarly, by looking at the relation between the working hours per day and the income of the UK sample, it becomes clear that there is no significant correlation (N=41, ρ= 0.121, sig.(2-tailed) =0.495). However, further examining of the graph reveals that there is a £2.50 increase per day across one week, see Graph 5.9. This fact supports what was mentioned by the UK plumbers that all the stated working hours are paid for.



Graph 5.9: The relation between the hourly rate and worked hours per day in the UK plumbers sample

On examining the relation between the number of working days and the income of the UK sample it becomes evident that it is not significant (N=42, ρ=-0.177, sig. (2-tailed)=0.316), see Graph 5.10. The graph clearly illustrates that there is hardly any difference in the hourly income across the number of days worked per week. This, also, emphasizes the nature of the fixed income rates that the UK plumbers had quoted in interviews



Graph 5.10: The relation between the hourly rate and worked days per week in the UK plumbers' sample

There was no significant correlation between the increase of age of the Egyptian and UK samples together or separately and the decrease of working hours.

Looking at the two samples it becomes clear that the average income of the Egyptian plumber is L.E 2.23 per hour (equivalent to £0.50 in the data collection year 2000 when £1= L.E. 5.50), whereas, the average income of the UK plumber was £8.29 per hour. Even allowing for the different costs of living these figures represent a major difference in economic welfare between Egyptian and UK plumbers. In the UK…

> Newly-qualified plumbers can earn up to £15 an hour and go on to make £60,000 a year.
>
> (Hunter, 2002:8)

Within less than a year these figures had grown as reported in the following article

> Recent publicity given to the £70,000 salaries that plumbers earn has caused a huge increase in applications to trade courses.
>
> (Watson, 2003: 53)

It is important at this point to highlight the means by which both samples seek their customers. Firstly, in Egypt the plumbers follow one of the following ways:

- In case of having a shop, the plumber would sell bath sets, plumbing requirements and equipment and then try to arrange with the customers to do the installations to them;
- Make use of his personal contacts whether working in a company or through other colleagues;
- Go round areas calling out for his services.

From the above it becomes clear that the income of the self-employed Egyptian plumbers, who represent the majority (66.7%) of the sample, is unstable.

On the other hand, the UK plumbers generally follow one of the following ways:

- Make use of his personal contacts whether working in a company or through other colleagues;
- Make a classified or display advertisement in one of the local newspapers, which would usually cost him as little an amount of money as £1, very small in comparison to his income.

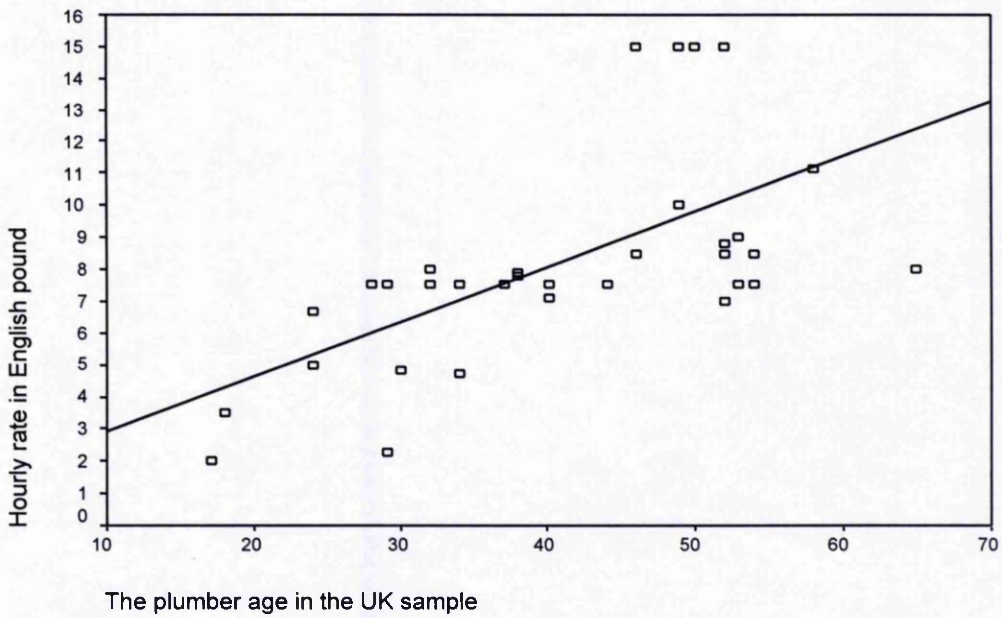
It is worth noting that none of the Egyptian plumbers mentioned seeking newspaper adverts as an option because a similar advert would have cost L.E. 150 (equivalent to £30 at the year 2000 exchange rate when the data was collected, when £1= L.E.

5.50). In spite of the difference in value, the price of this advert is not proportional to the income of the Egyptian plumbers.

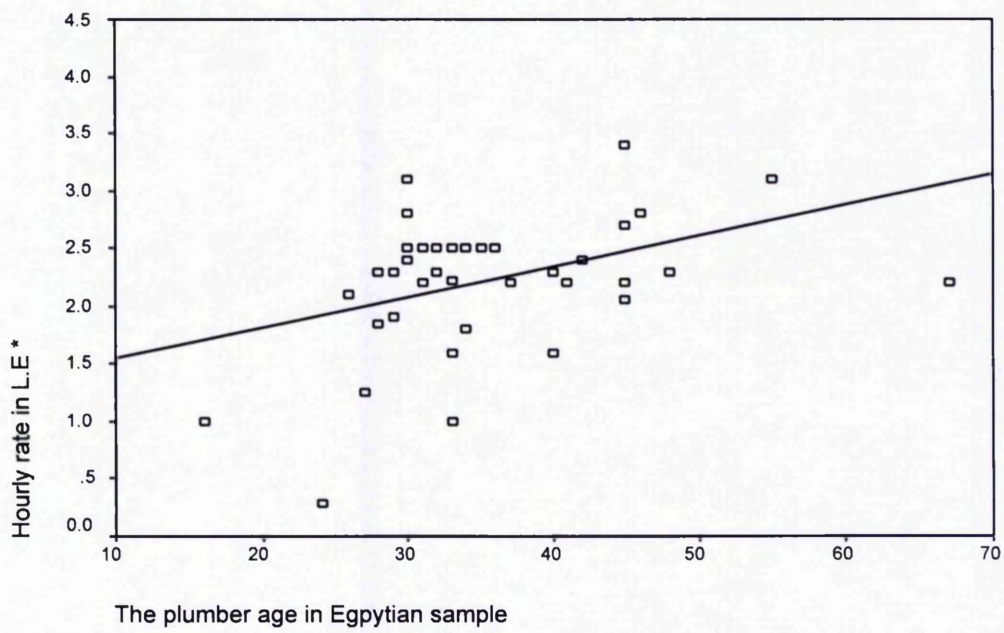
5.4.3 Age and income

As both UK and Egyptian plumbers increase in age their hourly income increases. The reason for this is that as the sample members grow older they become more experienced and, accordingly, their income increases. At the same time as they grew older they get to choose the nature of the jobs that suit their health and fitness.

Graphs 5.11 and 5.12 show the pattern of income for the UK and Egyptian samples separately. The lines displayed are least-squares regression lines. Between the start age of employment and retirement, hourly income increases for both groups, but the increase witnessed by the UK sample is greater than that of the Egyptian sample. The graphs show an increase of £9 in the UK sample over a working career; in contrast to L.E. 1.50 (equivalent to £0.15p) over the working careers in the Egyptian sample. The Pearson correlation coefficients are high (for Egypt N=42, r_{pb}=0.411, sig. (2-tailed) =0.007 and for the UK N=41, r_{pb}=0.613, sig. (2-tailed) $<$0.001). The very important difference from the perspective of this research is the relative mean rates of growth of hourly income with age between the countries, with the percentage growth rate in income with age for the UK being approximately double the equivalent figure for Egypt.



Graph 5.11: The relationship between the hourly rate and the age in the UK plumbers sample



*L.E. Egyptian pound.

Graph 5.12: The relationship between the hourly rate and the age in the Egyptian plumbers sample

5.4.4 Supporting other family members

As explained earlier the nature of society plays a role in the workers' responsibilities, taking account of the plumbers' performance, interests, and needs.

In addition to the fact that the country provides free health care and social support to the UK plumbers, we find that 53.6 % of the UK sample has no financial responsibility towards anyone apart from their job. A minority of them (46.3 %) were responsible for 1 to 4 persons.

On the other hand, on examining the Egyptian sample we find that in spite of the low standards of support and services provided by the government, in comparison to the UK, the Egyptian plumber could be responsible for up to 9 persons in the family. It should also be noted that, culturally, parents' duration of responsibility for their children in Egypt far exceeds that of UK parents. That fact implies more continuing financial support from the plumbers. This also underlines the reason behind which Egyptian teenagers join the labour market at an early age, seeking a job that does not need qualifications.

From the above, it could be hypothesised that the presence of a secure income to the UK plumbers and the lack of responsibility towards non-earning people puts the workers in a better mental and psychological state, enabling them to concentrate and excel in performing the required tasks. On the contrary, the low educational, cultural and financial levels of the Egyptian plumbers and their social responsibilities have a negative effect on the level of performance and fulfilment of the required tasks. The

Egyptian plumber would be tempted to finish the job quickly, regardless of the standard of performance, in order to find another job. The researcher is aware of the risk of overgeneralization, but it could be concluded that if this were the case with many of the architectural crafts and workers in Egypt, then a low standard of performance would be a norm.

5.5 Methods of Developing Knowledge and Skills (Part 4)

5.5.1 Introduction

This part deals with the plumbers' development of additional knowledge and skills – to get a functional way to improve the plumbers' expertise. There are two parts to the study:

(a) Improving their knowledge of materials,

(b) Improving their knowledge of techniques.

These are dealt with together in each section.

Four means of development were offered in the questionnaire, with 'other' also available

(i) Talking with others

(ii) Reading

(iii) Attending exhibitions

(iv) Looking round stores

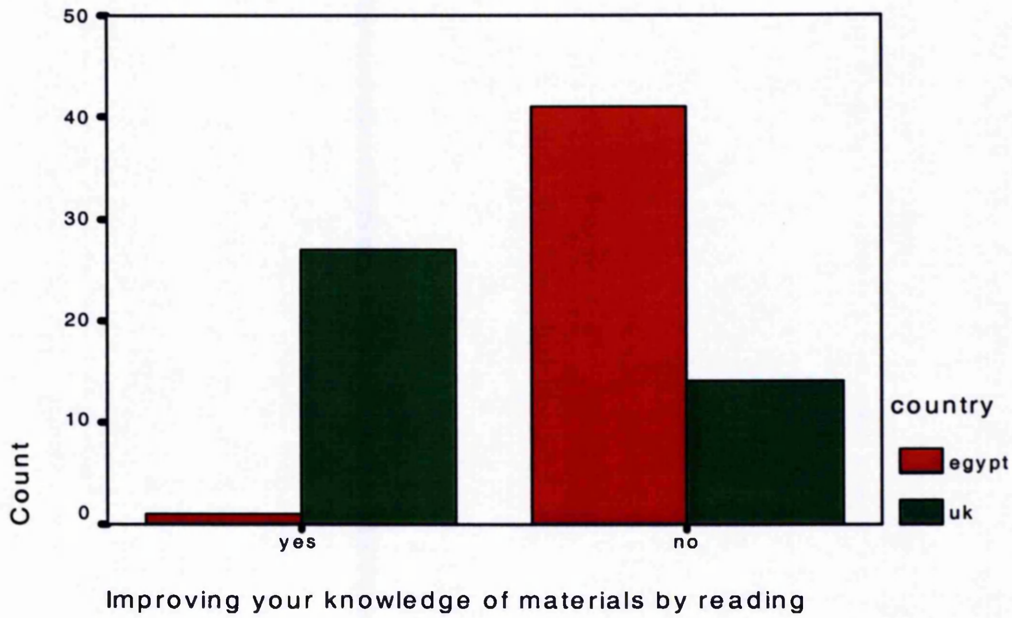
5.5.2 Development of knowledge of materials and techniques

Table 5.16: Means of improving material knowledge and working techniques in both UK and Egyptian samples

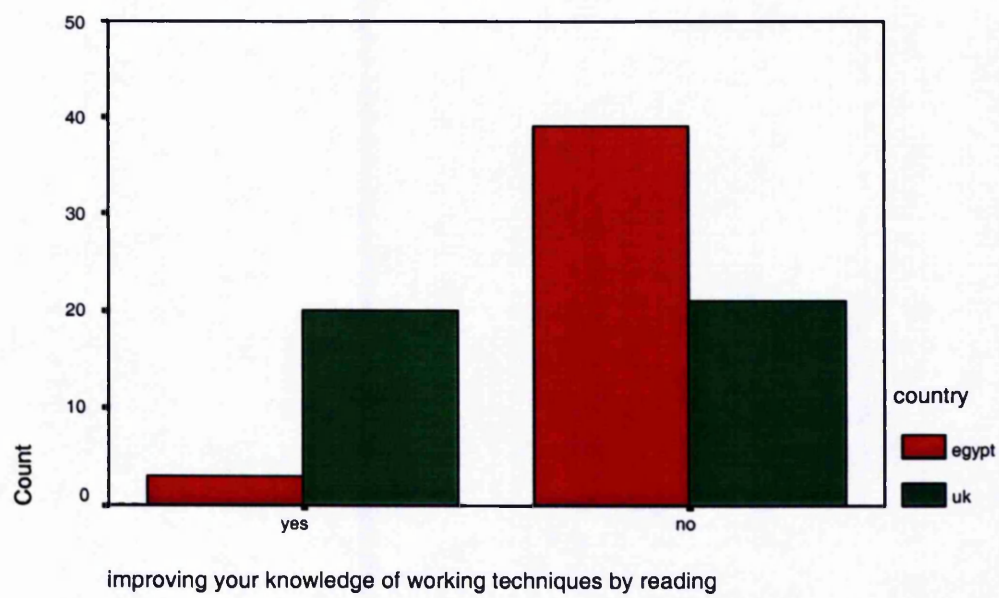
		Improving materials knowledge			Improving working techniques knowledge		
		Country		Total	Country		Total
		Egypt	UK		Egypt	UK	
Talking with others	Yes	38	35	73	40	37	77
	No	4	6	10	2	4	6
	Total	42	41	83	42	41	83
Reading	Yes	1	27	28	3	20	23
	No	41	14	55	39	21	60
	Total	42	41	83	42	41	83
Attending exhibitions	Yes	21	9	30	18	8	26
	No	21	32	53	24	33	57
	Total	42	41	83	42	41	83
Looking round stores	Yes	40	18	58	34	13	47
	No	2	23	25	8	28	36
	Total	42	41	83	42	41	83

On investigating the different methods by which both sample groups improve their knowledge of materials and working techniques, Table 5.16 reveals a close similarity in numbers and in rank between both samples in that '*talking with other colleagues*' represents the most common way. It, thus, can be claimed that the null hypothesis that there is no difference between the samples in improving their knowledge and work technique through talking with others, i.e. passing experiences to each other, is not rejected. There is no significant difference between the two samples in regard to improving their materials knowledge in this way (N=83, χ^2= 0.511, df=1, sig. (2-sided)= 0.475). No significant difference is also seen between the two samples in regard to improving working techniques knowledge through the same way (N=83, χ^2= 0.772, df=1, sig. (2-sided)= 0.380).

However, there is a significant difference at the 5% level between the samples in respect to improving either their knowledge of material (N=83, χ^2= 37.391, df=1, sig. (2-sided)<0.001) or working technique knowledge '*through reading*' (N=83, χ^2=5.256, df=1, sig.(2-sided)= 0.022 (<0.05)); see Graphs 5.13 and 5.14. The UK sample has a higher level of reading in comparison to the Egyptian sample. The reason for this could be referred to the lack of specialised periodicals in Egypt. The majority of the sample, 97.6%, regarding their knowledge of materials, and 92.9%, regarding knowledge of working techniques, mentioned that they were unaware of the presence of such magazines. A minority of the Egyptian sample that did know of such magazines mentioned that there is only one architectural magazine that talks about architecture in general but with no particular specification to plumbing. This minority also mentioned that this magazine comes at a high price, which makes it impractical to buy it regularly. It was also reported that the magazine is not well distributed, and is only present in certain bookshops.



Graph 5.13: A comparisons between Egyptian and UK plumbers sample in improving their knowledge of materials through reading

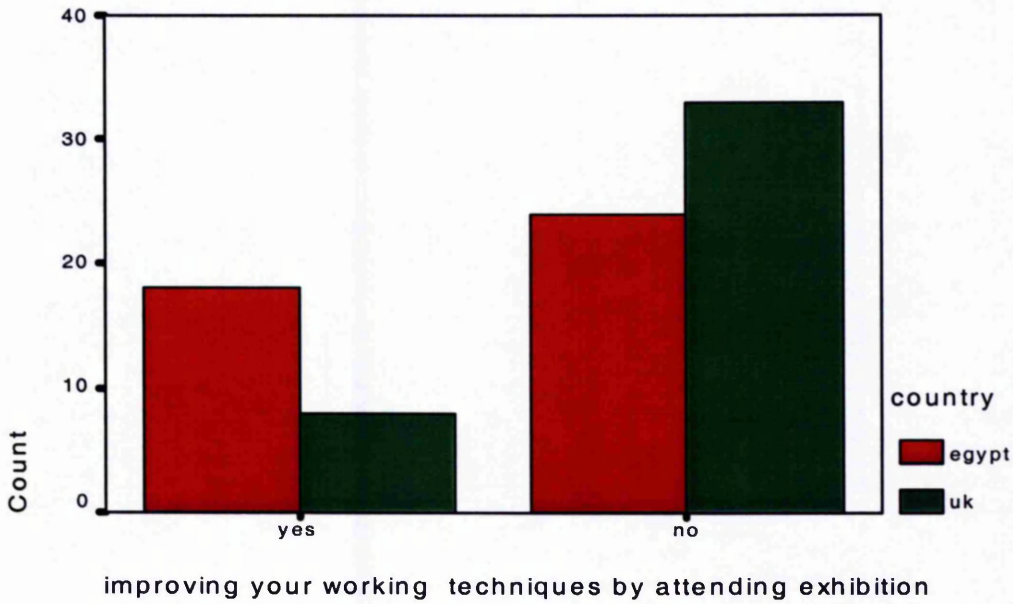


Graph 5.14: A comparison between Egyptian and UK plumbers sample in improving their knowledge of working techniques through reading

In regard to the UK sample, it is clear that more participants than in Egypt refer to reading in order to improve their standards. The reason for this is due to the presence of a number of free specialist trade plumbing magazines (being paid for by the advertisers), regular information provided to them through the unions and professional associations, as well as the availability of specialized leaflets in the plumbing wholesale centres. These trade leaflets include detailed specifications of the components and instructions for installation or use of the different plumbing components, equipment, tools, and materials. Within the UK sample there seems to be not much difference; 65.9% regarding their knowledge of materials and 48.8% regarding knowledge of working techniques, mentioned reading as a means of self-development.

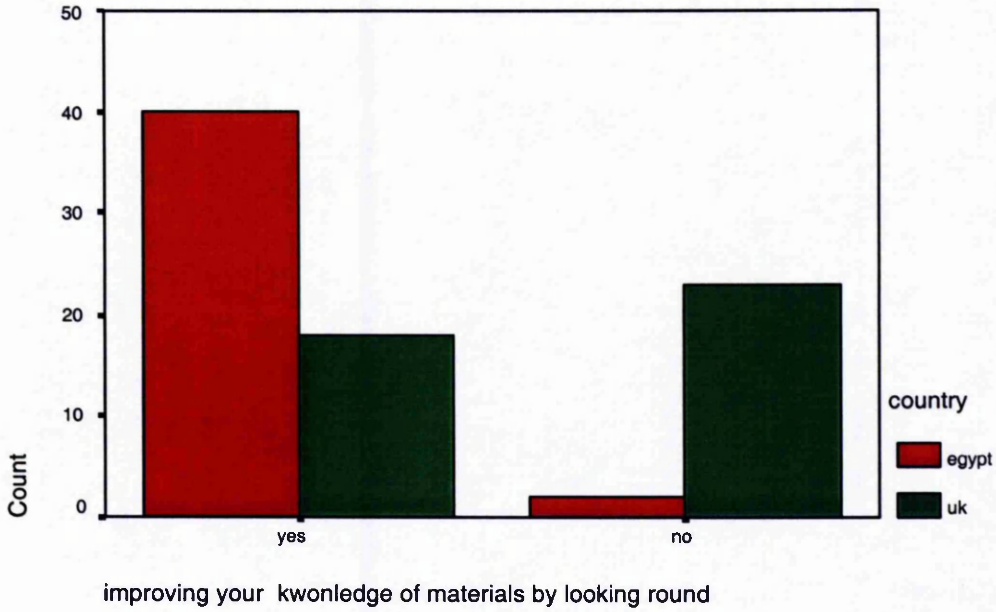
There is a statistically significant difference between the two samples in attending exhibitions and trade fairs as a means of improving knowledge of materials (N=83, χ^2=7.072, df=1, sig. (2-sided)=0.008). There is also a significant difference at the 5% level between the two samples (N=83, χ^2=5.256, df=1, sig. (2-sided) =0.022) in regard to improving knowledge of working techniques.

More Egyptian plumbers than UK claimed to attend exhibitions and trade fairs (see Graph 5.15) but it is a minority in each case. By this the Egyptians are referring to the annual Cairo International Exhibition and Trade fair that includes the new trends in most fields and areas. However, it should be pointed out that few of the UK sample considered attendance at exhibitions as a feasible option because of the presence of the previously mentioned available written information.

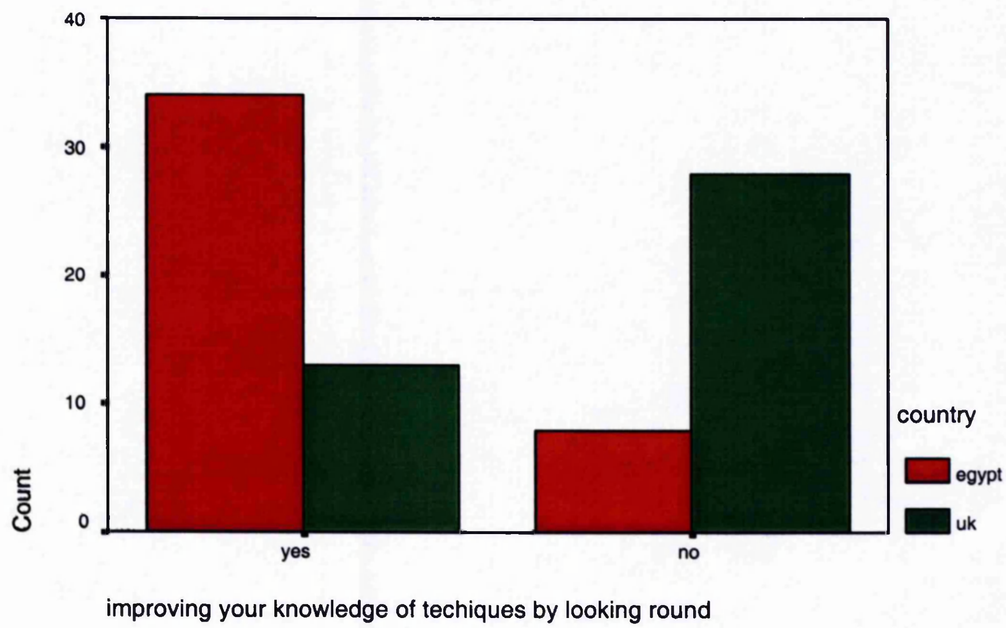


Graph 5.15: A comparisons between both Egyptian and UK plumbers sample in improving their knowledge of working techniques through attending exhibitions

Similarly, there is a significant difference between the two samples in looking round specialised stores and shops as a means of improving knowledge of materials (N=83, χ^2=25.977, df=1, sig. (2-sided)<0.001), see Graph 5.16. There is also a significant difference between the two samples (N=83, χ^2=20.458, df=1, sig. (2-sided)<0.001) in regard to improving knowledge of working techniques using the same way (Graph 5.17).



Graph 5.16: A comparison between Egyptian and UK plumber samples to improving their knowledge of material through looking round stores



Graph 5.17: A comparison between Egyptian and UK plumber samples to improving their knowledge of working techniques through looking round stores

5.5.3 Informal learning, experience and qualifications

An important aspect from the viewpoint of this research is the linkage between informal styles of learning and existing qualifications. The null hypothesis is that there is no link between each means of learning and the prior qualification held. A second hypothesis to be tested is the link between experience (years working as a plumber) and use of informal learning styles.

It may be useful to remind the reader that the means of informal learning as specified in the questionnaire in the present research study are: talking to other colleagues, reading, attending exhibitions and looking round stores.

Experience

Investigating the relation between the years of experience of the participant plumbers in both samples and means of informal learning to improve their material knowledge and working technique knowledge revealed the following.

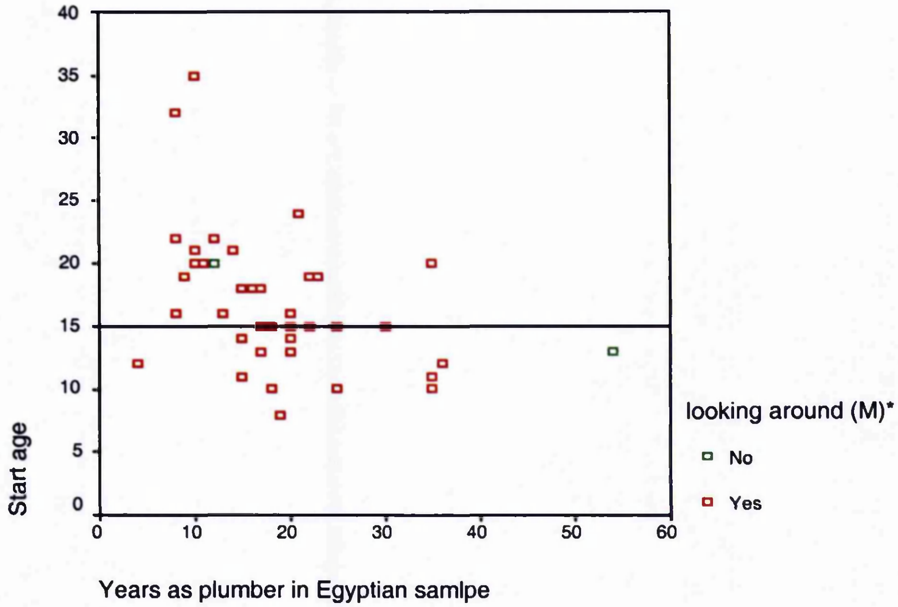
Most of the Egyptian sample depends on talking to the other colleagues as a means of passing and acquiring experience. 90% of them gain materials knowledge experience through talking to each other. There is no significant correlation between their years of experience and this way of informal learning (N=42, r_{pb}=-0.254, sig. (2-tailed)= 0.105,). Talking with others is also the main means of improving the working techniques for 95% of the Egyptian sample. There is also no significant correlation between their years of experience and this way of informal learning (N=42, r_{pb}=-0.122, sig. (2-tailed)= 0.440).

There is no significant correlation between the years of experience of the Egyptian sample and reading as means of improving material knowledge. Only 3% of the sample utilizes this method (N=42, r_{pb}= -0.265, sig. (2-tailed)= 0.090). Similarly, only 7% of the sample utilizes reading as a means of improving their working techniques (N=42, r_{pb}= -0.114, sig. (2-tailed) = 0.473).

Attending exhibitions was used by 50% of the Egyptian sample with different years of experience to improve their material knowledge. There is no significant correlation between their years of experience and visiting these exhibitions (N=42, r_{pb}= 0.097, sig. (2-tailed)= 0.541). 48% of the sample visits these exhibitions as a means of improving their working techniques. Correspondingly, There is a very low correlation between their years of experience and visiting these exhibitions (N=42, r_{pb}= 0.032, sig. (2-tailed) = 0.843).

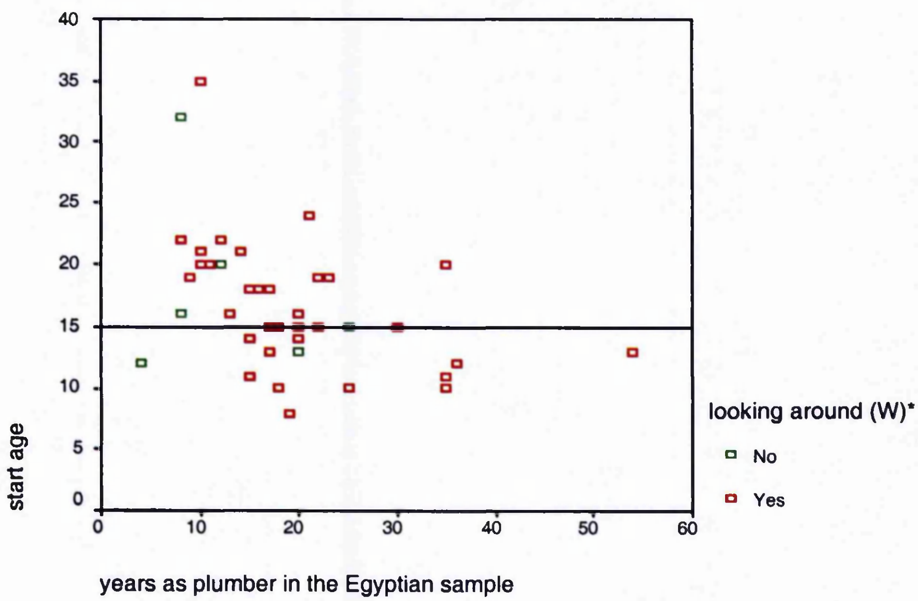
The majority of the Egyptian sample (95%) look round wholesale shops to improve their material knowledge as there is no published material that could provide them with information (N=42, r_{pb}=0.333, sig. (2-tailed)=0.031). The mean of plumbers years of experience who look round shops in order to improve their working techniques is 18.5 years (81% of the sample), and the mean of experience for those who did not is 14 years. Thus, it could be noted that the more experienced plumbers in the sample are those who are keen on exploring and being up to date with what is available in the shops, though this relationship is not statistically significant (N=42, r_{pb} =-0.221, sig. (2-tailed)=0.160).

From the above it can be concluded that the Egyptian sample relies mainly on traditional means of acquisition and improving both their material knowledge and working techniques. Passing down experience and knowledge among each other could be easily related to the fact of being unqualified and the previously mentioned significant relation between joining the field of plumbing and having a member of the family in the same field. Looking round shops and stores was also widely used by Egyptian plumbers of different ages and with different experiences as a result of the lack of published information (see Graphs 5.18 and 5.19). To conclude, the null hypothesis of the presence of no link between each of the informal means of learning and the prior years of experience of the Egyptian sample is not rejected.



*(M) material knowledge

Graph 5.18: The correlation between the Egyptian plumber sample starting age, years of experience and means of improving their *material knowledge* through looking around stores



*(W) knowledge of working techniques

Graph 5.19: The correlation between the Egyptian plumber sample starting age, years of experience and means of improving their *knowledge of working techniques* through looking around stores

Analysis of the relation between the UK sample's years of experience and means of informal learning revealed various results as follows:

85% of the UK sample use talking to each other as a means of improving their material knowledge. However, there is no significant correlation between their years of experience and this way of informal learning (N=41, r_{pb}= 0.142, sig.(2-tailed)= 0.375). 91% of the sample used the same way to improve their working techniques. Similarly, there is no significant correlation between their years of experience and talking to each other (N=41, r_{pb}= 0.190, sig. (2-tailed)= 0.235).

Reading as a means of improving material knowledge was used by 64% of the UK sample. There is no significant correlation between their years of experience and this way of knowledge acquisition (N=41, r_{pb} = -0.052, sig. (2-tailed) = 0.745). Only, 49% of the sample regarded reading as a means of developing their working techniques. But, there is a significant negative correlation between their years of experience and this way of informal learning (N=41, r_{pb} = -0.017, sig. (2-tailed) = 0.917).

Attending exhibitions was carried out by only 22% of the UK sample to improve their material knowledge. Nevertheless, there is a significant negative correlation between their years of experience and this way of informal learning (N=41, r_{pb} = -0.319, sig. (2-tailed) = 0.042). Only 19% of the sample visited these exhibitions to improve their working techniques. There is no significant correlation between years of experience and this way of informal learning (N=41, r_{pb} = -0.160, sig. (2-tailed) = 0.317).

Looking round wholesale shops was carried out by only 44% of the UK sample to improve their material knowledge. There is no significant correlation between the years of experience and this means of informal learning (N=41, r_{pb} = -0.003, sig. (2-tailed) = 0.094). Only 32% of the sample looked round wholesale shops to improve their working techniques. Similarly, there is no significant correlation between years of experience and this way of learning (N=41, r_{pb} = -0.190, sig. (2-tailed) = 0.235).

From the above, reading was mostly used due to the fact that the UK sample is more qualified than the Egyptian sample as well as having the presence of easily accessed vocational courses. Talking to each other was also common due the previously mentioned significant relation between joining the field of plumbing and having both the father and one of the family members in the same field. To conclude, the null hypothesis of the presence of no link between each of the informal means of learning and the prior years of experience of the UK sample is accepted in regard to talking to the others, reading, looking round. However, the same null hypothesis was rejected in the case of attending exhibitions.

Qualifications

The following is an investigation of the relation between the qualifications of the participating plumbers in both samples and the means of informal learning, as mentioned earlier, to improve their material knowledge and working technique knowledge.

90% of the Egyptian sample, of which only 24% are qualified plumbers, depend on talking to the other colleagues as a means of improving their material knowledge. However, there is no significant correlation (using the Komolgorov-Smirnoff K test, (Cohen et al, 1979:185-188)) between their qualifications and this way of gaining knowledge (N=42, KS= 0.651, sig. (2-tailed) = 0.791). Talking with others is also the main means of improving the working techniques for 95% of the Egyptian sample. There is also no significant correlation between their qualifications and this way of informal learning (N=42, KS= 0.449, sig. (2-tailed)= 0.988).

There is clearly no significant correlation between the qualifications of the Egyptian sample and reading as a means of improving materials knowledge as only 2% of the sample utilizes this method. Similarly, only 7% of the sample utilizes reading as a means of improving their working techniques, none of whom is a qualified plumber (N=42, KS= 0.556, sig. (2-tailed) = 0.916).

Attending exhibitions was used by 50% of the Egyptian sample with different qualifications to improve their material knowledge. There is a significant correlation between their qualifications and visiting these exhibitions (N=42, KS= 1.389, sig. (2-tailed) = 0.042). 43% of the sample visits these exhibitions as a means of improving their working techniques. There is no significant correlation between their qualifications and visiting these exhibitions (N=42, KS= 1.069, sig. (2-tailed)= 0. 203).

The majority of the Egyptian sample (95%) look round wholesale shops to improve their material knowledge (N=42, KS= 0.863, sig.(2-tailed) =0. 446). 81% of the

Egyptian sample also use looking round wholesale shops to improve their working techniques. There is also no statistical significant between the qualifications of the Egyptian sample and looking round shops and stores (N=42, KS= 0.973, sig. (2-tailed) = 0.300).

From the above it can be concluded that there is a similarity between the results of the analysis of the relation between the qualifications of the Egyptian sample and the results of their experience in relation to the means of informal learning. The reason for this phenomenon can be due to the fact that more than 80% of the Egyptian sample gave the same answer in both questions. Most of the Egyptian sample, of whom the majority are unqualified, rely on talking to other colleagues and looking round shops as a main means of improving their material knowledge or working techniques. Passing down experience and knowledge among each other could be easily related to the fact of being unqualified and the previously mentioned significant relation between joining the field of plumbing and having a member of the family in the same field. To conclude, the null hypothesis of the presence of no link between each of the informal means of learning and the qualifications of the Egyptian sample is not rejected.

Analysis of the relation between the UK sample's qualifications and means of informal learning revealed the following results.

85% of the UK sample of whom 85.4% are qualified plumbers use talking to each other as a means of improving their material knowledge. However, there is no significant correlation between their qualifications and this way of informal learning

(N=41, KS= 0.453, sig. (2-tailed) = 0.987). 90% of the sample used the same way to improve their working techniques. Similarly, there is no significant correlation between their qualifications and talking to each other (N=41, KS= 0.591, sig. (2-tailed) = 0.877).

Reading as a means of improving materials knowledge was used by 66% of the UK sample. There is no significant correlation between their qualifications and this way of knowledge acquisition (N=41, KS= 0.337, sig. (2-tailed) = 1.000). Only 49% of the sample regarded reading as a means of developing their working techniques. Similarly, there is no significant correlation between their qualifications and this way of informal learning (N=41, KS= 0.290, sig. (2-tailed) = 1.000).

Attending exhibitions was carried out by only 22% of the UK sample to improve their material knowledge. There is no significant correlation between their qualifications and this way of informal learning (N=41, sig. (2-tailed) = 0.999, KS= 0.368). Only 20% of the sample visited exhibitions to improve their working techniques. There is no significant correlation between qualifications and this way of informal learning (N=41, KS= 0.327, sig. (2-tailed) = 1.000).

Looking round wholesale shops was carried out by only 44% of the UK sample to improve their materials knowledge. There is no significant correlation between the qualifications and this means of informal learning (N=41, KS= 0.652, sig. (2-tailed) = 0.788). Only 32% of the sample looked round wholesale shops to improve their working techniques. Similarly, there is no significant correlation between qualifications and this way of learning (N=41, KS= 0.909, sig. (2-tailed) = 0.381).

From the above, the null hypothesis of the presence of no link between each of the informal means of learning and qualifications of the UK sample is not rejected.

The relation between the qualification of the plumbers in the whole sample (Egypt +UK, N=83) and means of improving materials knowledge and working techniques is discussed as follows:

- There is a significant relationship (using the Kolmogorov-Smirnov KS test) between reading as a means of informal learning of improving their material knowledge and their qualifications (N= 83, KS= 2.445, sig. (2-tailed) < 0.001). Similarly, there is also a significant correlation between reading as a means of informal learning of improving their working techniques and their qualifications (N= 83, KS= 1.613, sig. (2-tailed) = 0.011).
- There is a significant correlation between looking round stores and whole shops as a means of informal learning of improving their materials knowledge and their qualifications (N= 83, KS=1.856, sig. (2-tailed) = 0.002). Similarly, there is a significant correlation between looking round stores and whole shops as a means of informal learning of improving their working techniques and their qualifications (N= 83, KS= 1.606, sig. (2-tailed) = 0.011).
- There is no significant correlation between talking with the other as a means of informal learning of improving their materials knowledge and their qualifications (N= 83, KS=0.325, sig. (2-tailed) = 1.000). Similarly, there is no significant correlation between talking with others as a means of informal learning of improving their working techniques and their qualifications (N= 83, KS= 0.531, sig. (2-tailed) = 0.941).

- There is no significant correlation between attending exhibitions as a means of informal learning of improving their materials knowledge and their qualifications (N= 83, KS=0.655, sig. (2-tailed) =0.784). Similarly, there is no significant correlation between attending exhibition as a means of informal learning of improving their working techniques and their qualifications (N= 83, KS=0.627, sig. (2-tailed) =0.826).

The presence of these correlations could simply be explained by the fact that both samples together represent a relatively big sample. Another reason could be taken back to the greater variety of qualifications of the plumbers available in the two samples jointly, in addition to the availability of a range of published materials providing information.

5.5.4 Priorities of Means of Informal Learning in Both Samples

To sum up, Table 5.17 provides a ranking of the methods used by participants in both samples. It is clear that 'talking to other' colleagues represent the most common way in both samples. On the other hand, 'looking round stores' comes in the second rank to the Egyptian sample with 88.1% in contrast to the UK's second rank of 'reading' with 57.35%. This fact emphasizes what has been mentioned earlier regarding the lack of published materials in Egypt, which leaves the plumbers with seeking all the other options and leaving reading as a last option. In addition, this could also be explained by the fact that the UK plumber samples have higher specialised qualifications than the Egyptian sample. 'Looking round stores' and 'attending exhibitions' came in the 3rd and 4th rank respectively to the UK sample because, as claimed by some of them, most of the needed information is found in the published materials, as well as in most cases the customers are the ones who have gone round the shops and stores to explore what is new and what they want.

Table 5.17: The priority of means of improving materials knowledge and working techniques in the Egyptian and UK plumbers samples						
The ways to improve the skills	Egypt Mean %*	Egypt's Sample priority	UK Mean %	UK's Sample Priority	Egypt's and UK's Mean %	Egypt's and UK's Priority
Talking to the others	92.85	1	87.8	1	90.4	1
Readings	4.75	4	57.35	2	30.7	4
Attending exhibitions	46.45	3	20.75	4	33.7	3
Looking round stores	88.1	2	37.35	3	63.3	2

*Mean %= $[N_{=\text{yes (to improve materials knowledge)}} + N_{=\text{yes (to improve working techniques)}}] / N_{\text{(sample)}}$

5.6 Possessed Skills (Part 5 and 6)

5.6.1 Introduction

On examining the samples, data revealed that there is a significant difference in the skills possessed by participants in each country. This following section investigates these differences.

There are two parallel sets of variables and data: (a) measures of the means by which training on the skill was acquired ('training' in the following discussion) (Part 5 of the study) and (b) measures of the extent of practical usage of the skills ('usage' in the following discussion) (Part 6 of the study).

For analytical purposes it was necessary for the researcher to divide the skills possessed by the Egyptian and UK sample members into a number of main categories; this was to organize the findings in a structure that will enable the researcher to link them effectively with the educational issues involved. The order presented in the questionnaire list was hierarchical in terms of the writer's perception of the relative difficulty and familiarity, though clearly there are differences here between Egypt and UK. To obtain an alternative model a factor analysis of the skills usage variables was performed. Table 5.18 illustrates the total classification of acquired skills for both Egyptian and UK samples. Jointly there are six main skill categories identified as components, which are skills concerned with: Technology Systems, Advanced pipe-work, Domestic internal systems, Hazardous operations, Numerical operations, Outflow Systems. Four additional questions on educationally advanced specialist knowledge were included in the questionnaire but, being nominal data were not in the factor analysis. These relate to theory rather than practical activity in plumbing.

Though the factors might have some difficulty aspects, each is discrete in representing technically different operations, and in some cases in Egypt, different employment categories- that is, nominal factors rather than ordinal. These factors have different implications for training procedures and in terms of curriculum design.

The factor analysis used Varimax (Kim, 1978_b) on SPSS with a cut-off value in the printout of 0.5.

Table 5.18: Factor analysis of plumbers' skills usage patterns							
Skills		Component					
		1	2	3	4	5	6
1	Pipe fitting, jointing, valves and taps			0.809			
2	Installing fixtures			0.831			
3	Fitting pipe insulation systems			0.783			
4	Pipe hangers and supports in overhead installations		0.656				
5	Measurements, costing and estimations					0.845	
6	Work on steel pipe fittings	0.641					
7	Work on cast iron pipe systems		0.803				
8	Work on lead-to-copper jointing		0.597				
9	PVC		0.739				
10	Hot water heating systems: installation and maintenance		0.647				
11	Draining systems and sewerage						0.526
12	Rain water disposal systems						0.848
13	Gas-fired heating systems	0.899					
14	Electrical work on installations	0.673					
15	Brazing and soldering	0.892					
16	Oxyacetylene cutting and welding	0.548			0.535		
17	Shielded metal arc welding				0.695		
18	Specialised work on systems for carrying toxic chemicals				0.790		

It is recognised that the correct mathematical conditions for a valid factor analysis are not fully met (Kim,1978$_a$): (a) the distributions are based on an ordinal scale, not an interval scale and a normal distribution is not implied, (b) the crude ordinal scale has only three points, and (c) the number of cases (83) is small as a multiple of the number of variables (18). Hair (1995:105) recommends between 5 and 10 as a minimum ratio. However, as a guide indicating possible factors within which analysis may be presented, it has value. Factor analysis studies of UK and Egypt data separately and together were done for the frequency of use scale, and the most useful (combined) scale is shown in Table 5.18. A cut off at 0.500 was applied to the printed output table. The variation of the acquired skills among the UK sample in particular could be explained as a consequence of the wide field of specialized courses available for study.

The six factors thus show variables within components with clear theoretical and logical connections. The following section will deal with each of the six components in regard to skills usage and training.

The seventh item added represents four questions, which it was not logical to include in the factor analysis. These relate to studied knowledge gained by more advanced education. The explanation within each component will involve describing each sample separately, then a relation will be made between both samples in an attempt to see whether there are significant relations and the reasons behind them.

The order of presentation is shown in Table 5.19. The same structure is used for the analysis of data on acquisition of skills, as is derived for frequency of usage.

Table 5.19: Order of presentation of plumbers skills analysis

Order of presentation	Name given	Component
1	Domestic Internal systems	3
2	Outflow Systems	6
3	Technology Systems	1
4	Advanced Pipe-works	2
5	Hazardous operations	4
6	Numerical operations	5
7	Educationally Advanced Knowledge	---

5.6.2 Domestic Internal Systems

Table 5.20: Cross tabulation between UK and Egyptian plumber samples on Domestic Internal Systems skills training			
Skills	Training	Country	
		Egypt	UK
1a-Pipe fitting training	School training	9	35
	Market training	33	6
	No training	0	0
2a-installing fixtures training	School training	9	32
	Market training	33	8
	No training	0	1
3a-fitting fixtures training	School training	9	30
	Market training	33	10
	No training	0	1

From Table 5.20 and bearing in mind the previously mentioned facts regarding the differences in education of both samples, it is concluded that the majority of the Egyptian sample were not introduced to these basic skills until joining the labour market. This fact can be explained by the fact that the majority of them are not specialised in the field. On the other hand, the majority of the UK sample was introduced to these commonly used skills during their specialised education before joining the field.

Comparing between both the Egyptian sample and the UK regarding whether or not they received training towards these basic common skills reveals that 100% of the Egyptian sample and 97.6% of the UK sample received training regarding these skills either during their education or through their working career despite the difference in their education, qualification, employment and experience. This fact stresses the reality that possession of these skills is important for any practicing plumber.

In the case of all three skills, the country difference shown by chi-square tests is significant (N=83, sig. (2-sided) <0.001 in each case).

Table 5.21: Cross tabulation between UK and Egyptian plumber samples on Domestic Internal Systems skills usage

Skills	Usage	Country	
		Egypt	UK
1b-Pipe fitting	A lot	40	36
	Sometimes	2	3
	Seldom	0	2
	Total	42	41
2b-installing fixtures	A lot	39	34
	Sometimes	3	3
	Seldom	0	4
	Total	42	41
3b-fitting fixtures	A lot	39	34
	Sometimes	3	5
	Seldom	0	2
	Total	42	41

Table 5.21 shows a great similarity between the Egyptian and the UK samples in respect to the usage of these skills; this stresses the popularity and importance of these skills in both settings. Tables 5.22 and 5.23 illustrate the importance of these skills within the two samples individually.

Speaking of the Egyptian sample both the educated minority plumbers (9) and the uneducated majority fell in the categories that highlights the significance of being trained in these skills (school and market training) as well as the high frequency of their usage (Table 5.22).

Table 5.22: Cross tabulation between training and usage for Domestic Internal Systems skills in Egyptian plumbers sample					
1- Pipe fitting		Skill usage			Total
		A lot	Sometimes	Seldom	
Skill training	School training	9	0	0	9
	Market training	31	2	0	33
	No training	0	0	0	0
	Total	40	2	0	42
2- Installing fixtures		Skill usage			Total
		A lot	Sometimes	Seldom	
Skill training	School training	9	0	0	9
	Market training	30	3	0	33
	No training	0	0	0	0
	Total	39	3	0	42
3-Fitting fixtures		Skill usage			Total
		A lot	Sometimes	Seldom	
Skill training	School training	9	0	0	9
	Market training	30	3	0	33
	No training	0	0	0	0
	Total	39	3	0	42

Similarly, Table 5.23 demonstrates a parallel situation in the UK sample to that of the Egyptian sample.

Table 5.23: Cross tabulation between training and usage of Domestic internal systems skills in UK plumbers sample					
1- Pipe fitting		Skill usage			Total
		A lot	Sometimes	Seldom	
Skill training	School training	32	2	1	35
	Market training	4	1	1	6
	No training	0	0	0	0
	Total	36	3	2	41
2- Installing fixtures		Skill usage			Total
		A lot	Sometimes	Seldom	
Skill training	School training	27	3	2	32
	Market training	7	0	1	8
	No training	0	0	0	0
	Total	34	3	3	41
3-Fitting fixtures		Skill usage			Total
		A lot	Sometimes	Seldom	
Skill training	School training	27	1	2	30
	Market training	7	3	0	10
	No training	0	1	0	1
	Total	34	5	2	41

From the above it can be concluded that the null hypothesis is satisfied in regard to obtaining training, either in schools or in the market, and the high frequency of usage in both samples.

5.6.3 Outflow Systems

Observing Table 5.24, the same conclusion can be applied regarding means of training and numbers of trainees of both samples with respect to their education. However, it should be noted that, unexpectedly, there are 6 plumbers in the UK sample who did not receive any training in regard to draining systems and sewerage, despite the fact that their education qualifications range between Ordinary National Diploma and no qualification. In addition the mean of their working experience is 21 years. These 6 plumbers employment ranged between 1 self-employed, 1 working in 2-5 Company, 3 in a company of more than 5 persons, and 1 in a big company. The reason behind this phenomenon could be explained by the speciality in jobs, except to note that underground ceramic/PVC work is normally done in the UK by the builder rather than the plumber.

Table 5.24: Cross tabulation between the Egypt and UK plumbers sample in Outflow Systems skills training

Skills	Training	Country	
		Egypt	UK
11a-Draining systems and sewerage training	School training	9	26
	Market training	33	9
	No training	0	6
12a-Rainwater disposal systems training	School training	9	30
	Market training	32	9
	No training	1	2

Comparing between both the Egyptian sample and the UK regarding whether or not they received training towards the skill of draining systems and sewerage training (11) reveals that 100 % of the Egyptian sample and 85.4 % of the UK sample received some training regarding this skill, as above, either during their education or through their working career despite the difference in their education, qualification, employment and experience. By looking at the skill of rainwater disposal systems training (12) reveals that 97.6 % of the Egyptian sample and 95.1 % of the UK sample received training regarding this skill either during their education or through their working career despite the difference in their education, qualification, employment and experience. Again this stresses the reality that these skills are important.

These are more narrowly defined skills, which require specialist training and, for some of them, represent use of integral systems. Conceptually these are operations.

Table 5.25: Cross tabulation between the Egypt and UK plumbers sample in Outflow Systems skills usage			
Skills	Usage	Country	
		Egypt	UK
11b-Draining systems and sewerage	A lot	20	20
	Sometimes	21	16
	Seldom	1	5
	Total	42	41
12b-Rainwater disposal systems	A lot	13	23
	Sometimes	22	11
	Seldom	7	7
	Total	42	41

As the case with the previous component both samples showed a resemblance in the fact that the majority of their participants fell in the two categories of 'a lot' and 'sometimes' in regard to the usage of these skills, see Table 5.25. However, it should be noted that within the Egyptian sample most of the Egyptian plumbers used them 'sometimes', whereas most of the UK sample used them 'a lot'- as expected particularly in the case of rainwater disposal systems.

Table 5.26 illustrates a true reflection of the Egyptian fieldwork. Due to the fact that these are external skills that are only performed once even in the multi store buildings, unlike the internal connections that are performed numerously, the majority of the plumbers reported 'sometimes'.

Table 5.26: Cross tabulation between usage and training for Outflow Systems skills in the Egyptian plumbers sample					
11a-Draining systems and sewerage training		Skill usage in Egypt			Total
		A lot	Sometimes	Seldom	
Skill training	School training	3	5	1	8
	Market training	17	16	0	33
	No training	0	0	0	0
	Total	20	21	1	42
12a-Rainwater disposal systems training		Skill usage			Total
		A lot	Sometimes	Seldom	
Skill training	School training	2	5	2	9
	Market training	11	16	5	32
	No training	0	1	0	1
	Total	13	22	7	42

Looking at the UK sample, Table 5.27, these skills are more frequently used among educated and uneducated plumbers. The reason for this as claimed by the participants is the nature of the climate, which leads to a lot of parts being worn out that need maintaining and repairing.

Table 5.27: Cross tabulation between usage and training for Outflow Systems skills in the UK plumbers sample					
11a-Draining systems and sewerage training		Skill usage in UK			Total
		A lot	Sometimes	Seldom	
Skill training	School training	16	8	2	26
	Market training	4	5	0	9
	No training	0	3	3	6
	Total	20	16	5	41
12a-Rainwater disposal systems training		Skill usage			Total
		A lot	Sometimes	Seldom	
Skill training	School training	19	8	3	30
	Market training	4	3	2	9
	No training	0	0	2	2
	Total	23	11	7	41

5.6.4 Technology Systems

Technology systems in this context means a group of systems and processes that extend the range of work of the plumber into specialised areas.

Table 5.28: Cross tabulation between the Egypt and UK plumbers sample in Technology System skills training

Skills	Training	Country	
		Egypt	UK
6a-Work on steel pipe fittings	School training	0	29
	Market training	4	8
	No training	38	4
	Total	42	41
13a-Gas-fired heating systems	School training	0	27
	Market training	5	9
	No training	37	5
	Total	42	41
14a-Electrical work on installations	School training	0	15
	Market training	9	7
	No training	33	19
	Total	42	41
15a-Brazing and soldering	School training	0	27
	Market training	7	7
	No training	35	7
	Total	42	41
16a-Oxyacetylene cutting and welding	School training	0	15
	Market training	12	7
	No training	30	19
	Total	42	41

Investigating the detail of Table 5.28 reveals that none of the minority of the Egyptian sample who have had specialised education of the field had received any training regarding these developed skills at school. In addition only a minority of them were introduced to them during their working experiences 9.5 % regarding work on steel pipe fittings, 11.9 % for gas-fired heating systems, 21.4 % electrical work on installations, 16.7 % brazing and soldering, 28.6 % oxyacetylene cutting and welding.

The majority of the Egyptian sample did not receive any training throughout their careers. The reason behind this could be explained by the nature of the Egyptian labour market, where other specialised craftsmen apart from plumbers perform some of these skills. For example, there are separate shops specialised in brazing and soldering, or oxyacetylene cutting and welding.

However, in the case of the UK sample, it is observed that 90.2 % of them received training towards work on steel pipe fittings, 87.8% in gas-fired heating systems, 82.9% in brazing and soldering either during their education or their working career. 53.7% received training regarding electrical work on installations and 53.7% received training regarding oxyacetylene cutting and welding.

Table 5.29 illustrates the relationships between the Egyptian and UK samples regarding receiving any type of training to these five skills.

Table 5.29: The Chi-square (χ^2) test between Egypt and UK plumbers sample in Technology System training

Skills	N	χ^2	df	Sig. (2-sided)
6a-Work on steel pipe fittings	83	45.081	1	<0.001
13a-Gas-fired heating systems	83	47.815	1	<0.001
14a-Electricalwork on installations	83	9.210	1	0.002
15a-Brazing and soldering	83	36.440	1	<0.001
16a-Oxyacetylene cutting and welding	83	5.399	1	0.020

The significant differences between the two samples in regard to these five technologies skills stresses the gap between the training efficiency of the two samples. The Egyptian labour market lacks these vital developed skills in the everyday plumbing field. Consequently, introducing these skills on a wider scale among the

Egyptian plumbers, could participate in their having a more comprehensive knowledge instead of relying in their jobs on other specialist craftsmen.

Table 5.30: Cross tabulation between the Egyptian and UK plumbers sample in Technology System skills usage

Skills	Usage	Country	
		Egypt	UK
6b-Work on steel pipe fittings	A lot	1	23
	Sometimes	2	10
	Seldom	39	8
	Total	42	41
13b-Gas-fired heating systems	A lot	0	26
	Sometimes	2	9
	Seldom	40	6
	Total	42	41
14b-Electricalwork on installations	A lot	0	11
	Sometimes	5	12
	Seldom	37	18
	Total	42	41
15b-Brazing and soldering	A lot	0	21
	Sometimes	2	9
	Seldom	40	11
	Total	42	41
16b-Oxyacetylene cutting and welding	A lot	0	5
	Sometimes	3	11
	Seldom	39	25
	Total	42	41

In regard to the usage of these skills, data reveals that in most of the skills the majority of the UK sample uses them 'a lot'; unlike the Egyptian sample where most of the participated Egyptian plumbers only uses them on 'seldom' incidents, Table 5.30. However, there are two of these technology system skills: electrical work on installations and oxyacetylene cutting and welding, where the majority in both samples 'seldom' used them.

The reason for the seldom use of these technology system skills in Egypt could be explained as follows: most of the plumbers claimed that steel pipes are no longer in use in the Egyptian market as they have been replaced by plastic ones. Gas-fired heating systems have only been introduced into Egyptian society 10 years ago. In addition there is only one national company responsible for all gas fittings. Electrical work in Egypt does not usually fall under the responsibilities of the plumber, there are other craftsmen specialised in the electrical settings of equipment. There are also special shops devoted to brazing and soldering as well as oxyacetylene cutting and welding, as mentioned earlier.

The obvious difference between the Egyptian and the UK samples and the apparent variation is that the responses of the Egyptian sample are only distributed among the 'seldom' and 'sometimes' responses; whereas the distribution of the UK sample across all three responses reflects the presence of a wider range of skills usage possessed by the UK plumbers in order to be able to cover the various demands of the labour market.

Table 5.31: Cross tabulation between usage and training for Technology Systems skills in the Egypt plumbers sample					
6-Work on steel pipe fittings		Skill usage			Total
		A lot	Sometimes	Seldom	
Skill training	School training	1	2	1	4
	Market training	0	0	0	0
	No training	0	0	38	38
	Total	1	2	39	42
13-Gas-fired heating systems training		Skill usage			Total
		A lot	Sometimes	Seldom	
Skill training	School training	0	0	0	0
	Market training	0	2	3	5
	No training	0	0	37	37
	Total	0	2	40	42
14- Gas-fired heating systems		Skill usage			Total
		A lot	Sometimes	Seldom	
Skill training	School training	0	0	0	0
	Market training	0	4	5	9
	No training	0	1	32	33
	Total	0	5	37	42
15-Electricalwork on installations		Skill usage			Total
		A lot	Sometimes	Seldom	
Skill training	School training	0	0	0	0
	Market training	0	2	5	7
	No training	0	0	35	0
	Total	0	2	40	42
16- Brazing and soldering		Skill usage			Total
		A lot	Sometimes	Seldom	
Skill training	School training	0	0	0	0
	Market training	0	3	9	12
	No training	0	0	30	30
	Total	0	3	39	42

It is clear from Table 5.31 that the skills that the Egyptian sample claimed to use either 'sometimes' or 'seldom' were also these skills that they did not receive any training towards either in school or in the labour market. The reason for this relation could be due to the fact that these skills fall outside the responsibilities of the plumbers in Egypt. This could also be confirmed by examining the chi-square tests between ‘market training’, ‘no training’ with ‘seldom’ usage and ‘sometimes’ (see Table 5.32) but these are interpreted with great caution because of the small value in many cells.

Table 5.32: The correlations between usage and training for Technology Systems skills in Egypt plumbers sample

Skills	N	χ^2	df	Sig.(2-sided)
Skill 6- Work on steel pipe fittings	42	0.692	2	<0.001
Skill 13-Gas-fired heating systems training	42	15.540	1	<0.001
Skill 14 Gas-fired heating systems	42	11.565	1	0.001
Skill 15-Electrical work on installations	42	10.500	1	0.001
Skill 16- Brazing and soldering	42	8.077	1	0.004

From Table 5.33 it becomes clear that the three most used skills: electrical work on installations, gas-fired heating systems training, work on steel pipe fittings; were reported by the majority of the UK sample were also the most trained during school education. Accordingly, the other two skills that were reported to be least used: brazing and soldering as well as gas-fired heating systems, were also those skills that the majority of the UK sample did not receive training in them either during the school education or the labour market.

Table 5.33: Cross tabulation between usage and training for Technology skills in UK plumbers sample

6-Work on steel pipe fittings		Skill usage			Total
		A lot	Sometimes	Seldom	
Skill training	School training	20	5	4	29
	Market training	3	5	0	8
	No training	0	0	4	4
	Total	23	10	8	41

13-Gas-fired heating system training		Skill usage			Total
		A lot	Sometimes	Seldom	
Skill training	School training	22	3	1	26
	Market training	4	5	0	9
	No training	1	1	4	6
	Total	27	9	5	41

14- Gas-fired heating systems		Skill usage			Total
		A lot	Sometimes	Seldom	
Skill training	School training	8	4	3	15
	Market training	1	6	0	7
	No training	2	2	15	19
	Total	11	12	28	41

15-Electricalwork on installations		Skill usage			Total
		A lot	Sometimes	Seldom	
Skill training	School training	19	4	4	27
	Market training	2	3	2	7
	No training	0	2	5	7
	Total	21	9	11	41

16- Brazing and soldering		Skill usage			Total
		A lot	Sometimes	Seldom	
Skill training	School training	4	6	5	15
	Market training	1	4	2	7
	No training	0	1	18	19
	Total	5	11	25	41

Table 5.34 confirms some significant correlations between the UK usage and training for the technology system skills. This fact could lead to the conclusion that education, provided to the plumbers-to-be, reflects and supplies the students with the actual needs of the labour market.

Table 5.34: The Correlations Between Usage and Training for Technology Systems Skills in UK plumbers sample				
Skills	N	χ^2	df	Sig. (2-sided)
Skill 6: Work on steel pipe fittings	41	25.268	4	<0.001
Skill 13: Gas-fired heating systems training	41	27.393	4	<0.001
Skill 14: Gas-fired heating systems	41	26.496	4	<0.001
Skill 15: Electrical work on installations	41	15.030	4	0.005
Skill 16: Oxyacetylene cutting and welding training	41	18.216	4	0.001

5.6.5 Advanced Pipe-work

Advanced pipe-work in this context includes the skills related to jointing, fixing and hanging pipes of different materials and of different usage.

Table 5.35: Cross tabulation between the Egypt and UK plumbers sample in Advanced Pipe-work skills training			
Skills	Training	Country	
		Egypt	UK
4a-Pipe hangers and supports in overhead installations	School training	9	29
	Market training	33	8
	No training	0	4
7a-Work on cast iron pipe systems	School training	9	27
	Market training	33	9
	No training	0	5
8a-work on lead-to copper jointing	School training	9	29
	Market training	33	8
	No training	0	4
9a-PVC water pipe systems	School training	9	28
	Market training	33	11
	No training	0	2
10a-Hot water heating systems: installation and maintenance	School training	8	31
	Market training	34	8
	No training	0	2

As expected, Table 5.35 shows that the majority of the Egyptian sample was introduced to these advanced pipe work skills during their practical performance. Although the minority of qualified plumbers were introduced to these skills during their education, it should be noted that none of the Egyptians claimed not being trained in any of them. However, looking at the UK sample it is observed that, despite the majority receiving training during their school education, yet there were also a number of plumbers who were introduced to these skills during their working experience and others who, despite their varied working experience, had received no training towards these skills. The major differences between the countries in all cases are obvious from the table. Table 5.36 illustrates some significant relationships between the Egyptian and the UK samples regarding using any of the five skills.

Table 5.36: Cross tabulation between the Egypt and UK plumbers sample in Advanced Pipe-work skills usage

Skills	Usage	Country	
		Egypt	UK
4b-Pipe hangers and supports in overhead installations	A lot	37	21
	Sometimes	3	13
	Seldom	2	7
	Total	42	41
7b-Work on cast iron pipe systems	A lot	32	18
	Sometimes	8	15
	Seldom	2	8
	Total	42	41
8b-work on lead-to copper jointing	A lot	27	18
	Sometimes	13	18
	Seldom	1	5
	Total	42	41
9b-PVC water pipe systems	A lot	25	28
	Sometimes	17	10
	Seldom	0	3
	Total	42	41
10b-Hot water heating systems: installation and maintenance	A lot	25	31
	Sometimes	14	3
	Seldom	3	7
	Total	42	41

Table 3.37 shows the correlations between the two samples for the advanced pipe-work skills usage.

Table 5.37: The correlations between Egypt and UK samples in Advanced Pipe-work skills usage				
Skills	N	df	χ^2	Sig. (2-sided)
4b-Pipe hangers and supports in overhead installations	83	1	4.305	0.038
7b-Work on cast iron pipe systems	83	1	5.450	0.020
8b-work on lead-to-copper jointing	83	1	4.305	0.038
9b-PVC water pipe systems	83	1	2.099	0.147
10b-Hot water hearing systems: installation and maintenance	83	1	2.099	0.147

From the above table it is noted that there is a significant difference between the samples in regard to three of the skills' usage but not two others. The majority of participants in both samples claimed to use these skills a lot.

Tables 5.38 and 5.39 provide a separate cross tabulation for each sample between the usage and training for advanced pipe-work skills.

Table 5.38: Cross tabulation between usage and training for Advanced Pipe-work skills in Egyptian plumbers sample					
4a-Pipe hangers and supports in overhead installations		Skill usage in Egypt			Total
		A lot	Sometimes	Seldom	
Skill training	School training	9	0	0	9
	Market training	28	3	2	33
	No training	0	0	0	0
	Total	37	3	2	42
7-Work on cast iron pipe systems		Skill usage			Total
		A lot	Sometimes	Seldom	
Skill training	School training	7	2	0	9
	Market training	25	6	2	33
	No training	0	0	0	0
	Total	32	8	2	42
8a-work on lead-to copper jointing		Skill usage			Total
		A lot	Sometimes	Seldom	
Skill training	School training	7	2	0	9
	Market training	20	11	1	32
	No training	0	0	0	0
	Total	27	13	1	41
9a-PVC water pipe systems		Skill usage			Total
		A lot	Sometimes	Seldom	
Skill training	School training	5	4	0	9
	Market training	20	13	0	33
	No training	0	0	0	0
	Total	24	17	0	42
10a-Hot water hearing systems: installation and maintenance		Skill usage			Total
		A lot	Sometimes	Seldom	
Skill training	School training	3	5	0	8
	Market training	22	9	3	34
	No training	0	0	0	0
	Total	25	14	3	42

Table 5.39: Cross tabulation between usage and training for Advanced Pipe-work skills in UK plumbers sample					
4a-Pipe hangers and supports in overhead installations		Skill usage in UK			Total
		A lot	Sometimes	Seldom	
Skill training	School training	19	8	2	29
	Market training	2	5	1	8
	No training	0	0	4	4
	Total	21	13	7	41
7-Work on cast iron pipe systems		Skill usage			Total
		A lot	Sometimes	Seldom	
Skill training	School training	16	9	2	27
	Market training	1	5	3	9
	No training	1	1	3	5
	Total	18	15	8	41
8a-work on lead-to copper jointing		Skill usage			Total
		A lot	Sometimes	Seldom	
Skill training	School training	17	11	1	29
	Market training	1	6	1	8
	No training	0	1	3	4
	Total	18	18	5	41
9a-PVC water pipe systems		Skill usage			Total
		A lot	Sometimes	Seldom	
Skill training	School training	21	6	1	28
	Market training	7	3	1	11
	No training	0	1	1	2
	Total	28	10	3	41
10a-Hot water hearing systems: installation and maintenance		Skill usage			Total
		A lot	Sometimes	Seldom	
Skill training	School training	26	1	4	31
	Market training	5	2	1	8
	No training	0	0	2	2
	Total	31	3	7	41

From Tables 5.38 and 5.39 it becomes clear that the majority of the Egyptian samples who used these skills a lot obtained training during their experience in the labour market. Whereas, the majority of the UK sample who used it a lot obtained the required training during their school education.

Table 5.40 shows some significant correlations between the usage and training for the advanced pipe-work skills in the UK sample. The table also stresses the strong connection between school training and labour market demands.

Table 5.40: The correlations between Egypt and UK samples in Advanced Pipe-work skills usage

Skills	N	df	χ^2	Sig. (2-sided)
4a-Pipe hangers and supports in overhead installations	41	4	26.056	<0.001
7a-Work on cast iron pipe systems	41	4	12.754	0.013
8a-work on lead-to-copper jointing	41	4	22.065	<0.001
9a-PVC water pipe systems	41	4	7.825	0.098
10a-Hot water hearing systems: installation and maintenance	41	4	14.718	0.005

5.6.6 Hazardous Operations

Three operations are identified as hazardous and grouped together in the factor analysis:

- Oxyacetylene cutting and welding training
- Shielded metal arc welding
- Specialised work on systems for carrying toxic chemicals

Table 5.41: Cross tabulation between Egypt and UK plumbers samples in Hazardous Operations skills training			
Skills	Training	Country	
		Egypt	UK
16a-Oxyacetylene cutting and welding training	School training	0	15
	Market training	12	7
	No training	30	19
	Total	42	41
17a-Shielded metal arc welding	School training	0	9
	Market training	11	4
	No training	31	28
	Total	42	41
18a-Specialised work on systems for carrying toxic chemicals	School training	3	7
	Market training	8	6
	No training	31	28
	Total	42	41

The oxyacetylene cutting and welding skill has a hazardous aspect of operation. So it came with this group, as well as under Technology Systems, as shown in the factor analysis. It is clear that there is a difference between the two samples in regard to getting training for these skills in school. Formal training is normal in the UK, but not in Egypt.

Unlike any of the other skills, the last two skills (17 and 18) are the only two where both the Egyptian and the UK samples showed a degree in similarity in regard to means of training (see Table 5.41), i.e. the majority in both samples did not receive any training at all. However, more Egyptian plumbers than UK claimed to have gained market training.

These are highly specialised skills, involving danger to both plumber and public if not performed correctly. Legal constraints apply, especially in the UK, and these affect training procedures and at which point of a career a plumber might use them. The proportion of "on-the-job" trained specialists in both countries is thus very surprising.

Table 5.42: Cross tabulation between Egypt and UK plumbers sample in Hazardous Operations skills usage			
		Country	
Skills	Usage	Egypt	UK
16b-oxyacetylene cutting and welding using	A lot	0	5
	Sometimes	3	11
	Seldom	39	25
17b-Shielded metal arc welding	A lot	1	5
	Sometimes	4	4
	Seldom	37	32
18b-Specialised work on systems for carrying toxic chemicals	A lot	0	2
	Sometimes	4	7
	Seldom	38	32

Table 5.42 shows a degree of similarity between the samples in regard to the usage of the hazardous operations skills. The majority of both samples only used them seldomly.

5.6.7 Numerical Operations

Table 5.43: Cross tabulation between Egypt and UK plumbers sample in Numerical Operations skills training			
		Country	
Skills	Training	Egypt	UK
5a-Measurements, costing and estimation training	School training	9	25
	Market training	33	8
	No training	0	8
	Total	42	41

This is the same topic, appearing as the only one variable in a component in the factor analysis, as was the focus of the Helwan study described in Chapter 4 of this thesis (El-Kersh, 1997). It must be noted that it did not appear separately in the factor analysis of Egypt only cases. This skill represents a typical case of skill training in both samples (see Table 5.43). School trainees in the UK exceed those in the Egyptian society although these numerical skills are regarded as a taught subject in the Egyptian technical school education. The labour market trainees among the Egyptian sample exceeds that of the UK sample due to the small percentage of educated plumbers in the Egyptian market. However, it should be noted that these skills are considered important as a means of getting jobs through the only two means of employment in the Egyptian labour market: self-employed and big companies. Knowing that the majority of the Egyptian plumbers are self-employed, they gained these essential skills in order to be able to carry out the jobs independently. In addition, it is also considered as a vital pre requisite in order to join the big firms. Table 5.44 shows the resemblance between both the UK and Egyptian samples (despite the difference in their qualifications) in regard to the usage of these skills.

Table 5.44: Cross tabulation between Egypt and UK plumbers samples in Numerical Operations skills usage

Skills	Usage	Country	
		Egypt	UK
5b-Measurements, costing and estimation	A lot	39	21
	Sometimes	3	11
	Seldom	0	9
	Total	42	41

5.6.8 Theoretical knowledge and skills

The following section deals with some of the theoretical background skills potentially involved in training. These skills were chosen for being advanced and to provide a closer insight of the qualification and education differences between the two samples. The questions ask whether a particular skill has been acquired, not how it was acquired. In practice these skills tend all to be taught formally. Each skill has an important place in terms of efficiency in the labour market.

Table 5.45 shows the cross tabulation between the Egyptian and UK plumbers' samples in the selected theoretical skills.

Table 5.45: Cross tabulation between the Egyptian and UK plumbers sample in Theoretical Skills

Theoretical Skills	Received training?	Country		Total
		Egypt	UK	
Building plans and blueprint reading	Yes	33	32	65
	No	9	9	18
	Total	42	41	83
Mathematics relevant to plumbing	Yes	21	32	53
	No	20	9	29
	Total	42	41	83
Physics relevant to plumbing	Yes	17	21	38
	No	24	20	44
	Total	42	41	83
Legal requirements and regulations about plumbing	Yes	22	34	56
	No	19	7	26
	Total	42	41	83

Tables 5.45 and 5.46 show the differences between the two samples regarding these skills. It is clear that building plans and blueprint- reading skills are the most acquired by plumbers in both samples: 78.5% of the Egyptian sample and 78.0 % of the UK sample.

Table 5.46: The chi-square (χ^2) test between the Egyptian and UK plumbers sample in theoretical skills				
Theoretical Skills	N	χ^2	df	Sig. (2-sided)
Building plans and blueprint reading	83	0.003	1	0.954
Mathematics relevant to plumbing	82	6.455	1	0.011
Physics relevant to plumbing	82	0.785	1	0.376
Legal regulations about plumbing	82	8.110	1	0.004

As expected, mathematics relevant to plumbing, which is mainly acquired through years of education, was more highly acquired among the UK sample than the Egyptian. Nearly half the Egyptian sample (47.6%) did not receive training in this respect.

Although physics relevant to plumbing would have been introduced through education, the UK sample showed that nearly half of the sample (48.7 %) was not introduced to it. However, in the Egyptian sample despite that the majority of the sample is not educated, yet 40% of the sample claimed to have received training in it. This figure is unexpected and outside the researcher's experience. Possible sources of error were considered:

1. The translation to Arabic was re-examined. It is very clear and has exactly the same meaning as the English version. It is unlikely to have caused confusion.
2. Data entry errors are unlikely. The questionnaire was administered as an interview with the researcher personally collecting the data. No such errors are shown in adjacent responses.
3. Sample size is the same as for other questions. Missing data accounted for only one case out of 42.

4. Respondent fatigue might be considered for this penultimate question, though such doubt does not relate to the last question.

The reason is elusive. The technical school national curriculum in plumbing does not include physics as such. It can only be assumed that other school physics relates in the Egyptian plumbers' minds to this question (e.g. convection, expansion, leverage, etc.).

As expected 82.9 % of the UK sample claimed to be aware of the legal requirements and regulations about plumbing due to their education. 52.3 % of the Egyptian sample claimed receiving training regarding them. Despite the low percentage of educated plumbers among the Egyptian sample they realised that these skills were essential to be acquired in order to perform in the labour market. The fact that this knowledge does not require previous education as a foundation made it easier for the Egyptian sample to acquire it.

The following, Table 5.47, ranks these developed theoretical skills according to their acquisition by both samples.

Table 5.47: The rank of theoretical skills according to their acquisition by both Egyptian and the UK plumbers samples

The skills	Egypt %	The Egypt priority first	UK %	The UK priority first
Building plans and blueprint reading	78.5%	1	78.4%	2
Mathematics relevant to plumbing	50%	3	78.4%	2
Physics relevant to plumbing	41.5%	4	51.2%	3
Legal regulations about plumbing	53.7%	2	82.9%	1

From the above table it becomes clear that the Egyptian sample are mainly concerned with the skills that would enable them to practice plumbing than those skills that could improve the quality and standard of their work. On the other hand, the UK sample showed awareness and interest in both applying and quality of skills.

5.6.9 Skills Egyptian plumbers would like to have

In response to the final totally open question, the Egyptian plumbers mentioned a number of skills that they would like to acquire in order to improve the level of their performance and their knowledge of the craft. The UK plumbers were asked the same question but no one in the sample of 41 gave an answer to this. The reason for non-response is unclear but might, for example, be (i) that they are satisfied with their level of skills or (ii) that it is very easy in the UK to get additional experience or education and that they have already obtained the skills they want at present, or (iii) that being busy they were unwilling to extend the interview time (unlike the Egyptian sample).

Table 5.48 is the full list of the skills given in Egypt:

Table 5.48: Skills that the Egyptian plumbers sample reported would like to acquire (in rank order)	N*
Fixing ceramics tiles in bathrooms and kitchens	5
Installing electric heaters	4
Installing full automatic washing machines and basic maintenance	3
Measuring and working out water tanks inside and outside houses	5
Applying waterproof layers in bathrooms	2
Building sewage inspection chambers inside and outside houses	4
Plastering sewage inspection chambers	4
Fixing problems related with hot water pipes inside the walls using modern solutions	3
Installing water and sewage pumps for tall buildings (more than 15 floors).	2
Fixing and maintaining boilers	2
Brazing and soldering	3
*** N =The number of plumbers mentioning this kind of skill.**	

5.7 Chapter summary

- In the Egyptian sample, the younger participants possessed more qualifications than the older participants. However, their qualifications are not necessarily related to the field. This could be explained by the fact of the educational reform movements, that have been occurring in the Egyptian society in the past few decades, resulting in extending the period of free compulsory education. This has lead to the younger generations receiving more education. However, at the same time the fast growing inflation in the Egyptian society accompanied by the low financial income of this sector had lead these young educated generations to abandon their education and join the labour market to help in supporting the family.

- In contrast, in the UK sample, the older participants are the more qualified.

- As a result of easily joining the labour market as craftsmen in Egypt without educational or technical specifications, and due to the low financial level; most of those in Egypt who chose to join the field of plumbing were self-employed. The remaining minority was employed in large firms as a means of guaranteeing a secure income.

- The organized nature of the British society and the presence of well known specifications for joining the labour market, the presence of strict laws and the presence of regulations for materials prices and distribution of equipment lead the UK sample to be distributed among a wider range of employment sectors.

- The relation between the income and the qualifications of the participants in both samples was not significant although in both cases the higher and more specified the qualifications, the higher was their income.

- The Egypt and UK age profiles as shown in the samples were different, the UK plumbers generally starting employment later and remaining longer in employment as plumbers. Both samples include a small number who joined the labour market without having work permission at an early age. So, there is nothing to guarantee their safety (insurance).

- From both samples it became clear that there is no statistical relationship between participants in the samples joining the field of plumbing and having their father or a member of the family working in the same field. In the Egyptian sample this could be interpreted by the low economic standard of the family accompanied by absence of any support from the government that leads members of the families to seek means of providing support to their families. In the UK sample joining the labour market without having a member of the family in the same field could be attributed to the fact that school leavers are tempted to leave early to try to gain entrance to industry via technician courses (see Price and Whipp, 1996).

- It was interesting to find that all the Egyptian participants in the sample, regardless of their years of experience, had no other previous jobs before being plumbers. However, the UK sample showed a sign of planning and preparation before joining the plumbing field. The minority of them who practiced other jobs prior to plumbing reported doing so while gaining qualifications to join the plumbing field.

- There is a clear difference between the working hours profile in both samples, either in regard to the number of hours worked per day or the number of days per week. The Egyptian sample share was bigger in both instances. However, the income of the Egyptian sample is far less than that of the UK sample. Despite the previously mentioned reasons that could contribute to this fact, see Section 5.4.1, another important reason could be the huge difference in the way both societies regard repair and maintenance jobs. In the UK, buying new equipment could be sometimes less expensive than having it fixed or repaired, due to the high cost of manpower in the society.

- There is a better marketing opportunity and more means of being informed with innovations and development in the plumbing field available to the UK plumbers through written published information, easy and different means of information access, as well as being qualified in this field. Unlike the case with the Egyptian plumbers who lack these opportunities.

- The null hypothesis of the presence of no link between each of the informal means of learning and the prior years of experience of the Egyptian and UK samples separately is not rejected.

- Both similarities and differences exist between the UK and Egyptian training and usage in specific skills. The large number of differences might suggest that curriculum transfer is not a practical proposition.

Chapter 6:

The qualitative study of the background attitudes and abilities of practicing technical teachers

6.1 Introduction

This chapter deals with the qualitative study (interviews) of the background attitudes and abilities of a sample of Egyptian practicing technical teachers. Chapter 4 covers details of the selection of the sample, the qualitative questions designed and the logic behind this part of the study. Though this is a qualitative study it was found that some data were amenable to coding and to some quantitative statistical analysis.

6.2 Accessing the teachers

As explained earlier in Chapter 4 a former colleague of the researcher carried out the interviews. However, the researcher participation did not stop at this point. The Egyptian colleague sent to the researcher a list of names and contact telephone numbers of 10 teachers across the four participating schools. The researcher then made international personal calls to each of these 10 teachers to explain to them the situation, obtain their direct approval and positive cooperation, enlighten them with the aims of the research and to ask them to pass on the situation to their colleagues in the schools who could not be contacted. These phone calls proved highly beneficial as they led to significant changes in the means of implementation of the data instrument, as will be discussed in the following section. The option of carrying out the interviews by phone was considered but was rejected because of the relatively impersonal nature of the method and the high cost consequences. The Egyptian colleague was paid for his time in administering the interviews.

6.3 Instrument Design and Development

These interviews were initially planned as a series of individual tape-recorded interviews. But, on speaking to the Egyptian teachers, it was revealed that the majority of them were unwilling to participate in the study as long as it was a recorded interview.

The teachers indicated that their voices could be recognised and therefore traceable within the limited number used in the sample. They were concerned that their responses, if critical of the Egyptian educational system, might be regarded adversely. However, they showed no objection to filling out the information in writing. These fears were unanticipated in view of the facts that (i) the teachers were assured of anonymity, and (ii) Egypt is a democracy with assurance of free speech – yet there is a culture of not being publicly critical of national decisions.

Thus the researcher had to modify the interview plan so that the responses to each question were recorded in writing privately by each interviewee, without use of a tape-recorder. The one-to-one 'clinical' procedure was still followed for each individual teacher in order that there was maximum freedom for open responses. It should be noted that the modified structured interview proved very successful; the data collected gives the necessary evidence, as will be illustrated later in this present chapter. For each teacher, therefore, there were two (anonymous) written readers: one by the teachers and one by the interviewer. Both were used in analysis.

A second benefit behind the researcher's shift to written responses design was that it ensured collection of all relevant information from the teachers without accidental omission of parts of questions. This was especially valuable considering the fact that somebody else instead of the researcher himself carried out the field study interviewing. There is, perhaps, a reduction of the risk of interviewer bias affecting the outcomes by using an independent assistant.

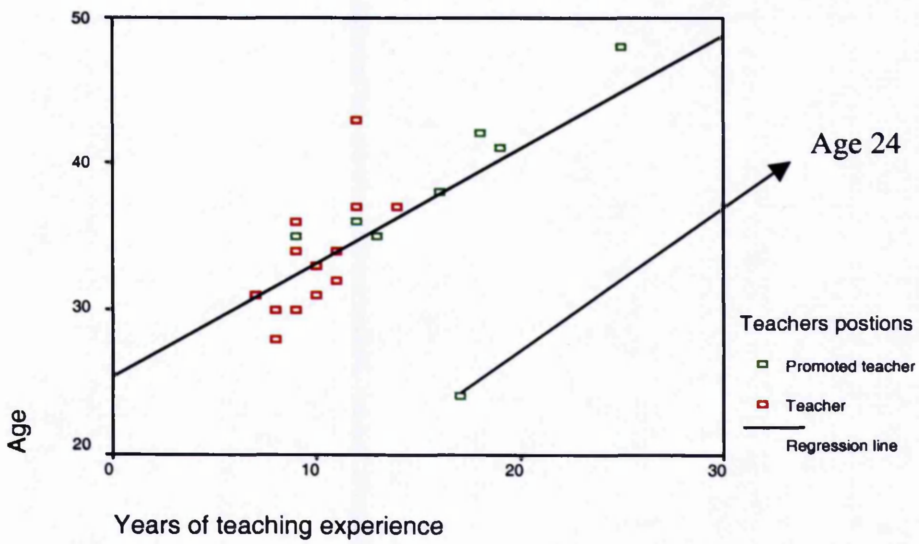
A third benefit was that it was easier to extract data from the written records without the need for transcription of recorded interviews. As discussed below, this also enabled coding of the open responses for further analysis and use of SPSS (the Statistical Package for the Social Sciences).

The question arises as to whether writing questions in this particularly controlled manner would inhibit the open-endedness targeted through the use of interview techniques. The assistant interviewing was instructed to deal with this issue carefully: ensuring that interviewees were discussing and writing responses to the open-ended questions, making sure that verbal answers were all recorded in writing by either the interviewee or the interviewer and allowing adequate time for continuous writing. Inspection of the scripts indicate that the open response aspect was successfully preserved.

6.4 Description of the sample

6.4.1 Age and years of experience

The ages of teachers in the sample (N=22) range between 24 and 48 years with a mean of 35.1 years. The sample therefore covered different years of experience. The years of experience in the sample ranged between 7 and 25 years and had M_s=12.5 years. The following scatter plot, Graph 6.1, represents the relation between the teachers' age and their years of experience. the line is a least squares regression fit.



Graph 6.1: Correlation between the age and experience of the Egyptian teacher sample and their employment position

As expected, a Pearson (2-tailed) correlation test between the teachers' age and experience is significant at the 1% level (N=22, ρ=0.674, sig.(2-tailed)=0.001). Thus, it is concluded that the null hypothesis, of the presence of no relation between the age of the teachers and their experience, is obviously strongly rejected.

The teacher aged 24 who claimed 17 years experience of teaching has clearly included his own experience of education (from age 6). Visibly, he has about 3 years teaching experience. This item of data was classified as 'missing data' in the subsequent analysis.

The biserial correlation between experience and teaching position (promoted or basic grade) was highly significant, as expected (N=21, r_{pb} =0.674, sig.(2-tailed)=0.001). Age correlated against teaching position was (marginally) not significant (N=22, r_{pb} =0.364, sig.(2-tailed)=0.091). This phenomenon could be explained by the following reasons that were put forward by seven promoted teachers and six basic grade teachers:

a) There are currently no vacant places in the higher positions.

b) Most of the promoted teachers refuse any further promotions (e.g. to a non-subject position such as deputy head) in order to be able to retain an external income from private tuition.

c) Due to the fact that promotion takes place mainly as a result of the reports written by the supervisors, unsatisfactory reports play a role in holding back promotions.

6.4.2 Qualifications

The teacher sample contains 86% (19 teachers) with a Bachelor degree, 17 of whom (77%) had a Bachelor of Education degree, one teacher held a Bachelor of Engineering degree – in school 1; the other had a 4-year Architecture Institution qualification (an equivalent degree to that of Bachelor) – in school 3. Table 6.1

illustrates the qualifications of the participating teachers and their distribution across the schools represented in the sample. One teacher in School 2 did not respond. The final two held the higher postgraduate qualifications of Higher Diploma in Education.

Table 6.1: Qualifications of the Egyptian teachers sample and their distribution across the schools

Qualifications	Schools				Total
	School 1	School 2	School 3	School 4	
Bachelor (School of Education)	4	3	5	5	17
Higher Diploma of Education	0	1	1	0	2
Other Bachelor	1	0	1	0	2
Total	5	4	7	5	21

It should be noted that five teachers of the sample, at the time of data collection, were studying for a postgraduate higher education qualification. These Higher Diplomas last two years after a bachelor's degree. This is described in the analysis as 'Higher Diploma' to distinguish it from other lower qualifications called diplomas. It is a necessary prerequisite in Egypt for entry to masters' or doctoral studies. The number of teachers in the sample studying for a higher diploma is very high for Egypt. The reason for this very high proportion is not known – whether related to ambition in education or whether related to possible career changes.

6.5 Discussion of opinions and attitudes of teachers

This section is a descriptive analysis of each of the developed interview-based questions, grouped in themes.

6.5.1 Evidence of ongoing training

The interview sought information of the means by which teachers seek to improve their skills. There are issues of keeping up to date with content (commercial and technical developments) and with process (teaching methods). The open response answers were scrutinised carefully and divided into four categories: (i) reading, (ii) watching educational television programmes, (iii) visiting exhibitions and (iv) attending conferences. In the following analysis these are treated as a crude ordinal scale of commitment to improvement (in terms in Egypt of determination required to undertake the activity).

It was hypothesised that there would be a relationship between age or years of experience and the chosen method of improvement. The correlations between the teachers' age and their chosen means of improving their teaching skills, (i) to (iv) above, proved significant at the 5% level ($N=15$, $\rho=-0.569$; sig.(2-tailed) $=0.027$). The negative correlation shows decreasing commitment with age. However, the correlations between the teachers' years of experience and their chosen means of improving their teaching skills proved not significant ($N=15$, $\rho= -0.270$, sig.(2-tailed)$= 0.331$). With $M_s=13.5$ years of experience ($N=22$) and median=11.5.

It thus becomes evident that in terms of the increase of the teachers' age and experience, they do not seek to further improve their teaching skills. It is the younger teachers who actively pursue means of improvement other than reading. The correlations were negative because most of the teachers who responded positively to this question were of a young age.

6.5.2 Teaching styles

The teachers were asked about their styles and methods of teaching. In cases where teachers were slow to respond prompts were used with words (roughly translated) meaning brainstorming, problem solving, lecturing, being used. The answers were further grouped together under lecturing (covering didactic methods) and active learning (covering all other techniques). For some analyses the sub-categories were retained, but these are for coding only and strict definitions should not be implied (see Table 6.2).

Table 6.2: Coding of responses of teaching styles for analysis with operational terminology used

Category	Examples	Code
Lecture	Didactic methods in which the teacher communicates primarily by monologue	1
Brainstorming	Any methods mainly involving the generation of ideas by students	2
Problem Solving	Methods in which a problem is posed to the students for solution individually or in groups	3
Other	Any other active learning methods including games and simulations	4

This, in terms of practice in Egypt, can be regarded as an ordinal scale of the extent to which the teachers is prepared to be adventurous in terms of the school culture.

The teacher data shows a statistical significance in the spearman correlation between the varieties of teaching methods and their age (N=22, ρ=0.512, sig.(2-tailed)=0.015). 19 teachers out of the sample, with a mean age of 36 years, use lectures as their main teaching method. The mean of years of experience of these 19 teachers was 12.3 years. However, there is no significant correlation between the years of experience and the teaching method (N=22, ρ=0.144, sig.(2-tailed)=0.522). The two youngest teachers reported use of brainstorming; one listed 'others' but did not specify; see

Graph 6.2. Reasons for the preference of the lecture method as mentioned by the teachers are:

a) The short duration of the lessons.

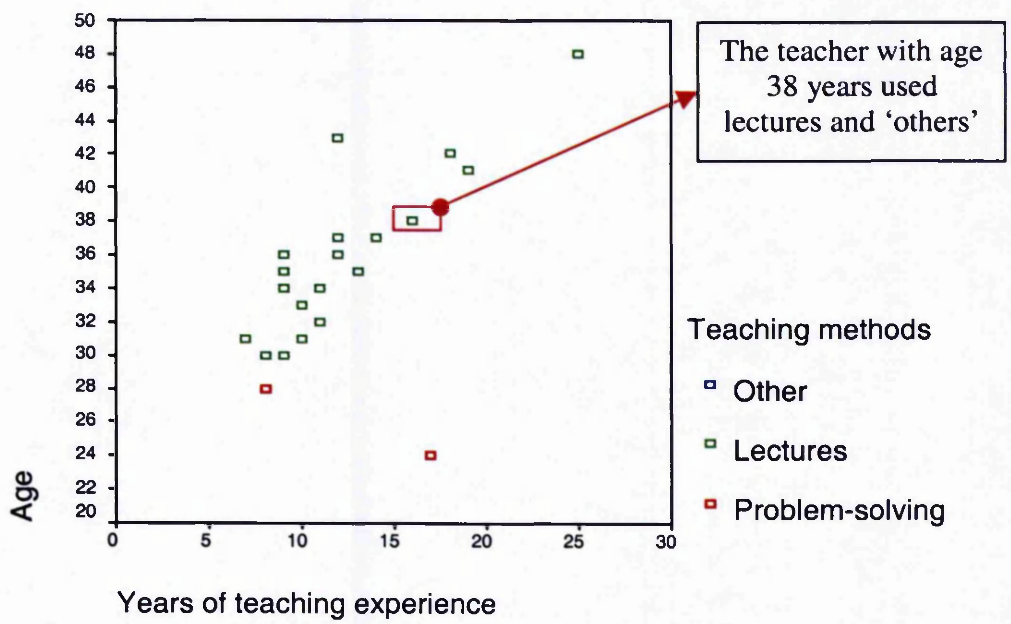
b) The long syllabus, which needs to be covered in the academic year.

c) The large number of students in the class, which does not allow the application of any other method.

d) It is the easiest and fastest way for lesson preparation as most teachers teach more than one subject.

e) The absence of a Teacher Guide Book to provide ideas of teaching.

f) The students are not used to the other methods of teaching.



Graph 6.2: Age, years of experience for the Egyptian teachers sample and their teaching method.

The question arises as to whether or not teachers believe that their teaching activities (methods and styles) are relevant. The interview sought basic information on three topics – (a) the teaching methods actually used, (b) the methods the teachers consider to be most effective, and (c) the methods they most enjoy delivering to the students. It is hypothesised that these three are the same. The following is an investigation of this aspect.

There is no significant correlation between the teachers' qualifications and using the lecture as the main method (N=21, ρ=0.347, sig.(2-tailed)=0.123), see Table 6.3. The reasons for this could be also taken back to the same six reasons that were mentioned by the teachers earlier, but there are small numbers in some categories and the result must be treated with care. The same applies in some of the following analyses.

Table 6.3: Teaching methods used by the Egyptian teachers sample

	Qualifications			
Teaching methods	Bachelor (the school of education)	Higher Diploma of education	Other Bachelor	Total
Problem-solving	2	0	0	2
Lectures	15	1	2	18
Other	0	1	0	1
Total	17	2	2	21

As for the teachers' perception of the most effective method to be applied, the lecture method was still thought to be the most effective by 50% of the Faculty of Education graduates (7 missing data). The remaining 50% thought that active learning methods were most effective; see Table 6.4.

Table 6.4: Teaching methods thought to be most effective by the Egyptian teachers sample				
	Qualification			Total
Most effective teaching method	Bachelor (the school of education)	Advanced Diploma of education	Other Bachelor	
Brain storming	2	0	0	2
Problem-solving	3	0	1	4
Lectures	5	1	0	6
Other	0	1	0	1
Total	10	2	1	13

From the above, it can be concluded that the majority of the graduates of the Faculty of Education, despite their qualified teacher training still believed in and used lectures as their main teaching method. They were not eager to apply any other method.

As for the method the teachers most enjoy, data analysis reveals that the responses of the teachers to this question exactly corresponds to their responses to their perception of the most effective method to be used with the students (N=13, ρ= -0.49, sig.(2-tailed)=0.875).

6.5.3 Self-perception of quality

Bearing in mind the important role played by teachers in any educational setting, a question was asked regarding each teacher's views as to whether they regard themselves as well qualified to do their specialist teaching in the classroom or workshop. Noting that the teachers are judging colleagues and themselves one might expect a strongly favourable response. The figures in Table 6.5 show this is not so.

Table 6.5: The Egyptian sample teachers' perception of the level of their qualification		
Opinion	Frequency	Percentage
Highly qualified	4	18.2
Well qualified	3	13.6
Moderate qualified	6	27.3
Poorly qualified	2	9.1
Total	15	68.2
Missing System	7	31.8
Total	22	100.0

36.4% of the responses to this question admitted that the self-perception level of the teachers was either moderate or poorly qualified, compared to 31.8% who thought the level was either highly or well qualified. 31.8% were unwilling to record clearly their opinion in the discussion. The teachers' answers were not easy for them to present – evaluation of themselves involves issues of honesty, confidence and realism. The range of answers is thus interesting.

The idea that status, in terms of holding a promoted position or not in the school, is relevant to this attitude is not supported in a correlation test of position against opinion regarding qualification ($N=15$, $r_{pb}=-0.187$, sig.$=0.505$). It would seem possible then that these are a reflection of honestly held views.

6.5.4 Problems facing classroom (theory) teachers

An open-ended question was included in the interview, with prompts, regarding teachers' classroom problems. After careful inspections replies were coded into four categories, related respectively to students, space, time and resources (according to their importance inside the classroom and their effect on the teachers' performance).

One teacher declined to answer this question, the same teacher who declined to give his qualifications and who omitted many other questions. See Table 6.6.

Table 6.6: Problems facing Egyptian sample teachers in the theoretical classrooms

Qualifications	Classroom Problems*											
	Students			Space			Time			Resources and facilities		
	Y*	N	T	Y	N	T	Y	N	T	Y	N	T
Bachelor degrees	16	4	19	11	9	19	8	12	19	6	14	19
Higher Diploma of Education	2	-	2	1	1	2	-	2	2	2	-	2
otal	18	4	22	12	10	22	8	14	22	8	14	22

* Yes=Y, No=N, Total=T

The findings show that 18 of the 22 teachers said they have problems with their students. Their reasons given tended to be simplistic and not analytical:

> "The students are not active".
>
> "They are thick-headed/stupid and do not have any disposition for studying".

The other four of the teachers made it clear that they were satisfied with their student-teacher relationship.

12 teachers out of 22 mentioned teaching space as one of the problems in the classroom. But they did not explain whether the lack of space was, in their opinion, due to the large number of students, or the small area of classrooms. But, there are other possible causes for dissatisfaction with the space available for teaching: for example, insufficient circulation space between desks, the inadequate provision of bench seating requiring students to be too closely packed to write easily, poor room layout. It should also be pointed out that, from the researcher's experience, the same classes are used for both the theoretical subjects as well as architectural drawing

lessons. Students sharing the same desk in the theoretical lessons struggle to find a space to carry out the drawing practice. The writer has observed that this fact, in many cases leads the students to miss that day out from school and compensate it through private tuition.

Surprisingly, none of the teachers mentioned the class size as a problem. Class sizes in the schools sampled ranged from 27 to 37 students.

Although the lessons last for 45 minutes, 8 teachers out of the 22 agreed that this time is not enough. One teacher expressed this clearly:

> The duration of each lesson is not enough and the number of the lessons is not enough to finish the curriculum.

The time constraints were closely reflected in some of the comments regarding alternative teaching methods.

> It does not help us to use different methods or to do our work well.

Conversely, 14 teachers did not mention resources and facilities as a problem. Regarding the blackboard, desks and chalk as their ultimate facilities, 8 theory teachers saw a problem with the resources and facilities in the classroom. But many were discerning in this respect ;one commented:

> We have what we need – the blackboard and enough tables for the students.

6.5.5 Problems facing workshop teachers

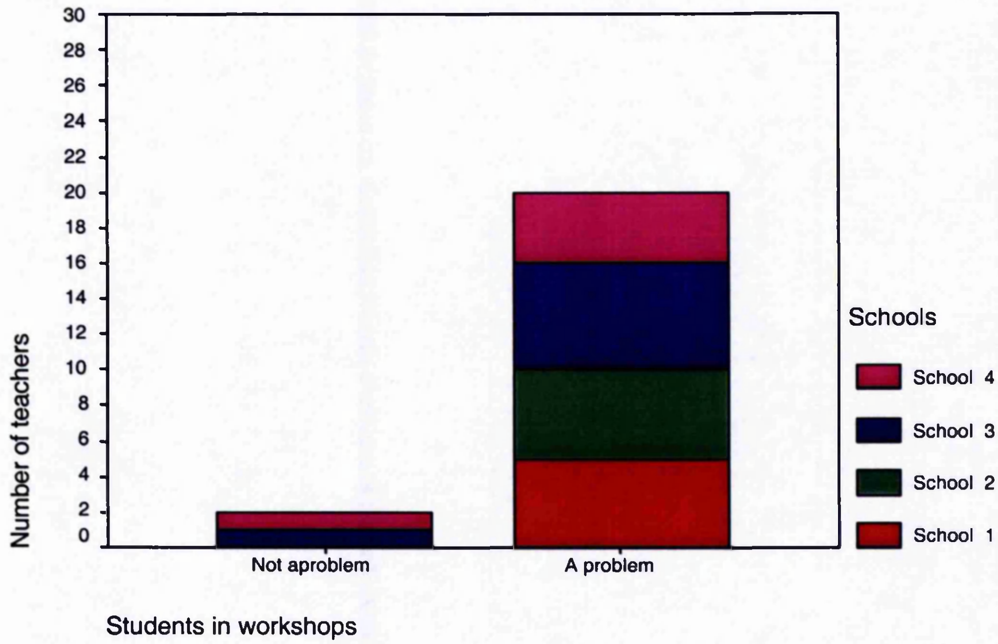
An open-ended question asked teachers to identify any problems facing them in their workshop teaching. Their answers were carefully scrutinised and six problem areas were identified. Each response was allocated to one or more of these areas. This section therefore discusses the six problems that teachers face in workshops, based on their experience. Table 6.7 summarizes the problem areas that have been quoted according to the frequency by which they were mentioned.

Table 6.7: Frequency of problems facing Egyptian teachers sample in workshops (N=22)

Problems in the workshops	Yes	No
1. Students.	20	2
2. Technological development.	19	3
3. Resources	10	12
4. Space	3	19
5. Time.	2	20
6. Other Teachers	1	21

1. Students

20 teachers out of 22 (90.9%) considered their students as the major problem facing them in workshop sessions, see Graph 6.3.



Graph 6.3: The number and distribution of the Egyptian sample teachers regarding students as a problem in the workshops

From the above chart it is clear that this complaint is spread among all schools in the sample. Only two teachers did not find students to be a problem. The nature of the student problem stated varied with such inclusions as poor motivation (e.g. because the students had no opportunity to follow an alternative course), attitude to learning (e.g. failure to complete tasks), recalcitrance in carrying out set tasks, poor communication skills with staff, and absenteeism. As Petty (1993:32-40) said, these are all concerned with behavioural issues. Interestingly, no teacher identified lack of academic ability or intelligence as a student problem, even though entry to the architectural course is mainly by failure to get a high enough mark to join conventional secondary school or another technical area course. Additionally, within the architectural section those with the lowest marks are admitted to plumbing, higher grades going to such areas as joinery.

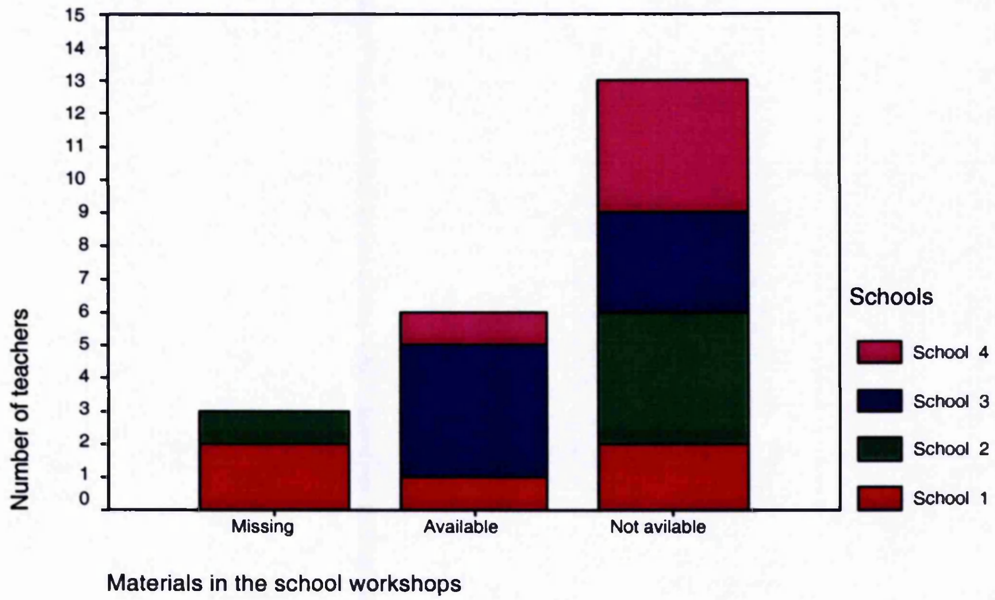
2. Technological development

The fact of not updating the tools and materials used in workshops was reported by 19 teachers (86.4%). This area included problems with the relevance of the technology taught in schools to the real work of plumbers in Egypt. For example, the work in schools is almost entirely based on steel piping system for water supply and cast iron or ceramics for sewerage. In reality practising plumbers in Egypt are beginning to use more copper piping indoors and plastics for sewerage systems. Similarly, teachers complained that the tools provided did not represent good modern practice. Basically, the syllabus is obsolescent in technological terms.

3. Resources

Another problem mentioned by a total of 10 teachers is the lack of resources. By resources they mean: materials and tools.

A separate question specifically asked about the availability of materials in the workshops. 13 teachers (missing data=3) mentioned lack of materials available for students. Graph 6.4 illustrates the distribution of the lack of materials as a resource problem across the participating schools.



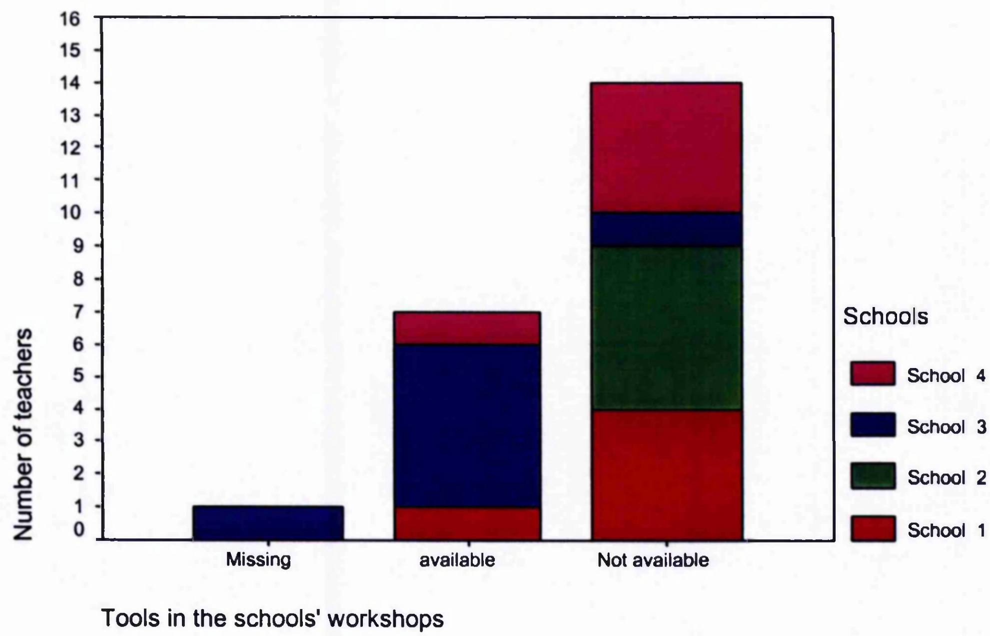
Graph 6.4: The number and distribution of Egyptian sample teachers stating lack of materials in the workshops

From the graph it is evident that lack of materials is a problem in the opinion of a majorities

Another separate question inquired from teachers about the means by which materials are made available to students in workshops; 19 teachers stated that either the school or Ministry of Education supply these materials (School = 3, Ministry=16). In practice these are the same source expressed differently. None of the teachers mentioned that students supply their own materials. However, this contradicts with the 37% of the student sample stating that they buy their own materials, which is discussed later in Chapter 7.

The teachers' response to these separate questions comes as a confirmation to the figures in Table 6.7.

As for tools, which were regarded by the 10 teachers as the second component of resources, it is hypothesised that lack of tools contributes to students' lack of motivation. Data analysis of a separate question specifically asking about the availability of tools in the workshops revealed that 14 teachers out of 21 (missing data=1) mentioned lack of tools; see Graph 6.5.



Graph 6.5: The number and distribution of Egyptian sample teachers stating lack of tools as a problem in the workshops

From the above graph it is also evident that lack of tools is spread across all sample schools with school 3 having an advantage because of position. It is relatively new in equipment provision. These 14 teachers also commented in another question that the available tools are in a bad condition; see Table 6.8.

Table 6.8: The cross tabulation between the lack of tools and their condition in the workshops				
		The tools are in a good condition		Total
		Yes	No	
Having enough tools in the schools workshop	Yes	7	0	7
	No	0	14	14
Total		7	14	21

The yes-yes and no-no responses in Table 6.8 are noted.

It is also noted that School 2 is generally presenting a strongly negative view. It is a big city school (the largest of the four studied here and one of the largest in the country) and it has some of the characteristics of an inner-city school in the UK.

On further investigation to find out the cause of the lack of materials and tools, 16 teachers mentioned that this lack is due to financial constraints. They clearly expressed that too limited a budget is allocated for buying tools and materials.

From the above discussion, lack of budget, leading to lack of materials and tools and the bad condition of the tools used by students in workshops, it could be hypothesised that it is one of the main reasons contributing to students' lack of motivation and unwillingness to perform the tasks required from them in workshops.

4. Space, time and teachers

The last three problem areas are grouped together because data analysis revealed only six responses in total for them. Only three teachers commented negatively on space, two on time and one other on a teacher-related problem. These comments on space and time are minority views not covered by colleagues in the same schools. The three space comments all came from different schools (2, 3 and 4); the two comments related to time also came from different schools (1 and 2). The last problem related to an accusation by a teacher against an allegedly incompetent colleague. There is no firm evidence on which to follow-up these minority views, and they are not discussed further here.

6.5.6 Teaching Load

This section covers the teaching load of teachers in relation to the number of lessons given per week (i.e. the time demands in terms of contact hours) and the number of architectural sections taught by these teachers (i.e. the demand in terms of variety of topics and preparation time). Note that the normal lesson length is variable according to the topic; for example an architectural drawing lesson would be a full day of 6 × 45minute periods, a metrology lesson would be one-third that length. The interview data was collected in such a way that total teaching load could be calculated from the information given. The median of subjects taught by 20 teachers (N=22, missing =2) is six subjects per week, whereas the median of lessons taught by teachers (N=22) is seven lessons per week. On the other hand, the median of the number of architectural sections they teach (N=22) per week is two sections. (Note that 'subjects' refers to such elements as drawing, metrology, technology or costing, whereas 'architectural sections' refer to such elements as plumbing, building, plastering or stonemasonry.) But, only four teachers (N=22) regarded the above as an unacceptable working load for them, even thought the evidence is that they have to be prepared to teach a wide variety of topics.

Thus, from the above, a significant (point biserial) correlation at the 5% level between the acceptability of workload and the number of subjects taught is detected (N=20, r_{pb}=-0.476, sig. (2-tailed)=0.034). The reason for which 17 teachers consider the teaching they perform as unacceptable could be explained from the next correlation between the acceptability of workload and their performing another job outside school besides teaching, see Table 6.9. Despite their low salaries, this correlation is not significant (N= 21, r_{pb}=-0.086, sig.(2-tailed) = 0.712). Use of a chi-square test yields the same result (N=21, χ^2=0.154, df=1, sig.(2-sided)=0.694). Accordingly, it could be suggested that the four satisfied teachers benefit from their large number of subjects as a means for private tuition. The one teacher who recorded both that the workload is acceptable and that he had another job besides teaching is an interesting case. Some teachers undertake private tuition as a means of supplementing their very low teachers' salaries. An efficient teacher with a wide range of subject expertise is likely to recruit well to his private tuition.

Table 6.9: The correlation between the Egyptian sample teachers' perception of their work load and practicing another job

Regarding the workload as acceptable	Practicing any other job besides teaching		
	Yes	No	Total
Yes	1	3	4
No	6	11	17
Total	7	14	21

What implications does this workload have for the preferred teaching methods in class? There is no significance between these variables the lecture being the main teaching method.

6.5.7 Curriculum support materials

Teachers guides

Despite the fact that 18 teachers (N =22, missing = 4) mentioned that they are in need of a teachers' guide this guide does not yet exist. The Ministry of Education is the commissioner and publisher of the textbooks used and they would of necessity be the providers of any such teachers' guide.

Two teachers of the three who did not express a need for the guide were the only teachers of higher qualification among the sample. However, the correlation between the teachers' need for a guide and their qualification is not significant (N=17, r_{pb}=-0.190, sig.(2-tailed)=0.465). The third teacher had an above average teaching experience of 14 years (median = 11.5). However, there are other teachers having the same qualification (19 out of 21, missing = 1) as well as those with higher years of experience (6 out of 22) who expressed their need of a teachers' guide.

External support

The researcher, through an open-ended question, tried to find how the teachers sample try to be in contact with organizations or associations to provide them with guide and support to solve their problems in the class or in the workshop. 19 teachers reported not seeking any external contacts (N=22, Yes=1, No=19, missing=2).

It is interesting to note that the only one teacher who stated being in contact with an external organization was studying as a post-graduate student. He noted…

One of my supervisors is a member in of the UNESCO organisation.

His contact came by chance during his postgraduate study.

6.5.8 The school and curriculum

Investigating teachers' perceptions of the appropriateness of the school in providing students with adequate technical skills for their future in the labour market revealed that 18 teachers believe that students are not acquiring sufficient skills; see Table 6.10.

Table 6.10: The Egyptian sample teachers perception of the adequacies of the technical schools

Schools	Yes		No		Total
	Teacher	Promoted Teacher	Teacher	Promoted Teacher	
School 1	--	--	3	2	5
School 2	--	--	3	2	5
School 3	--	1	3	3	7
School 4	2	1	2	--	5
Total	2	2	11	7	22

Predictably, the only two teachers with postgraduate qualification in the sample were among these 18 teachers. Concerning School 4, the different response is statistically significant at the 5% level (N=22, χ^2=8.17, df=3, sig.(2-tailed)=0.043). This school is the smallest of the four, it has a small number of students and therefore a small number of classes, and it is well staffed. This provision of support means the teachers have enough time with individual students and it may be that they have time and facilities to complete the formal syllabus or even go beyond it. No significant results were found in a number of tests made to try to identify whether or not these teachers were the same ones as those reporting problems of time in classrooms or workshops or those who had an unacceptable workload.

Teachers had a similar view regarding the relevance of the technical education in Egypt in preparing the students for the real labour market. And guide them for the developing future (Doyle, 1999, Eline, 1999); see Table 6.11. 11 teachers of 16 thought of the current technical education as only loosely relevant to the requirements of the labour market; 4 teachers thought it was completely irrelevant and the one thought that it was closely relevant. The missing data from six teachers resulted, it might be suggested, not from unwillingness to answer but because the similarity to previous questions regarding curriculum coverage made an answer to this not obligatory – believing they had already answered it. Scripts were examined for additional data to relocate in this section, but none was found.

Table 6.11: The Egyptian sample teachers' perception of the relevance of the technical education to the labour market

Schools	Completely irrelevant		Loosely relevant		Relevant		Total
	Teacher	Promoted Teacher	Teacher	Promoted Teacher	Teacher	Promoted Teacher	
School 1	0	0	1	1	1	0	3
School 2	0	1	2	0	0	0	3
School 3	1	1	2	2	0	0	6
School 4	1	0	2	1	0	0	4
Total	2	2	7	4	1	0	16

As expected, stemming from their previous perceptions, the majority of promoted teachers shown in the Table 6.12 regarded preparation as inadequate. In regard to seeking the teachers' opinion in respect to whether the curriculum is covering everything that should be covered, eight of the nine in the promoted teacher sample said the *curriculum* has inadequate coverage.

Table 6.12: The Egyptian sample teachers' views of the curriculum as whether covering everything needed					
Schools	Yes		No		Total
	Teacher	Promoted Teacher	Teacher	Promoted Teacher	
School 1	2	1	1	1	5
School 2	2	0	1	2	5
School 3	1	0	2	4	7
School 4	2	0	2	1	5
Total	7	1	6	8	22

The difference of viewpoint of promoted and unpromoted teachers regarding the curriculum coverage is significant at the 5% level (N=22, χ^2=4.20, df=1, sig.(2-sided)=0.040). The question regarding whether the *school* gives the students enough skills for the future was similarly answered with seven of the nine promoted teachers giving a negative answer. The answers from unpromoted teachers however were different. The parallel study of differences of viewpoint on the school's provision of skills for the future workforce was clearly not significant (N=22, χ^2 =0.167, df=1, sig.(2-sided)=0.683).

6.5.9 Homework

The rationale behind homework in Egypt is to supplement and reinforce what is learnt in school. It does not normally form preparation for forthcoming lessons as might occur in some UK situations. It could be viewed as a means for accelerating the pace of knowledge acquisition. Homework can also be used in a complementary sense in providing experiences not available within the classroom – e.g. following up interesting less specific general reading. In Egyptian technical secondary education, homework takes only the form of reinforcement exercises for the task that has been finished in the immediately previous class.

On examining the sample teachers' view in regard to the role of homework, it becomes clear that the majority of teachers are aware of that role. Stated frequency of giving homework was coded as every lesson, weekly or monthly. Table 6.13 shows that 14 teachers (N=21) assigned homework every lesson, 6 every week (and that could be every lesson for a teacher only meeting a class once a week). Only one teacher gave homework once a month. The missing teacher (No.13) omitted a number of questions in this part of the interview.

Table 6.13: Frequency of assigning homework to the technical education students

Position	Frequency			Total
	Every Lesson	Every Week	Every Month	
Teacher	8	3	1	12
Promoted Teacher	6	3		9
Total	14	6	1	21

The researcher also investigated whether there is a homework schedule in the department; the majority of the teachers 14 of 20 (with two non-respondents) stated that such a schedule does not exist, whereas 6 confirmed that there is an agreed homework schedule. However, on further investigating the distribution, by school, of all teachers answering this question, Table 6.14 illustrates a contrasting situation.

Table 6.14: Egyptian sample teachers stating the presence of a homework schedule						
Schools	Yes		No		Missing	Total
	Teacher	Promoted Teacher	Teacher	Promoted Teacher		
School 1	0	0	3	2	0	5
School 2	0	1	3	1	0	5
School 3	1	1	1	3	1	7
School 4	2	1	1	0	1	5
Total	3	3	8	6	2	22

There seemed to be confusion of policy in all except School 1. From Table 6.14, it is clear that teachers within the same school gave different answers. Why does this arise? From the writer's experience it is suggested that the respondents, realising the importance of having a plan or schedule in each department, were unwilling to suggest the absence of a plan even where one did not exist; the alternative is that the plan does exist but some staff are unaware of it. Looking back, it might be that more sensitive wording of the question would have obtained more reliable information.

Within the 14 teachers stating that there is no homework schedule, the 6 promoted teachers had a mean experience of 17 years, and the 8 teachers had a mean of 10 years experience.

6.5.10 Assessment

> .....assessment in the curriculum is a process of determining and passing judgments on students' learning potential and performance. (Skilbeck, 1984:238)

The researcher in the present study is using the term 'assessment' and not 'testing' because, as (Dickins, 2000:376) quotes, assessment is a more inclusive term. It refers to the general process of monitoring or keeping track of the learners' improvement.

Assessment is part of the whole educational process of teaching and learning. Testing, on the other hand, is regarded as one kind of assessment.

Assessment can have a number of purposes. One purpose is educationally motivated. It is known as *formative assessment,* where the teacher uses the information gained from assessing the learners' progress as a basis for further and future class work. A second purpose for assessment, known as *summative assessment*, is to measure the learners' achievement. The results from summative assessment are to check quality. A third purpose for assessment is *formal certification*, (Dickins, 2000:376-77).

The two categories of 'every lesson' and 'every week' are grouped together as some schools have only one theory lesson per week. Teachers reported that 71.4% reported assessing students every lesson, while 33.3% reported assessing the students every month, see Table 6.15. From interviewing the teachers it became clear that their purpose from assessment was seen as totally summative.

Table 6.15: Cross tabulation between teaching position, years of experience and the students assessments in the Egyptian teachers sample					
		Frequency of assessing the students			
Teaching position	Years of teaching experience	Every lesson	Every week	Every month	Total
Teacher	7			1	1
	8		1	1	2
	9	1	2		3
	10	1		1	2
	11	1	1		2
	12		1	1	2
	14		1		1
Total		3	6	4	13
Promoted teacher	9	1			1
	12			1	1
	13	1			1
	16	1	1		2
	17			1	1
	18			1	1
	19		1		1
	25	1			1
Total		4	2	3	9

6.5.11 Suggestions for means of improvement

Due to the common theme and interrelationships of answers among the following three open-ended questions, the present section covers the opinion of the teacher sample on all three questions comprehensively.

(a) How do you prepare your students to face the future labour market?

(b) How, do you think, could we improve teacher training in this area?

(c) What would be your priorities if you were working in the government, responsible for curriculum improvement in this subject area?

The responses of the teachers on the question of how they prepare their students for future labour market were very carefully scrutinised, and grouped into seven categories, as follows, for analysis. Table 6.16 shows these suggestions and the position of the teachers mentioning them in each school. Three teachers' responses were doubly categorised.

Table 6.16 : The Egyptian sample teachers' suggested means of preparing the students for the future labour market									
Means	School 1 (N=5)		School 2 (N=5)		School 3 (N=7)		School 4 (N=5)		Total
	T*	PT*	T	PT	T	PT	T	PT	
1. Learn Foreign Language	0	0	0	0	1	1	0	0	2
2. Learn Computer skills	0	0	0	0	0	1	0	0	1
3. Know the skills of their speciality	0	0	0	0	0	0	2	1	3
4. Building self-confidence	2	1	0	1	0	1	1	0	6
5. Reading	1	1	0	1	1	0	1	0	5
6. Seek postgraduate studies	1	1	1	1	0	1	0	0	5
7. Listen to teachers' advice	0	0	1	1	0	1	0	0	3
Total	4	3	2	4	2	5	4	1	25
* T. = Teacher, PT*.= Promoted Teacher									

It is clear that, according to the teachers, building self-confidence of students in the plumber section is regarded as one of the main means of facing the future labour market. The importance of this aspect could be explained by the low social status of the technical education graduates in Egypt. It is noteworthy to acknowledge that 124 (45.1%) of the students joined this section either because they failed to get enough scores to join their preferred sections or were directed by their families to join this section, as will be discussed in Chapter 7. Similarly, only 19 (6.9%) out of the student sample (N=275) regarded the plumbing section as their favoured one. Teachers thus see that for these students to accomplish success in their practical lives, they ought to possess a high self-esteem.

It might be hypothesised that teachers wishing to see more building of self-confidence are those same teachers that regarded the major impediment to progress as being the students themselves, see table 6.17.

Table 6.17: The correlation between the Egyptian sample teachers regarding the students as being a problem in the classroom and the teachers' view that self-confidence is important in facing the future labour market

Preparing the students to face the future labour market through building self confidence	The students as a problem in the classroom.		Total
	Yes	No	
Yes	6	0	6
No	12	4	16
Total	18	4	22

Though there is clearly some bias in the data of the table, the relationship between teachers regarding the students as being a problem in the classroom and the teachers' view that self-confidence is important in facing the future labour market is not statistically significant at the 5% level. (N=22, χ^2=1.833, df=1, sig.(2-sided) =0.176).

It is worth noting that seeking postgraduate studies and reading were regarded by teachers as more demanding routes for facing the future labour market than knowing the skills of the students' speciality. Were these teachers believing that reading was a way of improving student preparation for the future labour market the same as those who themselves read to improve their teaching? The answer is that there is no statistical connection (N=22, χ^2= 0.780, df=1, sig.(2-sided).=0.781).

Table 6.18: The correlation between the teachers suggesting post-graduate studies for the students and the teachers doing post-graduate studies themselves				
		Postgraduate studies as a means of preparing students to face the future labour market		
		Yes	No	Total
Teachers studying for a higher education qualification	Yes	1	4	5
	No	4	13	17
	Total	5	17	22

From the data in Table 6.18, there is no significant relationship between the teachers suggesting taking post-graduate studies as a means of preparing the students for the future labour market and the teachers doing post-graduate studies themselves (N=22, χ^2=0.027, df=1, sig.(2-sided)=0.869). However, it was interesting to see that despite only one of these five teachers suggesting this means by doing postgraduate studies, the other 4 teachers appreciated the importance of such a step.

In terms of teachers' level of qualification, studies could only be undertaken for those responses given by the teachers having Higher Diplomas. This is significant at the 5% level for how the teachers prepare their students to face the future labour market by encouraging them to learn a foreign language (N=21, r_{pb}=-0.045, sig.(2-tailed)=0.042); and the same at the 1% level for encouraging them to learn computer use (N=21, r_{pb}=-0.689, sig.(2-tailed)=0.001), but the numbers in the test was very small.

As for the means of improving the curriculum of the plumbing section, teachers in the open ended questions suggested four main ways of achieving this aim. These ways again resulted from careful grouping from the responses. Table 6.19 states these suggestions.

Table 6.19: The Egyptian teacher sample suggestions to improve the curriculum in the plumbing section									
Means	School 1 (N=5)		School2 (N=5)		School3 (N=7)		School 4 (N=5)		Total
	T.	P.T.	T.	P.T.	T.	P.T.	T.	P.T.	
1. Comprehensive development	0	0	1	0	1	2	1	1	6
2. Linking the school with the technical needs of the national labour market	0	0	0	0	0	0	2	1	3
3.Complementing the theoretical and practical side of curriculum	0	0	0	1	0	0	0	0	1
4.Improving the financial and educational teacher status	0	0	1	0	0	0	0	0	1
Total	---	---	2	1	1	2	3	2	11
* T. = Teacher, P.T.= Promoted Teacher									

The response rate to this question was only 50%, and with the small numbers concerned and no response from the teachers in school 1, the results must be treated with caution. Reasons for non-response included (a) that teachers thought they had given their preferred answer elsewhere in the interview, (b) some indicated that they did not wish to answer because centralisation of the curriculum means that their opinions are not considered, and (c) there might have been some fatigue towards the end of the interview, these questions being late in the discussion period.

Emphasizing and reflecting upon the earlier discussed problems stated by the teachers, a comprehensive development of the curriculum was seen by them as the first priority. Responses included in this comprehensive development category were those that indicated the need for major change throughout the curriculum and delivery systems in this field, rather than adjustments to the content alone. This comprehensive need of development is also significant at the 5% level when tested against the teachers' opinion of the curriculum as not covering everything that should be covered ($N=22$, $\chi^2=4.714$, $df=1$, sig.(2-sided)=0.030).

Only one teacher acknowledged the importance of complementing both theoretical and practical sides of the curriculum. This is surprising. Most teachers in the sample deal with both theoretical and practical issues (though most of the theoretical teachers go into the workshops to assist, rather then take full responsibility).

Despite the low financial status of technical teachers, (£E 150 per month, reaching £E 300 p.m. after additions, equivalent to £30), only one teacher (No.10) mentioned the need of improving the financial status of the teachers as a contribution to curriculum improvement. This could be explained by the fact that technical teachers rarely rely on this salary alone and thus normally practice other jobs besides teaching to supplement their salaries; this is mainly private tuition rather then commercial practice of the trade they are teaching, the former offering better remuneration (and without need to travel) when compared with trade work.

Just three teachers noted the importance of linking the school with the technical needs of the national labour market as means of improving the curriculum of the plumbing section. It is hypothesised that noting this importance might correlate with answers to the question of whether schools give their students enough practical skills for their future as tradesmen. There is, however, only a low Spearman correlation coefficient of (N=22, ρ=0.156, sig.(2-sided)=0.488) between these variables and a chi-square test gives an equivalent result.

The final open-ended question, and the last in the interview, asked of ways of improving teacher training in this area. The opinions of the teachers' sample are shown in Table 6.20, following examination of the written answers and grouping of data revealed into the four categories. Shown in the Table 6.20 those were three non-respondents

Table 6.20: The Egyptian sample teachers' suggestions to improve teacher training

Means	School 1 (N=5)		School 2 (N=5)		School 3 (N=7)		School 4 (N=5)		Total
	T	PT	T	PT	T	PT	T	PT	
1. Carry out teacher training courses	1	1	3	1	1	2	1	1	11
2. Increase the practical sessions during teacher preparation	1	1	-	-	1	-	1	-	4
3. Comprehensive development	1	1	-	-	-	-	-	-	2
4. Send teachers for abroad training	-	-	-	-	-	1	1	-	2
Total	3	3	3	1	2	3	3	1	19

T. = Teacher, P.T.= Promoted Teacher

Although the majority of the teacher sample is regarded as being of qualified technical education teachers, most of them (N=11) highlighted the urgent need as King-Taylor (1999) and Snaders (1999) said of carrying out teacher training courses (in-service training).

It is noted (N=22, χ^2 =3.667, df=1, sig.(2-sided)=0.056) that the teachers in the sample see a need to improve their career prospects as a part of comprehensive development for the technical education which will lead to the improving of their financial status, (see Table 6.21). It was shown in an earlier section that they are unwilling to seek promotion in the present curriculum and financial circumstances.

Table 6.21: Correlation between the necessity of carrying out teacher training courses and the comprehensive development of the curriculum

Improving the technical curriculum through comprehensive development	Improve teacher training in the technical field through carrying out teacher training courses		Total
	Yes	No	
Yes	5	1	6
No	6	10	16
Total	11	11	22
Yes = mentioned , No= not mentioned			

Four teachers pointed out the importance of increasing the number of practical sessions during teacher preparation.

From the above and as Spoon, (1999) said, it can be concluded that in-service training, comprehensive technical education development were regarded by the teachers as the main means of future development.

Chapter 7:

The quantitative study of the background interests of technical education students in Egypt

7.1 Introduction

This chapter has as its first part of the research to investigate the variables associated with the students. It seeks to find the variables needed to assist in defining the attitudes of students towards working in the plumber section, their reasons for joining this section, the problems they face and their future career interests (i.e. past, present and future issues). The second part deals with the measurement of vocational interests.

The instrument used was the questionnaire shown in Appendix 3.

7.2 The student sample

7.2.1 The schools selected

As described in Chapter 4, the sample was limited to four schools in order to balance spread of type of school and gain an adequate sample for analysis within each separate school.

The students' sample has been chosen from four significantly different schools across three areas – the same schools as for the teacher sample. Schools 1 and 2 are the only ones with a plumbing section in Area A. One of these schools is a three-year school (School 1); one is a five-year school (School 2). Area A is typical of the main urban cities in Egypt. School 3 is situated in Area B, which is a city also serving many villages. Students in School 3, thus, come from mixed backgrounds (rural and urban). School 4 is located in Area C, which is one of the newly constructed satellite (overspill) industrial cities outside the capital; being built in the desert area, it does not have a rural catchment. Schools 3 and 4 are three-year schools. The sample thus gives a reasonably representative and balanced picture of students in plumber sections throughout the country; there is no technical secondary school with a plumber section in the totally rural areas of the country.

7.2.2 The detail of the student sample

The sample of students was all of the third year plumber section students in the schools selected.

The sample included 277 third year students from the four technical architectural secondary schools, plumber sections, in Areas A, B, and C, but two questionnaires were rejected because most responses on these were 'spoiled'. The students were from the same school as the non-responding teacher. Accordingly, the total usable number of students in the sample is 275 (see Table 7.1).

Table 7.1: The students' sample.		
Schools	Students	
	Distributed	Usable
School 1	65	65
School 2	95	93
School 3	66	66
School 4	51	51
Total	277	275

The researcher chose the third year because it is the last year in technical education before directly joining the labour market as technicians or joining further education (either by continuation in a five-year school, or moving to a specialist institute for two years) to train to be a practical teacher or a supervisor in a location in the labour market. Table 7.2 illustrates the distribution of the participating student sample.

Table 7.2: The Student Sample Distribution.			
Area	School	Number of students tested	Number of classes
Area A	School 1	65	2
	School 2	93	3
Area B	School 3	66	2
Area C	School 4	51	2
Total		275	9

The average class size is 37 students; the average tested per class is 31 students. The difference represents absence from class on the day of testing. The reason for such absence may be illness, because the student receives additional private tuition or because the student is working away; under the compulsory education scheme in Egypt a student is required to put in 85% attendance. The attendance rate of 84% is considered good in terms of the likelihood of bias.

7.3 Responses to the questionnaire and student motivation

The questionnaire was divided into sections. Section A collected demographic data: school, age, academic year, section, etc. (see Chapter 4).

7.3.1 Subject preferences

As the study aims to discover the main variables that lead to success through education, the researcher has tried, through section B to find the effect of students' motivation and enjoyment on the plumber area of study.

Motivation to learn has been defined in a number of ways; Lumsden (1994) presents two definitions:

> It is defined by one author as "the meaningfulness, value, and benefits of academic tasks to the learner – regardless of whether or not they are intrinsically interesting" (Hermine Marshall 1987). Another notes that motivation to learn is characterized by long-term, quality involvement in learning and commitment to the process of learning (Carole Ames, 1990).

This part will first deal with the students' preference for their section (plumber) after spending over two years studying it. What do they think of it? If the Student motivation naturally has to do with students' desire to participate in the learning process. But it also concerns the reasons or goals that underlie their involvement or non-involvement in academic activities. Although students may be equally motivated to perform a task, the sources of their motivation may differ (Lumbsden, 1994). From Table 7.3 illustrates that most of the students did not like their membership of the plumber section.

Table 7.3: Student preferences of architectural technical sections			
Favourite section	Frequency	Percent	Valid Percent
Plumbing	19	6.9	7.0
Plastering	31	11.3	11.4
Concreting	19	6.9	7.0
Stonemasonry	74	26.9	27.1
Joinery	3	1.1	1.1
Building	6	2.2	2.2
Other	121	44.0	44.3
Total	273	99.3	100.0
Missing System	2	0.7	-
Total	275	100.0	-

48.7% of the plumber section students expressed a preference for an architectural section other than the one they were studying (and 44.3% other than architectural subjects). In terms of motivation this is surprising and a serious problem: 27.1% of the students expressed a liking for the stonemasonry section, that is over half of those who preferred any architectural section. The reason for this was not obtained from the questionnaire. However, stonemasonry is popularly regarded by the students as an easier option, probably because shortage of materials means that the practical work will not be performed. So, at the end of the course, the students can perhaps aim for a pass with less effort.

Most of the students joining technical secondary school come from low-income backgrounds. As Yang (1996:3-8) said the relation between the Socialist Market Economy and Technical and Vocational Education and Training is very high. So if these Egyptian students do not learn personal responsibility and self-regulation from school, they are unlikely to learn it from their busy over worked families. As McCombs (2001) quotes:

> The critical dimensions of self-regulation are then absent; and students' opportunities to develop self-regulated learning strategies are unequally

> distributed among those learners who come from families who value personal responsibility, learning and education and who are in a socio-economic position to provide their children with opportunities to learn personal responsibility and self-regulation skills outside of school. When these more advantaged students are in school, they are characterized as being goal-directed, being able to manage their time and effort while learning, and having a strong sense of self-efficacy about their abilities to reach learning goals (Caplan, Choy, & Whitmore, 1992). They are usually the ones we see doing well in school as contrasted with children who see themselves as less likely to succeed, are more impulsive, have lower academic goals, are more anxious, and are more influenced by extrinsic factors than their more advantaged peers (Caplan et al., 1992:37).

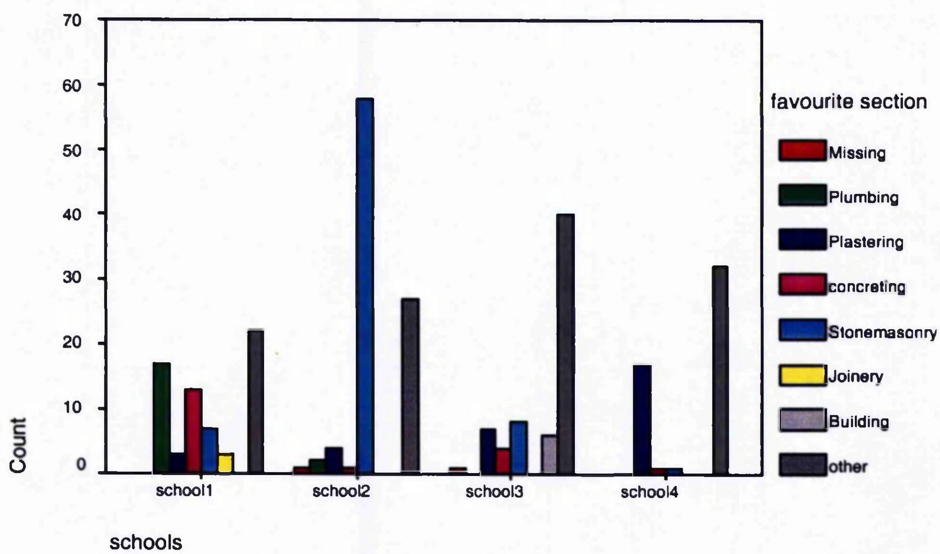
So the chance to help these students to have personal responsibility and self-regulation in the future will be difficult in this case. Many students come from unsupportive backgrounds, yet they have ambitions to leave the plumber section were that possible. The 'other' category was 44.3% of the students. Being asked in the questionnaire to specify their 'other' response, 119 of the 121 students were looking for a non-architectural section; the dominant choice was for air-conditioning technology, followed by electronics and radio, then by motor vehicle technology. A few specified other technical topics. All these are fast-growing and high-status technical fields in Egypt, and are previewed by the students as having better prestige and offering more interests. Two of the 121 wished to be studying in different type of secondary school, e.g. general secondary school but they did not get enough score to join it.

Only 19 students mentioned the plumber section as their favourite. 5 of them practice this work in the labour market and just 4 of that 5 said it is both their favourite section amongst the various architectural disciplines and that it is the section they enjoy most. The preferred alternative sections show interesting school variations. See Table 7.4.

Among factors that might influence this choice are the personalities or teaching skills of the teachers in the various sections. The imbalance between schools in Graph 7.1 indicates that there might be other unmeasured factors involved - e.g. plastering and stonemasonry (popular in school 2 and 4) are outdoor practical activities - very relevant in the Egyptian climate.

Table 7.4: The distribution of the students preferences of architectural technical sections across the schools sample

Area	School	Plumbing	Plastering	Concreting	Stonemasonry	Joinery	Building	Other	Total
Area A	School 1	17	3	13	7	3	-	22	65
	School 2	2	4	1	58	-	-	27	92
Area B	School 3	-	7	4	8	-	6	40	65
Area C	School 4	-	17	1	1	-	-	32	51
		19	31	19	74	3	6	121	273



Graph 7.1: Frequency of favourite architecture technical sections between the schools

From Graph 7.1 it is clear that the only 19 students who chose plumbing as their favourite section were all located in the urban city (Area A), none of the students in Areas B and C regarded the section as their first preference despite studying in it. The majority of the students in school 3 (Area B, mixed backgrounds) and School 4 (Area C, new city) mentioned 'other' as their preference. This may mean that students in these areas could be seeking new sections rather than the available traditional ones. Buildings in the newly build city (Area C) is less likely to have plumbing problems and thus does not need a lot of maintenance, so students in School 4 could not have seen a need to join this section.

7.3.2 Employment part-time

Table 7.5: Students practicing plumbing outside school

School	Do you practice this job outside school?		Total
	Yes	No	
School 1	12	45	57
School 2	15	73	88
School 3	15	47	62
School 4	3	41	44
Total	45	206	251

In reply to the question 'Do you practice this job outside school?' it was found that 20% of the students in the main city schools (Schools 1-3) practice this kind of work, (see Table 7.5) School 4 appears to be different with fewer than 7% involved in extra-curricular employment in plumbing. The difference between the two school categories (1-3 and 4) is significant at the 5% level (N=251, χ^2=4.476, df=1, sig.=0.034). There is a suspicion of some misreporting here. Because one of their family practices this work maybe some students did not report their work because they have been pushed to do it for family maintenance. 18 of the 251 sample reported close family in plumbing employment but reported that they did no out-of-school work in plumbing, even though this is their section. Even if, say, the father was employed in a construction company, the great majority also do private work. Some of the students undertaking work mentioned they did well in the school interview in the first year. Looking at all relatives the relationship illustrated in Table 7.6 is highly significant ($N=251$, $\chi^2 = 10.941$, $df=1$, sig.(2-sided) $=0.001$).

Table 7.6: Crosstabulation between having any member of the family working as a plumber and the student practicing plumbing.

Do you practice this job outside school?	Does any member of your family practice this job (father, brother, uncle or another relative)?		Total
	Yes	No	
Yes	22	23	45
No	50	156	206
Total	72	179	251

Egyptian cities have a lot of plumbing problems in the old buildings; even in the new buildings there are also problems (The Egyptian government has building problems on a considerable scale). Anyone in Egypt can build a new building without permission for building. These buildings have been constructed without any kind of supervision. The contractors are private and there is no control over what they are doing. The workers and the supervisors do not have professional qualifications. So the government has found itself facing building improvements or new building in the cities, with workmanship not of a good condition. So it is common to find some of the students practicing this job outside the school, unregulated. There are fewer opportunities in the newly-developed cities that are built totally under government standards supervision.

Table 7.7 shows that the majority of students enjoy this study if they have one member of their families practicing this work. However, treating closeness of relationship and enjoyment as ordinal scales gives a very low Spearman correlation coefficient (N=268, ρ=0.099, sig.=0.107).

Table7.7: Students' enjoyment of plumbing as a function of family practice			
	Does any member of your family practice this job?		
Do you enjoy studying in this section?	Yes*	No	Total
I enjoy this section very much	32	62	94
I usually enjoy this section	21	55	76
I do not really mind studying this section	16	39	55
I do not enjoy this section	4	16	20
I strongly dislike this section	4	19	23
Total	77	191	268
*Yes: father, brother, uncle, or other relative			

7.3.3 Students' motivations for joining the plumber section

> You can lead a horse to water, but you can't make him drink
>
> (Good and Brophy, 1994:209)

Petty (1993:32) reports that motivation is regarded by teachers as a pre-requisite for effective learning, and the greatest challenge they face is to make their students *want* to learn. If students do not want to learn, their learning efficiency will be so slow that they may learn virtually nothing of practical (ie. vocational) value.

Given the above fact of regarding the plumber section as their least favourite and the unpopularity of being in the plumber section poses the question of why did each student join it? Yet a majority (63.4%) enjoy the actual content and if we add the students who do not mind to study this section it rises to (84%). The question is important in understanding motivation and the job characteristics (Robertson, et al., 1992:52-55). Thus, the next point will deal with reasons and motivation that led the students to join this section.

Kyriacou (1991:67) offers three major influences on pupils' motivations in classroom:

- Intrinsic motivation
- Extrinsic motivation
- Expectation for success.

Intrinsic motivation concerns the extent to which pupils engage in an activity in order to satisfy their interest in the topic area, *for their own sake* (Kyriacou, 1991:68 and 1992:39). Thus, the present section will deal with reasons and motivations that led the students to join this section. (Extrinsic motivation and expectations for success will be dealt with in Section 7.3.6).

It is noted by 37.8% of the students in Table 7.8 that the main reason for joining this section was not achieving sufficient marks in the end of preparatory examination enabling them to join general secondary schools. Educationally, in terms of motivation of students, this is an extremely serious problem. The negative attitudes of over one third of the class are likely to affect the study of the whole group.

Table 7.8: Reasons leading students to join the plumbing section

School	This is the section I enjoy most	This is my present work out of school	I did well in the interview for this section	My family directed me to this section	I failed to get enough marks for an alternative	Total
School1	10	4	16	7	28	65
School2	23	8	26	3	33	93
School3	12	12	14	6	22	66
School4	6	1	18	4	21	50
Total	51	25	74	20	104	274

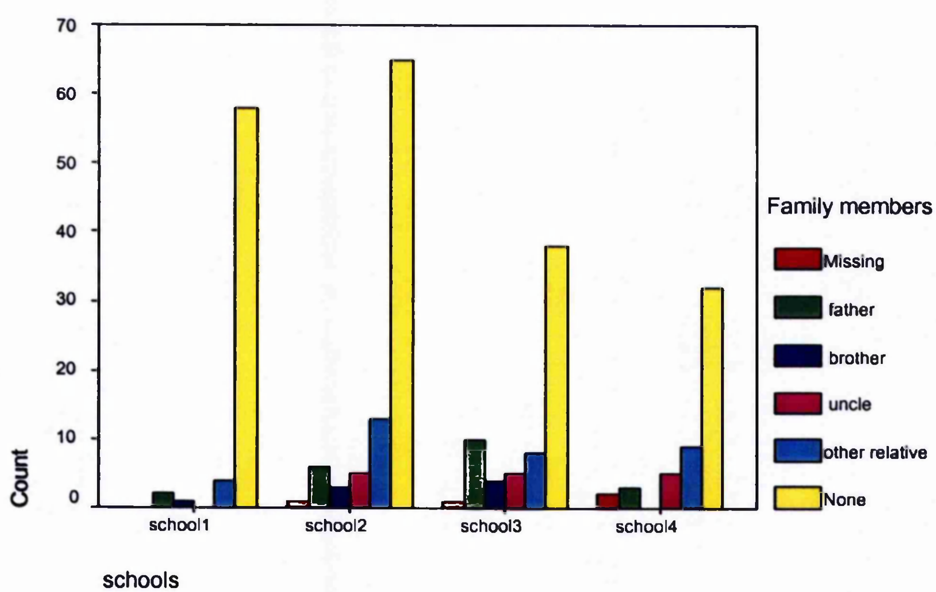
There seems to be a recurrent situation between students across the three areas in the four schools in regard to the reasons leading to their joining of the section. The majority of students in each of the schools as well as across the schools joined the section as they failed to get high enough marks to join the section they wanted or a general secondary school. However, it is worth noting that despite this none of the students in Schools 3 and 4 regard the plumbing section as their favourite. In Question 7, 18 students answered saying they enjoy the section, and 13 students reported working as plumbers out of school hours. Only one student out of these 13 is located in School 4, which is in Area C (the new city), which could back up the earlier assumption of this specialisation not being needed in the city, in the meantime, because of its newness.

There is no significance (N=275, χ^2=2.195, df=1, sig.(2-sided) =0.138) between the families directing their boys to join this section and the students' preference of this section, whereas, there is a significant relationship (N=275, χ^2 =5.514, df=1, sig.(2-sided) =0.019) between the students joining this section and one of the family members working as a plumber (28.8%); for statistical purpose all family relationships were grouped together (see Table 7.9). In other words, having a family member in this profession probably had an indirect influence on the students' choice to join the section. Having a family member in this profession could also indirectly lead to the students' expectations to get direct work with one of the family members after the finish of the study.

Table 7.9: Frequency of member of the students' family working as a plumber				
Family member	Frequency	Percent	Valid Percent	Cumulative Percent
My father	21	7.6	7.7	7.7
My brother	8	2.9	3.0	10.7
My uncle	15	5.5	5.5	16.2
Another relative	34	12.4	12.5	28.8
No	193	70.2	71.2	100.0
Total	271	98.5	100.0	-
Missing System	4	1.5	-	-
Total	275	100.0	-	-

7.3.4 Family influences

Harlen et al (1999:283) report that "it is well established that the achievement of an individual is as much a function of his or her social circumstances and the educational experiences of his or her parents as it is of the effectiveness of the school or schools attended".



Graph 7.2: Relationship between having any member of the family working as a plumber and the schools

By looking at Graph 7.2 it becomes clear that 28.8% of the students were influenced by the presence of a member of the family working in the plumbing field. 70.2% of the students across all schools did not have a family member working in the plumbing field. This could stress what has been mentioned earlier in Questions 7 and 8, that the students'scores, not their motivation or interest in the section, was the main reason behind their joining the section. It should be emphasised that on answering Question 9 most of the students stated that, after joining the section, they now enjoy studying it. See Table 7.10 and Graph 7.3.

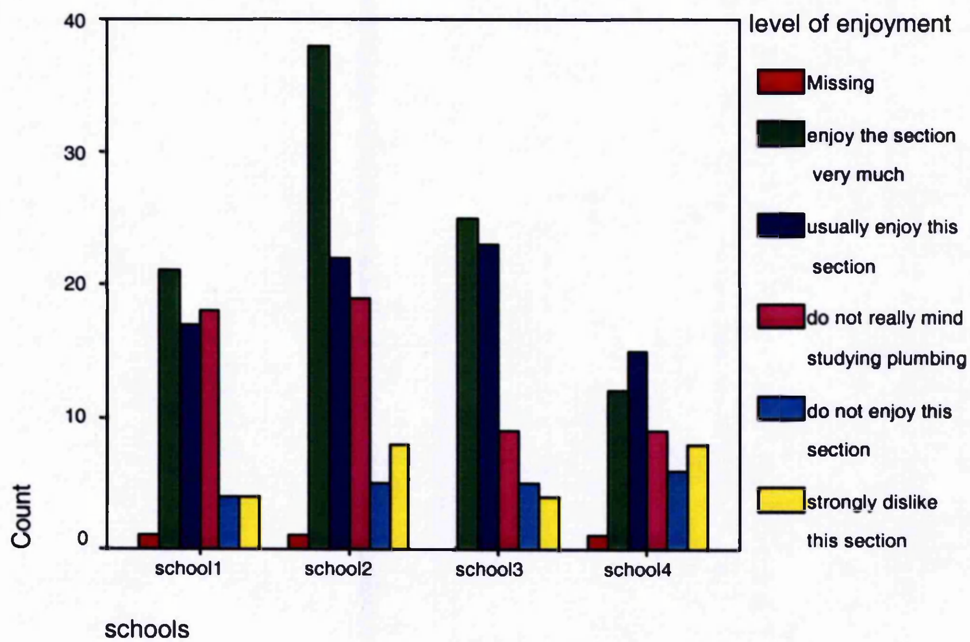
Further evidence of reasons behind this change in attitude are revealed by the end of the present chapter.

The correlation is significant between the reasons of joining this section and of enjoying it ($N=271$, $\rho=0.340$, sig. (2-tailed)<0.001).

7.3.5 Overall subject enjoyment

This question helped the researcher to get an idea of how the students think about their section after two years studying in it. The majority of the students across all schools were now satisfied to be in this section.

Table 7.10: Students' enjoyment of studying the plumbing section						
School	I enjoy this section very much	I usually enjoy this section	I do not really mind studying this section	I do not enjoy this section	I strongly dislike this section	Total
School 1	21	17	18	4	4	64
School 2	38	22	19	5	8	92
School 3	25	23	9	5	4	66
School 4	12	15	9	6	8	50
Total	96	77	55	20	24	272



Graph 7.3: Relationship between the schools and the level of enjoyment of the plumbing section

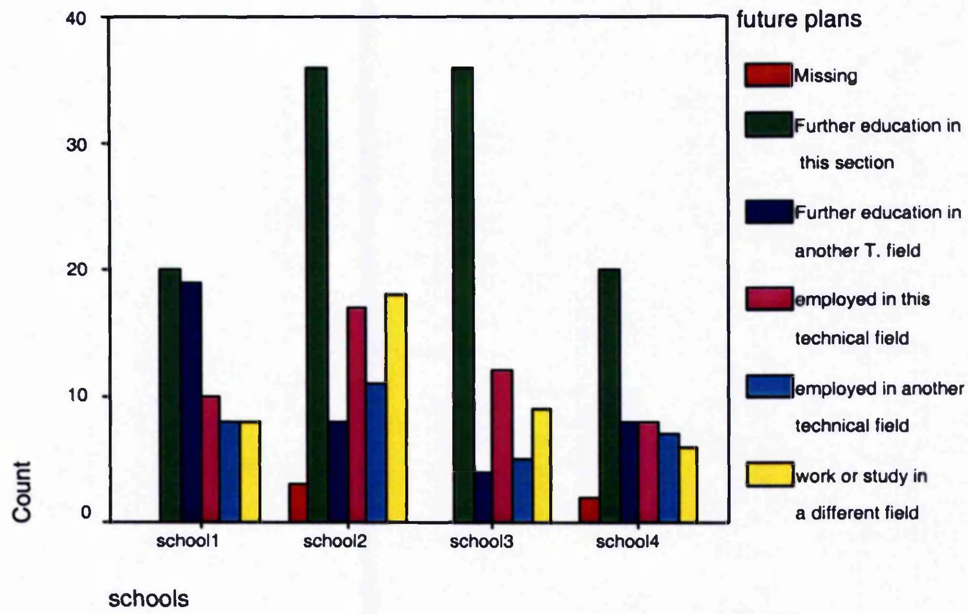
Comparing the information visually in Graphs 7.1 and 7.3 we note that, using School 2 as an example, the majority of students would have preferred stonemasonry, but at the time over one third are enjoying the plumber section 'very much' and only 13 out of 92 recorded dislike.

7.3.6 Ambition

Students' ambitions and future plans are closely related to the other two influences on pupils' motivations that Kyriacou (1991:67) mentioned: extrinsic motivation and expectation for success. Extrinsic motivation involves engaging in an activity in order *to achieve some end or goal*, which is rewarding. Expectation for success concerns the extent to which pupils feel they are *likely to succeed* in a particular activity (Kyriacou, 1991:68 and 1992:39). The present section deals with the extent to which the Egyptian secondary technical students meet these two factors.

As mentioned earlier, most of the students did not join this section upon their choice. This fact could have an effect on their future plans. A highly significant correlation ($N=269$, $\rho=0.328$, $sig.<0.001$) between their future plans and reasons for joining this section showed that the students' future plans did not aim at joining the labour market as plumbers.

Students across the three areas had a mixed variety of plans for the future. The largest group of them (41.5%) across all four schools had high expectations to carry out further education in the plumbing field (see Graph 7.4). This could be a means of seeking a way by which they would be able to improve their social status in the future, since technical graduates are not regarded as respected social figures in Egyptian society (see Chapters 2 and 3). Not surprisingly therefore just 17.4% of students across the schools were willing to join the labour market as plumbers.



Graph 7.4: Relationship between the schools and the students' future plan

7.3.7 Attitudes towards the plumbing section in schools

> Attitudes are combinations of concepts, information and emotions that result in a predisposition to respond favourably or unfavourably towards particular people, groups, ideas, events or objects. (Whitaker, 1995:64)

The next step is to examine the factors affecting the students' enjoyment of the plumber section, their future performance and the school–based component features that give positive attitudes to the students (Price, 1989), for example having enough materials, tools, time for practical work, and workspace area. The student sample gave some main points on how they were affected by these variables.

The sub-section discusses a number of highly significant relationships between the students' attitude and enjoyment on one hand, and available resources as well as some curriculum and teaching variables on the other hand (Pratkanis, et al.1989: 37-57).

Resources: tools

Although the tools quality in the schools workshop were regarded by the students as to be 'in a very good condition', the quantity of the tools is not abundant. 44.7% of the students mentioned that 'there are just enough tools for each student', whereas 33.1% reported that they 'need to share' the tools. Accordingly, it could be assumed that the students' performance in the workshops is restricted by the limited tool availability that in turn might affect their enjoyment of the section. However there is a strongly significant positive correlation between the students' enjoyment of the section and the *non*-availability of the tools ($N=271$, $\rho=0.345$, sig.(2-tailed)<0.001). This is a surprising and important finding. But there is a very significant positive corelation between the students' enjoyment of the section and good condition of the tools ($N=267$, $\rho = 0.347$, sig.(2-tailed)<0.001).

Resources: materials

The case with the materials is to a great extent similar to that of the tools. 34.9% of the students mentioned that the school provides 'most' of the needed materials, while 28% reported that they share equally with the school in providing the materials. As for the availability of the materials, 40.4% of the students mentioned that the materials are 'just enough', and 33.5% said that they 'need to share materials'. In the same way, this situation could lead to a negative attitude towards the plumber section.

There is a significant positive correlation between the students' enjoyment of the section and the *non*-availability of the materials (N=265, ρ=0.256, sig.(2-tailed)<0.001). Similarly again, there is a significant relation between the students' enjoyment of the section and good condition of the materials (N=265, ρ= 0.193, sig. (2-tailed)<0.001).

Resources: working space and allocated time

It was interesting to find that the majority of the students did not experience any difficulties with regard to either the time allocated to perform the task or the working area in which the tasks are performed. 45.1% of the students mentioned there is 'more than enough space for all activities' (see Table 7.11). Also, 45.1% of the students regarded the time as 'more than enough' to complete the allocated tasks. However, it must be noted that this availability of space and time could be of small use when associated with lack of materials and tools. The correlation is highly significant (N=272, ρ=0.220, sig.<0.001).

Table 7.11: Crosstabulation of the availability of time and space in the workshop

Describing the workshop area	The time to complete each task in the workshop					Total
	More than enough	Enough	Just enough	Short of time	There is never enough time	
More than enough space for all activities	66	19	17	16	6	124
Enough space for all activities	39	25	15	14	1	94
Just enough space for most activities	2	8	13	7	1	31
Some small shortage of space	2	3	0	7	2	14
Very short of space	5	1	3	0	0	9
Total	114	56	48	44	10	272

7.3.8 Opinions of teachers' performance: general issues

> With regard to effective explaining, it is interesting to note that a teacher's ability to explain things clearly is widely perceived to be one of the most important teaching skills. (Kyriacou, 1992:61)

The teachers' performance and means of teaching could also have a direct effect on the students' enjoyment of the section. This part of the questionnaire investigates these relationships. The links between student comprehension of the subject and enjoyment or success requires investigation. In the workshop context, if the students did not find enough materials and tools in the workshop, then teacher strategies could play a role in continuing the students' motivation.

Theory Teachers

83.6% of the students described the performance of their theory teachers in terms of interest of presentation as 'satisfactory' or better, see Table 7.12.

Table 7.12: Describing the theory teachers' performance by students

	Frequency	Percent
Very interesting	48	17.5
Interesting	76	27.6
Satisfactory	106	38.5
Not interesting	19	6.9
Boring	24	8.7
Total	273	99.3
Missing System	2	0.7
Total	275	100.0

Practical Teachers

The first issue for the practical work teachers is whether or not the students can understand their teaching in the complex situation of a practical workshop. It is noted that the norm for general teaching in Egypt is a formal didactic style. 55.6% of the students described their practical teacher performance as either 'excellent to understand' or 'good to understand', see Table 7.13. When the 'satisfactory to understand' numbers are added this increases to 82.8% - an encouraging proportion of the teachers are well regarded in this by their students. Only 16.7 gave negative responses.

Table 7.13: Describing the understanding of the practical teachers performance by students		
	Frequency	Percent
Excellent to understand	69	25.1
Good to understand	84	30.5
Satisfactory to understand	75	27.3
Bad to understand	24	8.7
Very bad to understand	22	8.0
Total	274	99.6
Missing System	1	0.4
Total	275	100.0

7.3.9 Views on teachers' assessment

Theory assessment

Students reported receiving regular theory assessment either every lesson or week. These categories are combined as some of the schools have only one theory lesson per week. Accordingly, 63.3% reported receiving assessment every lesson (one time a week) while 25.6% reported receiving assessment every month, see Table 7.14. These results correspond closely with the teachers' responses on the same aspect, which was dealt with in Chapter 6.

Table 7.14: Frequency of students' theory assessment in the plumbing section as reported by students						
School	Every lesson	Every week	Every month	Every term	Never	Total
School 1	18	24	17	1	4	64
School 2	26	36	22	4	4	92
School 3	18	21	15	1	9	64
School 4	11	17	15	1	6	50
Total	73	98	69	7	23	270

Practical assessment

A second issue is that of assessing practical work. From Table 7.15 below, it becomes clear that the students do get assessed regularly, but on different intervals. Some students (9.3%) had reported 'never' being assessed; this could be either a misleading answer from the students or it could equally indicate that some teachers methods of assessment are not recognised by the students' as 'assessment' (e.g. the personal judgment of practical course work outputs).

Table 7.15: Frequency of students' practical assessment in the plumbing section as reported by students						
School	Every lesson	Every week	Every month	Every term	Never	Total
School 1	19	4	39	0	3	65 *of* 65
School 2	25	21	35	5	6	92 *of* 93
School 3	14	21	22	6	1	64 *of* 66
School 4	8	19	4	1	15	47 *of* 51
Total	66	65	100	12	25	268 *of* 275

7.3.10 Views on formative feedback

A third issue in discussing the quality of teaching is that of the provision of formative feedback to the students concerning their progress (Flower, 1991).

Brown and Race (1995:56) consider feedback to learners as 'probably the most crucial ingredient in any recipe for successful learning'. Kyriacou (1992) also sees helpful and supportive feedback as an important characteristic of effective teaching, while unfriendly and insulting feedback is not.

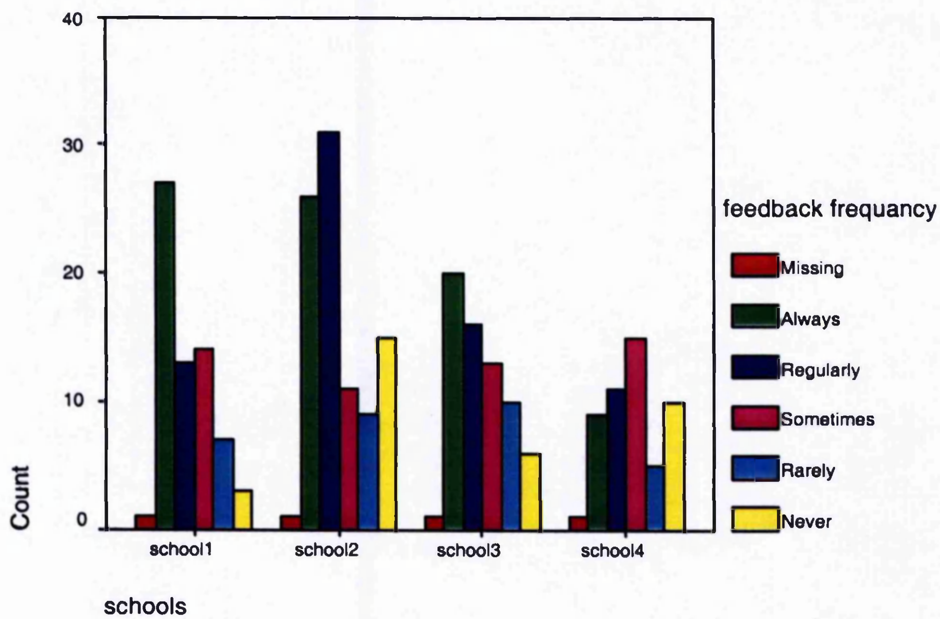
'Effective feedback needs to diagnose the nature of any problems, and not only give remedial help, but also try to mitigate future difficulties by developing sound study habits and self-confidence regarding learning' (Kyriacou: 1992:124). Kyriacou (1991:56) also adds that regular feedback offers a periodic boost to the students' motivation and effort. Whitaker (1995:119-121) sees that, for the feedback to be effective, the following two conditions need to be fulfilled.

1. Motivation.
   The pupil receiving the feedback needs to be motivated to improve and is therefore needy of the information which will help this.
2. Moderation.
   The amount of feedback provided needs to be sufficient and not excessive.

Whitaker (1995: 120) offers four further factors that need to be considered when providing feedback: be specific and concrete, be brief, be descriptive, and be reflective. However, Kyriacou (1992: 58) points out that "pupils do appear to be quite sensitive regarding the type of feedback they prefer". The following discusses the extent by which feedback is provided in the technical education secondary schools in the sample.

Theory performance

From the students' perception the majority (56.5%) of the teachers give 'regularly' or 'always' feedback on their theory performance. Graph 7.5 shows the distribution of the students responses. However, the students' response comes again as a partial confirmation of the teachers' responses, as 43% of the teachers reported offering of feedback sometimes, rarely or never (see Chapter 6).



Graph 7.5: Relationship between the schools and getting formative feedback on the theory test performance

From the graph it becomes clear that within each school all degrees of providing feedback are available but with different ratios. It is thus acceptable to assume that teachers within the same school and across all four schools possess different realisations of the importance of formative feedback in the assessment process.

Practical performance

Over 10% reported not getting feedback on practical performance assessment; see Table 7.16.

Table 7.16: Frequency of receiving feedback on practical test performance

School	Always	Almost always	Sometimes	Rarely	Never	Total
School 1	22	17	21	4		64
School 2	23	18	35	4	13	93
School 3	16	19	18	7	5	65
School 4	9	9	15	4	11	48
Total	70	63	89	19	29	270

There is a significant correlation between (a) the teachers informing the students of the criteria for assessment in advance as well as providing the major skills list upon which they will be assessed (Hussain,2000: 22) and (b) providing good feedback - see Table 7.17 for the significant factor in each school. For the whole group the statistics are $N=265$, $\rho=0.423$, sig.(2-tailed)<0.001. This is clearly an issue of quality of teacher: those preparing students well for assessment also take care in using feedback in a formative sense. This is especially important in the practical teaching and might be informal and ongoing as well as formal.

Table 7.17: Correlations between students opinion on teachers' provision of the list of major skills requested in the tasks and giving feedback as reported by students			
School		Value	Sig. (2-sided)
School 1	Spearman rho	0.408	0.001**
	N	62	-
School 2	Spearman rho	0.376	<0.001**
	N	92	-
School 3	Spearman rho	0.449	<0.001**
	N	63	-
School 4	Spearman rho	0.369	0.010**
	N	48	-
	Total = N	265	-
** Significant at the 1% level			

7.3.11 Views on curriculum content

Kyriacou (1992: 184) stresses the fact 'the most important aim of the curriculum is to prepare pupils for adult and working lives'. There is little doubt that technical and vocational education curricula would fall under this umbrella. Stemming from this fact, the researcher aimed at eliciting the students' opinions on the curriculum presented to them in regard to its efficiency to prepare them for their working lives.

The majority of the students expressed a neutral opinion regarding the content of the subject of their specialisation, as well as of the topics included. 35.3% described the content as 'satisfactory', and 38.2% regarded the topics of the curriculum as 'satisfactory to understand'. However, this unenthusiastic answer could be related to the use of the lecture as a main theory teaching method. There is a significant corelation between the students' opinion of the content and the method by which the theoretical teachers teach ($N=275$, $\rho=0.509$, sig. (2-tailed) < 0.001). However, there is a subtle difference between the content seen as an area of study and the specific subject matter included. Caution is needed in interpretation because of the very small number of teachers reporting that they were using alternative styles.

Similarly, there is also a significant relation between the students' opinion of the content and the method by which the practical teachers teach ($N = 275$, $\rho = 0.378$, sig (2-tailed) <0.001). Accordingly, it might be assumed that the teachers' means of teaching had affected the students' perception of the curriculum content and thus had affected the students' degree of appreciation and enjoyment of the section.

7.4 Problems facing the students

This section deals with problems mentioned by the students to the researcher through the open questions. In addition to the formal categorisation of problems faced in the classroom and workshop, the students raised a small number of other issues. Most of these relate to the working environment rather than the educational issues and provision of equipment and materials – in addition to the technical secondary school facing shortage of resources to cover the curriculum needs.

- The water supply in the school and in the toilets is inadequate. The water is impure and has been heavily chlorinated in most areas; as such it is not pleasant to drink.
- In the buildings plastering and painting are often missing or stained, and ceiling and wall plaster are physically damaged.

- On the ground floor one finds thermal discomfort, such as widely fluctuating temperatures, with too high or too low humidity levels, and cold drafts. They often do not replace the broken glass in the windows.

- In Egypt the weather is warm and dry – we can see ventilation problems, such as poor air circulation and lack of exhaust fans or ventilation screens in some toilet areas. Because these areas have small windows and these do not always face in a good direction for the prevailing wind, the problem is increased.

- There are cleanliness problems, such as dust accumulation around the supply vents and surrounding ceiling tiles, with infrequent dusting and pest problems.

The fact that the students have mentioned these (surprising and unexpected) problems is important because they recognise that the technical environment in which they are living to get their standards of training skills are not consistent with what they are being taught in the classrooms and workshops.

The school needs to persuade the school district authorities to ameliorate the environmental problems in the school. There is another point to this issue:

- The reason for students going to school is because they have to be well educated; further professional ambitions and a better future should be their aim. But some students mentioned they do not trust their level of competence after finishing their education, their evidence of this being true is because in the plumber employment interviews most of the student plumbers did not qualify – they are not employable commercially without further training.

The solution to the problem might be to use students studying in the other sections to do this work as training tasks (if there are enough materials). The writer suggests that the following points ought to be considered in looking for solutions.

- Research might be undertaken to collect information to improve the students' and the teachers' feeling of health.
- The relation between the students and teachers needs attention because the shortage of salary is de motivating to the teachers.

Students with behavioural needs require good conditions, whether in the form of materials or of the society in which they work. But the writer thinks we will not see much change in the school system in the short term. That does not mean there is nothing one can do. The first step the teachers should do is to become active: such as getting a support group going on the internet in their city or visit websites that offer technical education support and information in technical schools in similar situations.

Clearly, to evaluate a particular instructional approach is difficult, if not practically impossible, due to the wide range of external factors affecting the students' learning experience (e.g. financial pressures, the culture of the institution, the cultural background and previous educational experience of the student, workload due to other units to mention but a few).

In addition to this, it is difficult to determine the extent to which a student's ability to transfer skills can be attributed to the adoption of a particular learning strategy within one unit of a multi-unit course. Inter-unit effects will apply. However, it was hoped that the methods used would give some indication of the potential benefits and drawbacks of specific approaches.

This raises a more general issue: going to school, learning new things, being in a clean school environment and being safety and healthy (Lermack, 1999). This is every child's right. In reality, however, many children in Egypt do not have the main skills or access to safe and clean sanitation facilities. Although the importance of water and sanitary facilities for schools is acknowledged, in practice the sanitary situation in many schools is deplorable.

In Egypt, improved hygiene practices are essential if transmission routes of water and sanitation related diseases are to be cut. Appropriate hygiene education can bring about the intention to change hygiene behaviour. However, appropriate water and sanitation facilities are needed to allow children to transform intention into real change inside the school and outside the school. Such an emphasis on health education and cleanliness is fully compatible with principles of Muslim education.

Adding to this, Levine (1999) gave eight steps to success for employers in their technical fields. The school programs have to do the changes in hygiene behaviour of students by giving the students' sanitary conditions and facilities available in the school

From the previous discussion it can be concluded that the educational environment of the Egyptian technical education sector is lacking many factors that would enable it to establish its goals. From the researcher's point of view the students' response to Question 9 claiming that they enjoy studying in the section could be justified as a result of the lack of resources, which in turns implies less work and an easy pass. Their motivation for this response could also be justified by the fact that the majority of them joined this section unwillingly.

7.5 Implementation of the interest inventory

This part of the research examines the vocational interests of the students in Egyptian technical secondary schools in plumber sections. To do this an inventory method of measurement of vocational interest was used.

7.5.1 Instrument Development

There are two main types of vocational interest measurement instrument (Price and Whipp, 1996).

(i) The first group uses a "clinical" method with one-to-one discussion between the subject and the interviewer. The Strong vocational interest system is the main user of this type (Campbell, 1974).

(ii) The second uses an "inventory" method with the subject answering written questions. The Thurstone vocational interest inventory (Thurstone, 1947) is typical of this type. In this, pairs of careers are presented in each cell of a 10 x 10 cell grid columns and rows define respectively the vocational field of the careers numbered 1 or 2 in each cell. The student circles the number of the preformed career in each cell .Examination of row and column to identify each students score for each field.

The latter is suitable for quickly using with a large number of subjects, as in this research. After consultation, a modified Thurstone test was adopted for measuring the 277 students answering the questionnaire.

Further benefits of the Thurstone type of inventory include:

(i) It is easy to guide respondent into correct procedures;

(ii) The results can be processed locally;

(iii) No additional pro-rata costs in processing;

(iv) Adaptable for SPSS input and processing;

(v) Can be modified for different ages and cultures;

(vi) The interest categories are pre-arranged by the designer using a factor analysis;

(vii) The interest categories are determined using vocations as a basis - very relevant to technical education studies.

The following were three main issues, which required redesigning of the Thurstone inventory before further use:

1. The translation of the occupations from English to Arabic to ensure the same meaning.

2. The economic difference between the Egyptian, British and USA societies. This economic difference between these societies led to different income levels for the same job.
3. Another, third, problem that also faced the researcher was the different cultural perspective among these societies towards the job titles, i.e. status.

Means of overcoming these issues were discussed in Chapter 4: the researcher carefully translated the Whipp inventory into an equivalent Arabic language Egyptian version (see Section 4.8.3).

7.5.2 Pre-implementation reliability measures

To develop the inventory, arrangements were made to test the content validity of the translated inventory by piloting it on six PhD students, of Egyptian nationality (and native Arabic speakers) studying in Manchester, to assess the suitability of the revised inventory, judge the comparability of the occupations, and for editorial testing. During the implementation of the inventory the researcher asked the post-graduate students to highlight any occupation with which they were unfamiliar, and to make any other constructive criticism

Their main comments were as follows:

1. The technical secondary school students will not know how to fill this form or inventory. To solve this problem the researcher wrote a covering letter. The letter explained simply how to fill in the interest inventory.
2. The post-graduate students also commented that the secondary students would find it difficult to understand some occupations, e.g. 'judge' and 'mayor'. To

make the comparison inside each cell acceptable the researcher made many changes to occupation titles and used occupations of equivalent familiarity in each cell. For each pair the aim was to have approximate equivalence of familiarity for technical school students in Egypt.

3. The PhD students noted that there were substantially different financial reward levels between some pairs of occupations. For example, one term like 'plumber' was replaced with a higher level for the occupation as 'plumber supervisor'. In some cells in the inventory there were differences in the incomes of the two jobs mentioned. In some cases an income for the job described could have many levels – for example a professorial income is too variable in Egypt and was replaced by the term 'promoted teacher'. In each pair the aim was to have approximate equivalence of income in Egypt.

4. In some cells there were differences in the social level and prestige of the two jobs mentioned. For example the Whipp inventory had 'criminal lawyer' and 'bridge engineer' in the same cell. To obtain comparability of social level in Egypt the 'bridge engineer' was changed to 'design engineer'.

5. Some occupations were not suitable to use because they are seen only as women's jobs in Egyptian society – like 'nurse' or 'child welfare'. All students in these tests were male. The aim was to have equivalence of status.

7.5.3 Pilot test on teen-aged Arabic speaking students

The inventory, after revision on the basis of the PhD students' comments, was then piloted on ten students aged between 14 to 16 years old Arabic-speaking residents in the UK, in order to ensure the comprehension and readability of job titles and relevance of items of the test for the appropriate age for the test being used in Egypt. All students were male.

The sample of piloted students was constructed as illustrated in Table 7.18.

Table 7.18: Nationalities of 14-16 year old students commenting on changes to the Whipp inventory.

Home country	Number involved	Age
Palestine	3	14-16 years
Oman	4	14-16 years
Libya	3	14-16 years

The students here are from countries where the design criteria are almost the same as in Egypt. Completed grids and comments were collected from these ten Arab 14-16 year old students and their comments are summarised as follows:

1. They asked for more time to fill in the tests, even though they had been allowed 20 minutes.
2. The welfare occupation was one of the occupations they did not like, when they compared it with the others; it was not specific enough as an occupation.
3. The inventory did not include all the specialisations or branches of certain jobs, e.g. medicine and engineering.

4. In some cells in the inventory, there was still a perceived difference in the incomes of the two jobs mentioned. This concerned them.
5. In some cells, there was a perceived difference to the students in the social level of the two jobs mentioned.

Further amendments were then done to accommodate the changes needed, and after further formal consultation was accepted for use. The final version is shown in English translation in Appendix 4.

7.5.4 The tests on Egyptian secondary technical school students

The usable sample comprised the same 275 students in the final year of the three-year technical secondary schools in four technical schools distributed across three geographical areas across area A as described in Chapter 7. The same two students in the original sample of 277 as gave incomplete questionnaire returns did not attempt this inventory.

The Interest Schedule was administered to students by means of a colleague of the researcher in the Faculty of Education at the Helwan University, Cairo. The schedule took around ten minutes to complete with the Egyptian students. Due to the tight timetable in the schools participating in the study, the interest schedule was distributed to the students after filling in the questionnaire described in Chapter 7.

7.5.5 The students' sample descriptive statistics

Table 7.19 represents the mean score (from a maximum score of 20) for each of the Thurstone vocational interest categories. In theory, applied science and technology should link closely with the 'Physical Science' (PS) variable in the inventory in terms of described careers.

It can be seen that connections are weak, with close similarity between the scores. Ideally, the mean PS score would have been much higher, and its low value is very meaningful.

Table 7.19: Mean vocational interest scores for the students' sample

	N	Mean	Rank order
PS = Physical Science	275	10.42	2
BS = Biological Science	275	9.06	8
C = Computation	275	8.59	10
B = Business	275	9.40	5
E = Executive	275	11.05	1
P = Persuasive	275	9.22	7
L = Linguistic	275	9.67	3
H = Humanitarian	275	9.28	6
A = artistic	275	9.44	4
M=musical	275	9.02	9

Standard deviations were all similar ranging from 2.4 to 3.1. Calculations of reliability of these score were performed using a split-half method based on the separate scores, e.g. PS1 and PS2 correlation (see Appendix 4). In general these reliabilities are satisfactory, though slightly lower than the original Thurstone reliabilities with American students and lower than the Whipp reliabilities with British students.

Table 7.20: The reliability for the inventory sample	
	Reliability
PS = Physical Science	0.542
BS = Biological Science	0.727
C = Computation	0.703
B = Business	0.629
E = Executive	0.688
P = Persuasive	0.778
L = Linguistic	0.759
H = Humanitarian	0.724
A = Artistic	0.701
M=Musical	0.532

7.5.6 Results and Discussion

Regarding the relation between the students' interest and the vocational success which could serve as a means of prediction of whether a person will remain on the job or not, (see Campbell, 1974 and Curtis,1971), the physical science interest among the Egyptian technical secondary students came in the second and not the first rank, see Table 7.19. In the physical science category Thurstone included technical occupations. This poses the question of whether the students are in the right field. Accordingly, it also sheds doubt on the criteria of accepting these students in the technical secondary schools, which has been discussed earlier. However, that executive interest should come high is not altogether surprising for a group of students, most of whom will be self-employed on completion of the course.

7.5.7 Correlations between vocational interest factors

Table 7.21 shows inter-factor correlation plus correlations of each factor with the total interest score. The highest (Pearson) correlations $r>0.3$ taken from Table 7.21 in the analysis are (Table 7.22):

Table 7.22: Highest Pearson correlations between student vocational interest factors		
Between		Pearson r
Computation	Executive	0.340
Business	Persuasive	0.333
Persuasive	Executive	0.347
Linguistic	Executive	0.405
Artistic	Musical	0.423

The correlations with the total score (T) are higher because each factor is itself included in T.

It should be noted that Thurstone designed the categories to be as independent as possible, with low correlation between the components. These higher correlations are not unexpected in terms of the vocational interest areas concerned.

Importantly the difference between the highest mean score of the variables (Executive interest at 11.05) and the lowest mean score (Computation at 8.59) is only 22%, indicating the lack of polarisation of the scores.

The costing exercises described in the Helwan study in Chapter 4 showed that students were found to be poor in the practice of doing numerical work and estimation for plumbing after graduation from school. The interest inventory showed that for present students their computation interest was the lowest of all interests measured. That is they are least interested in vocations requiring computational skill. The two results are in conformity.

Thurstone devised a method for measuring the item validities, in which each cell is correlated with the totals of the row and column of which it is a member. However, a test may be reliable and valid, or reliable and not valid – but a test may not have a high validity along with a low reliability. In view of the low reliability coefficients, construct validity measures were omitted. However, the procedures described above and in Chapter 4 (including expert panels, etc.) have suggested that the construct validity would be high.

Table 7.21: Correlations between vocational interest factors

	Ps	BS	C	B	E	P	L	H	A	M	T
PS	1	0.184**	0.176**	0.201**	0.058	0.218**	0.073	0.238**	0.139*	0.023	0.457**
BS	0.184**	1	0.237**	0.144*	0.188**	0.216**	0.185**	0.296**	0.114	0.168**	0.522**
C	0.176**	0.237**	1	0.274**	0.340**	0.244**	0.230**	0.078	0.147*	0.004	0.512**
B	0.201**	0.144*	0.274**	1	0.209**	0.333**	0.073	0.102	0.112	-0.036	0.467**
E	0.058	0.188**	0.340**	0.209**	1	0.347**	0.405**	0.067	0.171**	-0.066	0.519**
P	0.218**	0.216**	0.244**	0.333**	0.347**	1	0.303**	0.235**	0.193**	0.004	0.578**
L	0.073	0.185**	0.230**	0.073	0.405**	0.303**	1	0.280**	0.258**	0.099	0.558**
H	0.238**	0.296**	0.078	0.102	0.067	0.235**	0.280**	1	0.196**	0.248**	0.540**
A	0.139*	0.114	0.147*	0.112	0.171**	0.193**	0.258**	0.196**	1	0.423**	0.548**
M	0.023	0.168**	0.004	-0.036	-0.066	0.004	0.099	0.248**	0.423**	1	0.413**
T	0.457**	0.522**	0.512**	0.467**	0.519**	0.578**	0.558**	0.540**	0.548**	0.413**	1

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

7.5.8 Discussion of the student sample responses

The variance in the results of the 275 inventories of the students could be as result of the following:

Individual Student Characteristics

- For most of the students none of the occupations mentioned in the inventory matched their interests. In fact, some (approximately 12% of the sample) added their own suggestions in the paper margins such as "football player". No student made any alteration to the grid options. Some of them even had serious military and political career interests such as "liberating Palestine" and "fighting Israel". No equivalent options were included in the grid – all were civilian occupations. The period of testing was during the period of tension prior to the Iraq war.
- Some of the students (about 1% of the sample) reported in writing on their inventory forms that they had some fear and doubts due to the fact that the researcher is studying in a foreign country. The problem is likely to be more widespread, only strongly minded students being willing to commit such an observation to writing.
- Due to the known fact that the students were accepted in this section based primarily on academic scores, their career interests in the inventory results did not match their subject specialization.
- Due to the shortage of available time that was allocated by the teachers to implement the research instruments, the inventory was implemented on the students after the questionnaire. This could have had a negative effect on the

students' interest and answers in terms of fatigue and, though it was an untimed exercise, students would be conscious of the need to complete within the lesson length and towards the end might have relaxed the reliability of their answers.

Group Student Characteristics

- As a consequence of the researcher not personally implementing the inventory, there is the risk that the students were given a chance to discuss their answers together, and thus were affected inconsistently by each other's opinions – giving a lowering of reliability. Classroom size and layout in Egypt places students in closer proximity than in the UK and thus increases such risk.

7.5.9 Post-implementation inventory reliability testing

Based on the above results and analysis, the researcher decided to apply the interest inventory personally to a sample of Arab native speakers and native British English speakers. The aim behind this procedure was to settle on whether the lower reliability results of the main study sample, compared to those of Thurstone Interest Schedule, were due to design or implementation deficiency. The following is an account of this procedure.

The inventory was implemented on 37 post-graduate Arabic native speakers in Manchester University and 22 post-graduate English native speakers studying in both Manchester and UMIST Universities. The duration of completing the inventory ranged from 5-7 minutes. Each was given their main native language version.

All the Arab students were met either in the University common room or in the mosque without prior appointments. These two places were chosen so that the students would be in their free time and would not rush in filling the inventory. 12 inventories out of the 37 of the Arabic native students were omitted because they completed too little of the inventory, ie., they only chose their present occupations.

Most of these students commented that there is no major difference between the two occupations in the same cell, whereas three students pointed out that there is a difference in the occupations mentioned in one cell (E1 with A2). Four Arab students did not understand what 'plastering' meant (although it was written in Arabic) except after my explanation to them.

The English native students were met outside the John Rylands University Library while having their break. Again, this place was chosen so that the students would be in their free time and would not rush. Before filling the inventory the researcher inquired from participants about their national origins and ethnicity. All 22 were English.

Few of the English students commented that some of the occupations in the cells were far from their career field: for example plumber and plastering. Some of the students mentioned that there is no similarity between the two occupations in cell (E1, E2) which are: Mayor and Hotel Manager and cell (E1, A2) which are: Ship's Captain and Commercial artist. Most of them reported that their choice was based on their actual specialization. None of the English students rejected any of the cells.

7.5.10 Discussion of the reliability testing outcome

From implementing the inventory on both the Arabic and the English native speakers students, the researcher noticed the following:

- The English students showed no hesitancy in participating. They also showed great interest in the research topic. They would even take themselves to one side or find a space alone on the floor to concentrate. However, the Arab students were relatively reluctant in participating. The reasons appear to be complex and might include (i) insecurity because of their unfamiliarity with the test, (ii) concern that a fellow Arab might identify unacceptable responses – though the reliability test results are acceptable provided that 'self-protective' responses are consistent.
- The English students, unlike some of the Arab students, were totally open in expressing their interests. Some Arab students told the researcher that they were not prepared to complete the inventory – the reasons being indicated was again their vulnerability and the cultural privacy amongst these students. Seven of the Arabic students explained their not choosing any of the musical related occupations for religious reasons. Thus, they were forced to choose the other occupation in the cell. This might explain the high reliability coefficient for the M (Musical) category.

7.5.11 Comment on the outcome

Table 7.23: Reliabilities of the measures of mature Arab students in the UK, the English students and the main student sample			
	Arab UK Students N=25	Mature English Students N=22	Student sample N=275
PS (Physical Science)	0.533	0.625	0.542
BS (Biological Science)	0.777	0.455	0.727
C (Computational)	0.834	0.837	0.703
B (Business)	0.844	0.612	0.629
E (Executive)	0.841	0.226	0.688
P (Persuasive)	0.358	0.417	0.778
L (Linguistic)	0.555	0.099	0.759
H (Humanitarian)	0.569	0.520	0.724
A (Artistic)	0.605	0.613	0.701
M (Musical)	0.907	0.770	0.532

From Table 7.23 it is clear that the results are variable when compared with the results from the students' sample, though lower than the Thurstone quoted reliabilities from large sample studies. Clearly the post-test reliabilities are based on a low sample size. This suggests that the designed inventory is not the major problem, but that the inconsistent entries by the students form the main source of variance. There are some causes for concern with the academic students in Manchester used in testing in that they were unhappy when dealing with low-income occupations.

Chapter 8:

Findings and Conclusions

8.1 The findings of the different research strategies

This chapter considers how far the current study has been able to fulfil the aims and meet the hypotheses that were set out. This process involves a consideration of the implications of the specific findings directly related to the field of plumber education, then shed the light on the broader aspects of technical education in Egypt, in general, leading to a set of recommendations. The present chapter also suggests lines for further research.

8.1.1 Discussion of main findings

The question arises in Chapter 5 concerning the attributes of plumbers that indicate their suitability for success in this trade.

The first set of concerns relates to qualifications. The findings reveal that, in the Egyptian sample, the younger participants possessed more qualifications than the older participants. However, their qualifications were not necessarily related to the field of employment. This could be explained by the fact of the educational reform movements that have been occurring in the Egyptian society in the past few decades, resulting in extending the period of free compulsory education. This has led younger generations to receive more education. However, at the same time the fast growing inflation in the Egyptian society, accompanied by the low financial income of this sector, has lead these young educated generations to abandon their education and join the labour market to help in supporting the family. In contrast, the UK sample was more specialised, the older UK participants were the most qualified, because of their general desire for ongoing training in improving their exploitable skills.

Secondly, the natures of the working conditions and employment were investigated to find out issues that reveal the nature of the working labour market in which the plumbers are performing.

As a result of joining the labour market easily as craftsmen in Egypt, without educational or technical specifications, and due to the low economic level, most of those in Egypt who chose to join the field of plumbing were self-employed. The remaining minority was employed in large firms as a means of guaranteeing a secure, if lower, income. On the other hand, the organized nature of British society and the presence of well-known specifications for joining the labour market, the presence of stricter laws and the presence of regulations for materials prices and distribution of equipment, leads the UK sample to be distributed among a wider range of employment sectors.

The Egyptian sample worked at a higher rate of hours per day and days per week because the majority of them have to hunt for their customers in a highly competitive environment. However, in the UK sample, the time spent by the plumbers is entirely dedicated to actual job performance, with plumbers highly paid, in complete contrast

As a result of the time wasted by the Egyptian plumbers seeking their customers, despite their long working hours, their income thus came at a lower comparative rate than that of the UK sample. Unlike the case of the UK sample, there is a relatively small increase of the Egyptian plumbers' income with respect to the increase in age. This has implications for motivation towards further education.

The chapter also asked what factors, in family terms, affect progress. The key findings are that, first, the Egyptian plumbers, unlike UK plumbers; receive no means of support (e.g. social security benefits) from the government. It was also revealed that, due to differences in the family bonds in the two societies, Egyptian plumbers are financially responsible for a larger number of non-earning members in the family. This fact contributed to the effective lower level of per capita income among Egyptian plumber families compared to UK plumbers.

Due to the difference in the income levels, the Egyptian and UK age profiles were different, the UK plumbers generally starting employment later and remaining longer in employment as plumbers. Clearly, income is a factor in the decision to continue employment in any trade.

Having a family member working as a plumber in the Egyptian sample had an influencing role on most of them to join this craft in particular. However, there was no relation between the UK sample participation in the field and having a family member performing the same job. This again is a cultural issue.

Another principal aim of Chapter 5 was to investigate the means by which plumbers develop their knowledge and skills of the materials and techniques related to the job. Both samples sought 'talking to other' colleagues as their main means of self-development. Yet, in Egypt, the absence of any official and formal venue organizing, regulating and supervising persons working as plumbers is noted. No published materials are available in this respect. Accordingly, 'reading' as an option of self improving was ranked last after 'looking round stores' and 'attending exhibitions'. By contrast 'reading' came before 'looking round stores' and 'attending exhibitions' as a means of self-improving among the UK sample, reflecting the higher level of literacy among the sample as well as the abundance of published materials in this field.

The final major aspect of the chapter was to investigate the different skills that affect progress possessed by both samples. The chapter identified (using factor analysis) and discussed six sets of skills in terms of (i) means of training of the skills and (ii) the practical use of these skills. The six sets of skills are: domestic internal systems, outflow systems, technology systems, advanced pipe-work, hazardous operations, and numerical operations.

With respect to training:

Both samples received training towards domestic internal systems and outflow systems either during education or during their working careers. But a big contrast was observed between the samples when discussing technology systems (e.g. gas or electrical fittings associated with plumbing). Only a minority of the Egyptian plumbers, in contrast to the majority of the UK plumbers, received training towards the technology systems either through education or working experience.

There was a slight difference in favour of the Egyptian plumbers regarding receiving training towards advanced-pipe-work skills. All the Egyptian plumbers received training either during education or working experience. However, there were some UK plumbers who reported not receiving any training in this respect. There was a unique similarity between both samples in regard to receiving training towards hazardous operations. The majority of both samples showed the resemblance in that they did not receive any training in that respect. School training towards numerical operations skills among the UK sample exceeded that among the Egyptian sample. However, due to its importance Egyptian plumbers had to gain it through their working careers.

With respect to usage:

There was a similarity between both samples considering their use of the domestic internal systems skills. This shows that both samples regard these skills as essential. There was a slight difference between the two samples in regard to using the outflow systems. UK plumbers used the skills more frequently than Egyptian plumbers due to the nature of the climate. The Egyptian plumbers usage of the technology systems skills came at a much lower rate than the UK plumbers' usage. This could be attributed to the fact that other craftsmen in Egypt perform these jobs. This fact stresses the large difference between the skills possessed by plumbers in each sample. There was a similarity between the samples in regard to the usage of the advanced pipe-work skills. The majority of both samples claimed to use these skills a lot. Both samples showed similarity in the seldom usage of the hazardous operations skills. Both samples showed likeness in the frequent usage of numerical operations skills.

Apart from these six sets of skills Chapter 5 also discussed a number of theoretical skills that were regarded by the researcher as essential in practicing the job. The researcher was interested more in knowing whether or not these skills were acquired, regardless the means. These skills were:

- Building plans and blueprint reading,
- Mathematics relevant to plumbing,
- Physics relevant to plumbing, and
- Legal requirements and regulations about plumbing.

It was revealed that the Egyptian plumbers were keener on acquiring the skills that would enable them to accomplish jobs rather than acquiring the theoretical information related to it. However, the UK plumbers showed equal interest in acquiring skills and knowledge that would guarantee both applicability and quality.

In Chapter 6, concerning the study of technical education teachers, it was seen that the following points were important:

The teachers' guide for these teachers (such as would be normal for a subject in general secondary education) does not exist, leaving them lacking confidence because of their knowledge that they lack suitable strategies for teaching. This situation is normal in technical secondary education. Only the newly-recruited Egyptian teachers seek to improve their teaching skills. The 'lecture' as a teaching method was the most commonly and widely used by teachers, whether being graduates of a Faculty of Education or other graduates. This teaching method was also regarded as the most effective, though in practice teachers have very little real choice and do not experiment with other styles.

Surprisingly, the majority of the Egyptian teachers sample had either a moderate or a poor self-perception of their own qualification level. The teaching load of the teachers was regarded by most of them as unacceptable. Teachers showed contrasting opinions, even within the same school, in regard to the presence of such issues as a homework schedule, feedback, testing, etc. Clearly, there is opportunity here in any planned improvement to develop the professionalism of teachers.

Teachers' promotion takes place in a routine manner depending on their years of experience accompanied by reports written via their supervisors. Promotions are not subject to attendance at any courses or to development in the teachers' skills. It was also noted that most teachers accept promotions until a certain position then they refuse any further promotions that will imply a rise in the salary limited by comparison with potential earnings from private tuition, which is a major source of their income.

The chapter investigated the problems facing the classroom (theory) teachers that affect the students' progress. Student-teacher relationships were the most commonly stated problem. Teachers also quoted 'lack of space', 'insufficient lesson duration' and 'lack of resources and facilities' respectively as other problems hindering their performance.

Similarly, the chapter investigated the problems facing the workshop teachers that could equally affect the students' progress. The workshop teachers agreed with the classroom teachers in quoting the students as the main problem facing them. Out of date equipment that does not correspond to the needs of the current labour market was also quoted beside lack of materials and tools and the poor conditions of the available ones. Teachers also quoted that the Ministry of Education was the only source of supply of these materials and tools, but wondered whether alternative sources of funding or supply might be possible. Lack of space, insufficient time and teacher-related problems were least important to workshop teachers.

These findings are not surprising and would probably be true of almost any group of teachers in any country in any subject: student problems and teaching resource problems being their major concerns. But these teachers are generally referring to a very specific complaint that the students lack motivation and have poor attitudes because of the selection process. Additionally, the resource problems are real in absolute terms.

Chapter 6 also explored the teachers' views regarding the capability of the school and the curriculum in preparing the students for the future labour market. Most of the teachers believed that the technical school is not providing the students with sufficient skills to enable them to join the labour market effectively. Similarly, most of the teachers regarded the current curriculum presented to the students as inadequate for the requirements of the current and future labour markets.

One of the concerns of the chapter was then to consider the teachers' views and suggestions on action that might improve the curriculum and improve teacher training in this area. In respect to improving the curriculum of the plumber section, the teachers regarded this question with great caution and only a minority of them answered the questions. However, the following suggestions were given: a comprehensive and total development of the curriculum was regarded as essential; linking the school with the actual need of the labour market was also mentioned, beside complementing both the theoretical and practical sides of the curriculum.

In respect to improving teacher training in this field, the main suggestion given was awareness of the importance of in-service training, rather than changing pre-service training. This outlook is not surprising from practising teachers, but the logistics of doing this presents another problem of finding times, locations and in-service staffing. But for the national interest more urgent are giving attention and support to improve pre-service training: particularly funding and curriculum, including balance between technical subjects.

Other suggestions were given regarding teachers' own professional development. Teachers regarded joining this section as something very challenging in the light of its low social status in the Egyptian society. Accordingly, acquiring higher self-esteem was the most quoted requirement of the teachers. Professional development through reading or seeking post-graduate studies were also regarded by the teachers as more demanding than simply acquiring more skills directly related to the job.

The overall picture is one in which well motivated teachers are disheartened by their circumstances and the poor student motivation.

Chapter 7 is concerned with the technical secondary school students' attitude and motivation for joining the section.

After spending two years in the plumbing section, most of the students showed a strong preference to other sections apart from their own. The majority of the students preferred joining a higher-status technical field that would promote better social respect. It was not surprising to find that only a minority of them performed this job outside the school. This fact would undoubtedly have a direct effect on the students' performance and progress in their study. It thus verifies the theoretical and workshop teachers' complaint of the students as being their main problem.

Stemming from the important role of motivation in studying, the chapter also investigated the reasons leading the students to join the plumbing section. It was found out that joining the section (disapprovingly) after failing in getting higher marks to join either general secondary education, or another technical education section, was the main reason for the presence of the majority of the students. Having a family member working in the field of plumbing had a little influence on the students' joining the section. In particular, there was no sign of having interest in the section being a reason for joining it.

It was therefore surprising to find out that a majority of the students were enjoying their study in the section. Further investigation revealed that part of the students' enjoyment of the section derived from the unavailability and the poor conditions of the materials, which in turn leads to fewer tasks being performed by the students. However, the majority of the students had a positive opinion of their teachers' teaching performance (both theoretical and workshops) and their assessment.

Another concern of Chapter 7 was to explore the students' perception of the curriculum they are studying, which in turn plays an effective role on their study performance and progress. The majority of the students revealed a neutral response.

Through an open-ended question in the questionnaire discussed in Chapter 7 the students found a chance to express their complete dissatisfaction with a number of environmental problems, health and hygienic problems that they encounter daily in their schools. It is certain to say that these poor surrounding conditions would have a directly negative psychological effect on the students' self-satisfaction, study-satisfaction and thus their motivation and performance.

One aspect of the originality and uniqueness of the present research study is highlighted in the last section of Chapter 7 through the redesigning and implementation of an Arabic interest inventory on the Egyptian technical education secondary students. The results of the inventory came as confirmation of the main finding of the students' questionnaire discussed in Chapter 7. There was no effective match between the field in which the students are studying and their vocational interests. This highlights the 'inactive' criteria set by the Ministry of allocating students into this field, relying entirely on the poor scores they obtain in their previous education.

8.1.2 Integration of findings

Against the above background, the following general conclusion could be reached. There is a gap between theory and practice related to technical education in Egypt at different levels:

As we saw in Chapter 2, the aims proposed by the Ministry of Education for teaching technical secondary students are highly ambitious and idealistic, but on the evidence presented in Chapters 6 and 7 the aims are only to a certain extent attained. However, it should be noted that it is generally not an easy task to translate such good quality general principles into actual educational provision, and the task is all the more difficult in the case of developing countries with limited resources.

There is also a real gap between the theoretical and practical sides of the curriculum implemented in the plumbing section. From the researcher's experience there is no reason to believe that the situation is any better in the other technical architectural education sections.

There was also an evident gap between the theoretical and practical side of the teaching practice within the technical architectural secondary schools in Egypt. There is no means of coordination or cooperation between the teachers of the theoretical and practical subjects, which are meant to be reinforcing each other. It is thus suggested that both the theoretical and practical application sessions might be placed in the same day in the timetable. Even better, an integrated curriculum might give better leadership and motivation. Doing this could reinforce the follow up and feedback processes that play a major role in enforcing the educational process.

Another concern regarding the need to link between the theoretical and practical could be detected by the fact that the technical students' career on joining higher education depends entirely on the scores of the theoretical subjects, excluding all the workshop scores as mentioned earlier in Chapter 2.

The unnecessary separation in principle of theoretical and practical activity has been a problem to technical education (and general education also) over a long period. The low status of practical and technological activity is common to many countries. But, for example, the case of the great British theoretical scientist and mathematician, Sir Isaac Newton, is interesting. It appears that he was as technical as he was theoretical (Price, 1996).

> Intellectually voracious by the time he started school at eleven, he was 'a sober, silent, thinking lad'. The Grantham garret he lodged in was filled with woodworking tools, its walls smothered with charcoal drawings of birds and beasts, men, ships and plants. Newton was always experimenting. He constructed wooden clocks driven by weights; water clocks; sundials made by hammering pegs into the wall; a model windmill powered by a mouse on a treadmill; a four-wheeled cart driven by a crank that he could turn as he sat in it; and, most memorably of all, a lantern of 'crimpled paper' he attached to the tail of a kite at night that 'wonderfully affrighted all the neighbouring inhabitants'.
>
> Besides being a practised carpenter, Newton could lay bricks, use a lathe, melt metals in a furnace and cut a screw thread – skills that stood him in good stead as a scientist in Cambridge (Richards, 1995)

Another issue that was concluded from the findings of the present research study is the need to link technical education in Egypt to the labour market more strongly. It has been mentioned earlier in Chapter 2 that the technical architectural curriculum (plumber section) had seen no changes in the content for decades, despite all the innovations that the labour market had witnessed. Some of the other technical architectural sections have seen change, most of which has been relatively minor. The researcher also encountered work by Askwith (1918), Lawler (1909), and Lawrence (1988) which contain content very similar to the current Egyptian curriculum.

A further need to link between the technical education in Egypt and the labour market derives from the earlier mentioned fact that any one wishing, without qualification or experience, to be registered officially as a plumber on his ID card would have to seek a letter issued from the police station based entirely on a verbal conversation (that is, without checks). Ideally, such letters should be supervised by a number of professionals and educators in the field.

It is hoped that the findings in the present research, which is the first of its kind in the field of plumber education in Egypt, might pave the road for further research in the field as well as to serve as a highlight on the issues that need developing.

8.1.3 Discussion of the hypotheses

This section is a discussion and re-examination of the initial hypotheses upon which the present research was based. The hypotheses were as follows:

Hypothesis (1)

There is a difference between the UK and the Egyptian plumbers sample in regard to:

a) Level of Skills

b) Level of Qualification

c) Income

d) Means of improving skills

e) Reasons for joining the labour market

According to the results and findings that were shown from empirical research implemented in the present study it can be concluded that the above hypothesis is accepted. Results have shown that the different cultural, financial, educational and social status have played a key role in creating differences between the two samples of the present research. This fact leads us on to the conclusion of the following hypothesis.

Hypothesis (2)

There is a difference between the education systems and cultures of Egypt and the UK, which implies an inability of adopting the same system and curricula.

Due to the difference between the UK and the Egyptian contexts, of which the plumbers are part, as discussed above, theoretical and empirical studies have both shown that it is not possible to use curriculum transfer. The idea of a typical international recipe to improve and develop education systems is unaccepted. People from each community have to form their own recipe because education is entirely determined and focused on the society in which it is functioning by being wrapped within its culture.

Hypothesis (3)

There are problems of motivation of the students in Egypt joining the plumbing section.

One of the major disturbing findings of the interest inventory, the first to be applied in Arabic in Egypt in this field and implemented in the present research, is that the interests and motivations of the technical secondary students studying in the section do not correspond with their field. The researcher is, disappointedly, concluding that the main aim of technical education in Egypt at present is restricted to serving as finding a place for those students whose low scores do not enable them to continue with their education in other fields. Serious efforts ought to be given to re-establishing positive criteria of accepting students in the technical education sector.

Hypothesis (4)

There is a difference between what the Egyptian students receive in their education and their employment requirements.

Outcomes of the preliminary study, and especially the plumbers' interviews and the teachers' questionnaire, as well as the students' questionnaire carried out in the present research have all proved that there is a big gap between what is presented to the students in the technical schools and the actual needs and requirements of the labour market.

Hypothesis (5)

There is a difference between the content of initial technical education teacher training and the teaching tasks they are required to perform.

The evidence is mixed. The responses of the teachers have shown that there is some truth in the hypothesis. Teachers lack confidence due to the mismatch. But students generally value teacher competence much better. (It might be noted, however, that a change of syllabus to more modern technology would require major initial training changes as well as in-service provision.)

8.2 General conclusions regarding technical education variables in Egypt

The findings in this research present a challenge to those who want to move forward with the full breadth of technical education in Egypt in a positive way. It is an extrapolation from the findings concerning plumbing. However, based on the above discussion of facts and being aware of the risk of oversimplifying the complexity of technical education in Egypt, this present section of the thesis seeks to widen the scope of the discussion. The present discussion involves the different variables that could play a significant role in the success of the technical education field, in general, in Egypt. The discussion of these variables will follow a chronological order starting from pre-joining the technical education field, then variables related to the technical education, and finally variables related to employment.

Initially, there is the 'social' variable represented in the growing need for awareness raising and showing more respect to blue-collar jobs. Mass media can play a powerful role in promoting positive attitudes towards technical education, overcoming prejudice and misinformation. But this *social variable* has a long history of discrimination against technical activity with negative attitudes being presented to children via their parents and otherwise and change will not be easy.

There is also the variable of the *students' self-esteem*. Al-Asousi (2001) reports that research studies consistently indicate a positive correlation between students' self-esteem and academic achievement. The degree of this correlation as reported by Lawrence (1996) is around 0.6. Although there could be other factors that influence levels of achievements, like ability, these factors will not be used to best potential if the students' self-esteem is low (West et al, 1980; Burns, 1982). Accordingly, the Ministry of Education needs to change the current approach of reserving the technical education for those who consider themselves as having 'failed already' as well as keeping these less-gifted students out of the higher education and off the streets.

In order to guarantee a cost-effective outcome of the technical education sector in Egypt, changes have to be made towards the score-based criteria upon which the students are accepted in the field of technical education in general. More attention ought to be given to the importance of the variable of *students' motivations and interest*.

Moving on to the quality of the technical education in Egypt, Fawzy (1999) found that the lack of skilled labour ranks high on the list of constraints that face the private sector in initiating and conducting their businesses in Egypt. A similar conclusion was earlier reached by the surveys of Galal (1996) and the World Bank (1994). Galal

(2002) reports that not only is technical education in Egypt producing the wrong mix of trades and skills, but also the wrong quality. It, thus, becomes clear that there is an urgent need to tackle the variable of *education quality*. In order to ensure that the outcomes of the technical education are consistent with market demands, there is a need to shift from the current approach of focusing much on the quantity and too little on quality, towards an approach that focuses on quality. Another aspect is to change the view regarding technical education in Egypt from an input/output table or a production function, into a process of maximization of private and social returns across the entire population. This shift does not mean neglecting reforms to improve the training of teachers, the physical quality of the schools, and upgrading the curriculum.

As the main provider of education, the Egyptian government own, manages, and supervises the education facilities and processes. This approach may have been suitable in the past, but it needs to change now in a more market-oriented economy. The current approach fails to motivate the teachers involved to deliver good quality education. It leaves teachers with limited motivation to teach in the classroom because their salaries are low. The technical education teachers' salaries are especially low. At the same time, they find it financially rewarding to teach outside the classroom. Accordingly, special attention ought to be given to the welfare of the technical education teachers.

The success of the technical education in Egypt is also related to a combination of *pre-employment* variables as well as *post-employment* variables. Employment in the technical field in Egypt needs to take a more genuine, standardized and organized means. There is a growing need to establish syndicates, unions or institutions for the different technical crafts in Egypt in which the self-employed (or employed) can cooperate to mutual advantage. These alliances, besides their administrative tasks, would play a role in providing the workers with the sense of security and a respected identity in the society. This in turn could play a role in initiating the students' motivation to join the technical education willingly. It would also enhance status, advise on curriculum content, and provide a channel through which government can consult practising tradesmen.

These alliances could also play a significant role in organizing and providing in-service training to its members, which in turn could assure keeping the craftsmen consistent with the labour market demands and development. It also provides a route for government, should it so wish, to finance trades in-service training.

In an attempt from the researcher to move the conclusions a step further, the following two sections present a number of practical steps that could be considered as a means of developing the technical education in Egypt.

8.3 Recommendations for developing Egyptian technical education

This section is divided into three parts:

- Theoretical research studies
- Curriculum development research
- Empirical research

8.3.1 Theoretical research studies

This section covers theoretical research ideas, important in allowing new development, without potential damage to students until the ideas are well formed and theoretically evaluated.

Graduates of general secondary schools obtaining the General Secondary Education Certificate have to take special (additional) tests in order to be able to apply to faculties of Engineering, Fine Arts, and Applied Arts. These include practical and theoretical exercises. Without passing these tests the students would not be able to join these faculties even if they have obtained the required total scores. So, it is recommended that designing and applying measures of interest, or other measures of vocational potential to students before joining technical education and specializing in a certain technical field might contribute to the estimation of their future achievement as technicians. Technical education in Egypt should no longer be regarded as a last option for educating the students. But identifying, differentiating, regulating and co-operating in the responsibilities, of each of the Faculty of Education teacher graduates and the 5-year Experimental Technical Secondary School graduates inside the workshops in order to ensure achieving the required goals, requires full theoretical exploration before attempts are made to try them out.

In order to regulate and sustain the quality of plumbers specifically, and workers in general, entering the Egyptian labour market it might be helpful to apply an occupational competency test (see Chapter 3).

Raising the technical teachers' awareness of the importance of the psychological side of the students' learning, and basing proposed educational models within our knowledge of learning theory, is essential.

Another area is that of implementing a similar inspection system as the UK's OFSTED to be applied to the technical schools in Egypt. There are strengths and weaknesses in the UK system, but some means of evaluation and recommendations on methods of improvement are needed in Egypt. This needs exploratory development.

Stemming from the great difficulties that faced the researcher in obtaining accurate, detailed and updated statistics related to each section within the technical system in Egypt, it is recommended that there should be relevant information coordination between the schools, educational departments, the Ministry of Education and international organizations (e.g. UNESCO). This could be expensive for the government unless well designed theoretically before further consideration (e.g. Assiri, 2001).

Conducting theoretical research studies to determine the budget required per student per year in each section of the technical education system in Egypt is needed. The latest available figure (1998) per student for the total costs of technical education (buildings, staffing, materials, etc.) is estimated (Senate, 1998,121) as just £E 3.25 per day (currently about UK 30p per day).

At present different sections each have their own culture; there is no standardisation of examination levels; different teaching structures and time allocations apply. This is partly because of the different needs of the different trades and partly without good reason except that the differences have developed historically. Technical education in Egypt needs attention to these issues with special theoretical research to determine the extent to which different sections should differ, and to maximise the common ground for teaching purposes.

8.3.2 Further Curriculum Development

The following are suggestions for possible future development of the Egyptian technical education curriculum.

In order to reach the aims of the practical tasks included in the curriculum, the researcher recommends developing guidance material for each of these practical tasks. These guides could include: materials and tools needed for the task, allocated time to achieve the task, steps for implementing the task, and duration of each - and also to determine the maximum number of students that could participate together in doing the task and, at the same time, acquire the set skills (due to the lack of abundant materials and tools which prevents each student from carrying out a separate task).

The guidance material could also determine the number of teachers required to supervise the students while carrying out the task. Standardizing the formative assessment process of the task by allocating fixed points for each step of the task, with set diagnostic tests to indicate competence at each stage, and pointing out the importance of peer-evaluation within the same group, allocating time in the task for this process as a step to aiding self-evaluation. In the Egyptian context this is likely to be very productive. Arab children are relatively good at collaborative activity.

As an example of the evaluative aspect of action research at the end of each task each teacher could write a feedback sheet (per class) including the difficulties faced and any comments or suggestions for the students to improve the implementation process. These feedback sheets could then be handed to the Ministry inspectors to try and overcome these problems.

Providing the technical teachers with a teachers' guide covering the theoretical side of the curriculum is important, but this must link strongly to the practical work. A new system could be piloted in one or two schools, given government cooperation, particularly regarding theory examinations. The value of summative assessment of practical work will need to be recognised.

It is really necessary to evaluate and update the technical curriculum via the Ministry of Education on a more frequent basis in order to include any improvements and innovations in the labour market. Based on the researcher's own experience with reading the Egyptian literature in the field of technical education, it is recommended that any goals stated by the Ministry or recommendations raised at the end of conferences ought to be phrased in a more detailed and applied way, to allow better (and faster) implementation.

8.3.3 Further empirical research

The findings and inferences from this study have provided information that would be enhanced by further empirical study.

It might be useful to employ similar research studies as the present research study to investigate the variables affecting success in other technical architectural sections. It is hoped that they may contribute to improving technical education provision for the students in the future. Plumbing was chosen as the (probably) most serious case for study. Replication in other areas is needed to see how serious are their curriculum weaknesses.

Research is also needed to investigate the vocational interests of the pre-service student teachers training in the faculties of education. Have these been selected from the right cohort of applicants? Do their attributes match their intended employment? It is potentially a very fruitful research area.

Research is needed in the fields of pre- and in-service training for technical education teachers. We need to know what is effective in training programmes within the Egyptian context as well as trying new ways of training teachers.

Research is also needed into the inspection service for the technical schools. We need to re-examine the criteria for training and selecting these inspectors. Evaluation of their work, which is potentially either very positively influential, or possibly destructive, is nationally important.

A final suggested area is to investigate the requirements needed to prepare the technical education graduates for European as well as Arabian labour markets. This long-term view of labour mobility is, at present, very speculative.

8.4 Epilogue

The role of the education of people in the Muslim countries is to raise the coming generations so as to be capable of facing a constantly developing world. Our means of doing this is based upon Islamic principles of caring for members of the community and knowing the value of education.

Although the results of the present research have perhaps revealed a present lack of implementation of these principles, the researcher believes that by laying sound foundations based on empirical evidence, he has paved the road for further research in the field, aiming for improving the welfare of our future generations in the field of technical education.

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Appendix 1

The School of Education **University of Manchester U.K.**

Research into the Vocational Training of Plumbers in the UK and Egypt

Plumber Questionnaire

Dear Plumber

I am carrying out research into the effectiveness of the training of plumbers in the UK and Egypt. This aims to provide a basis for improving the training programmes, not only of plumbers in Egypt, but also in the education of those who do the vocational training of skilled tradesmen in the specialist schools in Egypt. My base for research is in the University Of Manchester School Of Education.

These questions might appear rather simple, but they will assist me in developing profiles of plumber training and commercial success that will form the basis of the next stage of development of my research.

Please do not spend a great deal of time on this questionnaire. Please be as accurate in giving information as you can but, in some cases, the first answer you think of might well be the most accurate. Some of the information requested is clearly private and confidential. We value any information you are willing to give, as this aids us in judging the variability of rewards given to plumbers in terms of their quality of work experience, training, and area of employment.

You are not asked to sign this paper and so any information you provide is confidential. Any information is only of the sake of the research.

As I cannot trace who has filled in each questionnaire, please accept my thanks now for your kindness in replying to me. Your contribution to my research is most valued. An early reply in the envelope provided will be much appreciated.

For your interest, 50 plumbers in the UK and 50 plumbers in Egypt are completing this first pilot questionnaire. Thank you again.

Amr El-Kersh.

The questionnaire

On the following pages are the questions.

Please try to answer every question.
Where appropriate please answer each question with just one tick in the box, or write in the information requested.
If you are in doubt, please give the answer that is nearest to the truth.

About yourself and your work

Q1-Your age in years?... [ ] years

Q2-Your present job? Please tick.

1. Self-employed plumber... [ ]
2. Employed in a small company of 2-5 persons .... [ ]
3. Employed in a company of 5 or more persons... [ ]
4. Employed in a large multi-purpose contracting company .... [ ]
5. Other(please explain).. [ ]

....

....

About your training, qualifications and experience

Q3-Your qualifications? (This question tries to cover both UK and Egyptian qualifications for comparison. If in doubt, write a short note of explanation by this question.) If you already have the qualification, please tick the box. If you are in the process of studying part-time whilst working as a plumber, please write S (for studying) in the box for the qualification you will receive.

1. Higher National Diploma (or equivalent).. [ ]
2. Ordinary National Diploma (or equivalent).. [ ]
3. Five-year Egyptian Diploma.. [ ]
4. C and G Part 2 or equivalent.. [ ]
5. Three-year Egyptian Diploma... [ ]
6. C and G Part 1 or equivalent.. [ ]
7. No formal qualifications but presently apprenticed... [ ]
8. No qualifications or formal training - just experience on the job .... [ ]
9. Other qualifications gained or for which you are studying. This section is for specialised qualifications (e.g. CORGI). Please list and tick (or write S if you are still studying for the qualification).. [ ]

Your experience?

Q4-Your previous work? If you had a full-time job before you became a plumber, what was it?

1. None, I became a plumber after leaving school (or other training) .... [ ]
2. Builder.. [ ]
3. Electrician .... [ ]
4. Other (please explain) .... [ ]

....

....

Q5-For how many years (as near as possible)
have you worked as a plumber?.. [ ] years

Your family?

(*Computer coding Yes=1, No=2* (*this number does not mean anything*))

Q6-Is (or was) your father (or mother) a plumber?

Yes ....[ ] No [ ]

Q7-Does any other member of your family also work as a plumber?

Yes ....[ ] No [ ]

About your work as a plumber

Q8-How many days do you normally work in a week as a plumber?

1-[ ]; 2-[ ]; 3-[ ]; 4-[ ]; 5-[ ]; 6-[ ]; 7-[ ]

Q9-How many hours do you work as a plumber on a typical day?................ [ ] hours

Q10-What is your hourly rate of pay before deductions of any tax, pension contributions, or other statutory payments? (If you are not paid on an hourly rate, please either estimate as well as you are able, the equivalent hourly rate, or give your daily, weekly, monthly or annual figure. Any information is helpful; we will make adjustments and do calculations as necessary.)

£( ) per hour [ ], per day [ ], per week [ ], per month [ ], per year [ ].

Q11-How many non-earning people are there in your home? (Children, elderly parents, etc.) ....
....

About your interest in your development

How do you improve your knowledge of materials used in your job?

(*Computer coding Yes=1, No=2* (*this number does not mean anything*))

		Yes	No
Q12	Talking with others		
Q13	Reading books and magazines about plumbing		
Q14	Attending exhibitions and trade fairs		
Q15	Looking round specialised stores and shops		

Q15A-Please give the names of any books, magazines, exhibitions, fairs, stores, shops, etc. that you think are very useful ....

....

....

....

How do you improve your knowledge of working techniques?

(*Computer coding Yes=1, No=2* (*this number does not mean anything*))

		Yes	No
Q16	Talking with others		
Q17	Reading books and magazines about plumbing		
Q18	Attending exhibitions and trade fairs		
Q19	Looking round specialised stores and shops		

....

Q19A-Please give the names of any books, magazines, exhibitions, fairs, stores, shops, etc. that you think are very useful ....

....

....

....

About your skills

Q20-In the following list are some skills that a plumber might need.

Each item requires two ticks - the first table is to say whether your training included that topic, the second is to say whether in practice you actually use that ability. Please tick in the correct columns to show your training and experience.

(*Computer coding Yes=1, No=2* (*this number does not mean anything*))

Skills 1 (Training20sk..)		Trained about it in School or college		Trained about it on Location (your job).		Not been trained to Do it	
		Yes	No	Yes	No	Yes	No
1	Pipe fittings, jointing, valves and taps						
2	Installing fixtures (basins, etc.)						
3	Fitting pipe insulation systems						
4	Pipe hangers and supports in overhead installations						
5	Measurements, costing and estimations						
6	Work on steel pipe fittings						
7	Work on cast iron pipe systems						
8	Work on lead-to-copper jointing						
9	PVC water pipe system installation						
10	Hot water heating systems: installation and maintenance						
11	Draining systems and sewerage						
12	Rainwater disposal systems (guttering, etc.)						
13	Gas-fired heating systems						
14	Electrical work on installations (to IEE regulations)						
15	Brazing and soldering						
16	Oxyacetylene cutting and welding						
17	Shielded metal arc welding						
18	Specialised work on systems for carrying toxic chemicals						

Skills 2 (Usage (20sko))		Frequently used		Used sometimes.		Not used	
		Yes	No	Yes	No	Yes	No
1	Pipe fittings, jointing, valves and taps						
2	Installing fixtures (basins, etc.)						
3	Fitting pipe insulation systems						
4	Pipe hangers and supports in overhead installations						
5	Measurements, costing and estimations						
6	Work on steel pipe fittings						
7	Work on cast iron pipe systems						
8	Work on lead-to-copper jointing						
9	PVC water pipe system installation						
10	Hot water heating systems: installation and maintenance						
11	Draining systems and sewerage						
12	Rainwater disposal systems (guttering, etc.)						
13	Gas-fired heating systems						
14	Electrical work on installations (to IEE regulations)						
15	Brazing and soldering						
16	Oxyacetylene cutting and welding						
17	Shielded metal arc welding						
18	Specialised work on systems for carrying toxic chemicals						

<u>About your knowledge</u>

-Which of the following have you been trained to understand?

(*Computer coding Yes=1, No=2* (*this number does not mean anything*))

		Yes	No
Q21	Building plans and blueprint reading		
Q22	Mathematics relevant to plumbing		
Q23	Physics relevant to plumbing		
Q24	Legal regulations about plumbing		

Q24A-Are there any other special plumbing knowledge or skills or experience that you possess that you think we would be interested in? Please make notes about them here.

....
....
....
....
....
....

Thank you for your help.

Appendix 2

The School of Education **University of Manchester U.K.**

Research into technical education
Curriculum improvement

Dear Colleague,

I am an Egyptian research student working in the University of Manchester under the supervision of Prof. Tom Christie (Dean of the Faculty of Education and Director of the School of Education) and Dr. Glyn Price.

I am studying the variables in trades training that lead to commercial success through our education system. This means that I need to measure facts and attitudes related to the effectiveness of technical instruction in our architectural technical schools. The views of experienced teachers form an important source of information, and I am grateful for your willingness to help.

This interview has been structured to collect some of the data required. I would be very grateful if you could give about half an hour of your time to answer these questions with my friend.

The interview will be tape-recorded. Please be assured that these tapes will be completely confidential, only security copies will be made, and all will be erased on completion of the research. Their purpose is to assist in the recording of your ideas and to ensure that your views are not misrepresented.

No individual teacher will be identified by name.

Thank you for co-operation. What you say will be very important for this research.

Amr Elkersh

Teachers' Interviews

0.1 Teacher No:.. ( )
0.2 Tape No: .... ( )
0.3 Tape face No: .... ( )
Thank you for your help.
0.4 Have you any questions before we start?

1-Yes ....( ) 2-No .... ( )
If yes can you tell me this question please:...
....

1. First I would like to record some basic information about the school and your position

Could you tell me about your school and yourself?
(I do not need to record your name.)

1.1 What is your school name? ....

1.2 Is there any developing in your school buildings or facilities?
1-Yes ....( ) 2-No .... ( )

1.3 What is your age?.. ( )

1.4 What is your qualification? ....

1.5 What is your highest qualification

1-Bachelor..................( ); 2-Diploma of education .... ( )
3-MPhil ....( ); 4-PhD .... ( )

1.6 Are you studying for a higher education qualification?

1-Yes .... ( )
What? ....
2-No .... ( )
Why? ....

1.7 What is your teaching position?

1-Teacher ....( ) 2-Team leader teacher .... ( )
3-Superviser ....( ) 4-Head of department.................................( )

1.8 How many years of teaching experience do you have? ....( )

1.9 Do you or did you practice any other job besides teaching?

1-Yes .... (   )

What is it? ....

Is there a reason why you do that particular job as well as for/apart from Increasing your income? Is it related to teaching field?

....

2-No .... (   )

1.10 How do you improve your teaching skills?

1-Reading .... (   )

2-Watching programmes .... (   )

3-Visiting exhibitions .... (   )

4-Conferences .... (   )

5-Talking to the others .... (   )

2 Now I would like to ask some information about your teaching

First, we need some factual information

2.1 How many theoretical lessons or classes do you teach per week? .... (   )

2.2 Do you find that workload acceptable?

1-Yes ....(   ) 2-No .... (   )

2.2 How many subjects do you teach? .... (   )

Could you specify those or that one please? ....

....

2.3 How many architectural sections do you teach? .... (   )

Could you be specific, please? ....

....

3. I need to ask for your views on the available facilities:

3.1 Do you have teacher guide?

1-Yes ....(   ) 2-No .... (   )

IF no go to No.3.3

3.2 To what extend do you think the teachers' guide matches the content of the subjects?

1-Very high match .... (   )

2-High match .... (   )

3-Medium match .... ( )
4-Weak match .... ( )
5- No match at all .... ( )

3.3 Do you think the technical education teacher needs a teachers guide?

1-Yes ....( ) Why ....
2-No ....( ) Comment ....

3.4 Do you get good assistance in your workshops?

1-Yes ....( ) How? ....
2-No ....( ) Why? ....

3.5 How far do you think that theoretical/ practical teachers well qualified for the job?

1-Highly qualified .... ( )
2-Well qualified .... ( )
3-Moderate qualified .... ( )
4-Poorly qualified .... ( )
5-Unsatifactory qualified .... ( )

3.6 Do the students use the school library?

1-Yes ....( ) 2-No .... ( )

3.7 Do you think the books in the school library are useful to the students?

1-Yes ....( ) 2-No .... ( )

3.8 Do you know how many books are there in the library in your section?

1-5 ....( )	6-10 ....( )
11-15 ....( )	16-20 ....( )
21-25 ....( )	26-30 ....( )
31-35 ....( )	36-40 ....( )
More than 45 ....( )	

Do you think, is it enough?

1-Yes ....( ) 2-No .... ( )

3.9 Are there enough materials in the school workshops?

1-Yes..........................( ) No.. ( )

3.10 Did you try to be in contact with international organisations to support the students or the school?

1-Yes..........................( ) 2-No .... ( )

3.11 Does the school offer materials or do the students buy them?

1-The school.. ( )
2-The students... ( )
3-The ministry of education.. ( )
4-The school and students.. ( )
5-All of them to gather.. ( )

3.12 What do you think of the allocated budget towards the materials?

1-Enough.. ( )
2-More than enough.. ( )
3-Just enough .... ( )
4-I do not know.. ( )

3.13 What are your suggestions?

....
....

3.14- Are there enough tools in the schools workshop?

1-Yes..........................( ) 2-No .... ( )

3.15 Are they in a good condition?

1-Yes..........................( ) 2-No .... ( )

4. Could we now talk about your lesson planning and teaching methods, please

4.1 We know you will be planned in advance for each lesson, but do you write the plan down every time?

1-Yes..........................( ) 2-No .... ( )

4.2 What does your lesson planning include?

....
....
....

4.3 What teaching methods do you use?

1-Brain storming .... ( )
2-Problem-solving.. ( )
3-Lectures .... ( )
4-Other .... ( )
....

4.3 Which teaching method do you consider to be most effective?

....

4.4 Which of these methods do you personally enjoy most?

....

4.6 Is the lesson time long enough?

1-Yes ....( ) 2-No .... ( )
If No please can you tell me Why? ....

4.7 What are the problems that are facing you in the classroom?

....
....

4.8 How often do you give homework?

1-Every lesson... ( )
2-Every week .... ( )
3-Every month .... ( )
4-Every term .... ( )
5-Not at all .... ( )

4.9 Are there plans in each department every week for the homework?

1-Yes ....( ) 2-No .... ( )

4.10 How often do you assess the students?

1-Every lesson .... (   )
2-Week .... (   )
3-Month .... (   )
4-Term .... (   )

4.11 Do you prefer the positive or negative rewards to the students?

1-Positive reward ....(   ) 2-Negative rewards .... (   )

4.12 Do you think the curriculum is covering everything that should be covered in this section?

1-Yes ....(   ) 2-No .... (   )
If no what are your suggestions?..........................
....
....

4.13 How do you prepare your students to face the future labour market?

....
....

4.14 Do you think the school gives the students enough technical skills for their future as tradesmen?

1-Yes ....(   ) 2-No .... (   )

4.15 In your opinion what are the skills that the students should posses to cope with the future needs?
....

4.16 With your big experience as a teacher in this field, how do you think we can improve the curriculum in this section?
....
....

4.17 In this context, what are the problems in the workshop?

....
....
....

5. Finally, some very important questions about your recommendations for curriculum improvement

5.1 If you were in government, responsible for curriculum improvement in this subject area, what would be your priorities? And how would you help the students

....
....

5.2 How far is what we do in technical education relevant to the real labour market?

1-Completely irrelevant .... ( )
2-Far related .... ( )
3-Closely related .... ( )
4-Appropriate with the labour market.. ( )
5-Exceeds labour market needs.. ( )

5.3 How can we prepare our students for the changing technologies of the future?

....
....

5.4 How, do you think, could we improve teacher training in this area?

....
....

5.5 Do you prefer the existing technical education system or do you prefer changing it?

....
....
....

Appendix 3

The School of Education **University of Manchester U.K.**

Research into technical education
Curriculum improvement

Dear student,

I am an Egyptian researcher student working in the university of Manchester under the supervision of Prof. Tom Christie (Dean of the faculty of education and Director of the School of education) and Dr.Glyn price

I am studying the Variables Affecting Success in Technical Education in Egypt .this means that I need to measure to measure facts and attitude related to the effectiveness of technical instruction technical instruction in our architectural technical schools.

This set of questions has been structured to collect some of data that will be very important in helping me to develop ideas for the improvement of our educational System

I would be very grateful if you could give a little of your time to answer these questions for me.

If a question gives you a choice of answers please tick the answers that is **nearest** to what you think, even if it is not your exact view. Please answer all questions as accurately as you can. This anonymous, so **please do not put your name on the answer sheet**.

Thank you for co-operation. What you do will be very important for this research.

Amr Elkersh

Student's Questioner

Information about you and your school

1-what is your school name?

1) School (1) ....( )
2) School (2) ....( )
3) School (3) ....( )
4) School (4) ....( )

2-which city is your school in?

1) Cairo and Giza...( )
2) Other ....( )

3-which year are you new?

1)First...( )
2)Second ....( )
3)Third ....( )

4-What is the number of the students in your class?...( )

5-what is your department? ....

This section about your background and motivation

6-which section are you studying?

1) Plumber......( ) 2) Plastering ....( )
3) Concrete.....( ) 4) Stonemasonry ....( )
5) Joinery ....( ) 6) Building ....( )
7) Other ....( )

7-which of these is your favourite section?

1) Plumber......( ) 2) Plastering ....( )
3) Concrete.....( ) 4) Stonemasonry ....( )
5) Joinery ....( ) 6) Building ....( )
7) Other ....( )

8-why did you join this section?

1) This is the section I enjoy most ....( )
2) This is my present work out of school...( )
3) I did well in the interview for in this section..( )
4) My family directed me to this section ....( )
5) I failed to get enough marks for an alternative ....( )

9-Do you enjoy studying in this section?

1) I enjoy this section very much...( )
2) I usually enjoy this section ....( )
3) I do not really mind studying this section..( )
4) I do not enjoy this section...( )
5) I strongly dislike this section ....( )

10-what is your future plan after this school?

1) Further education in this section..( )
2) Further education in another technical field ....( )
3) To be employed in this technical field..( )
4) To be employed in another technical field ....( )
5) To work or study in a completely different field....................................( )

11-Do you know the names of any construction companies in Egypt?

1) None...( )
2) One company ....( )
3) Two companies...( )
4) Four companies...( )
5) Six companies...( )

12-Do you practice this job outside school?

1) Yes ....( ) 2) No .... ( )

13-Does any member of your family practice this job?

1) Yes, my father...( )
2) Yes, my brother ....( )
3) Yes, my uncle ....( )
4) Yes, another relative ....( )
5) None..( )

This section is about the materials and tools in your school workshop

14-Do you have sufficient materials when you are doing the tasks in the school workshop? Tick only one?

1) There are more than enough materials for the class ....( )
2) There is just enough for each student ....( )
3) We need to share materials ....( )
4) There is not enough for students - the teacher usually shows ....( )
5) We do not use any materials ....( )

15-When using these materials which of these is true

1) The school provides all materials ....( )
2) The school provides most materials ....( )
3) You share about equally with the school in providing material ....( )
4) You provide most materials..( )
5) You provide all materials ....( )

16-Do you have sufficient tools when you are doing the tasks in the school workshop

1) There are more than enough tools for the class ....( )
2) There are just enough tools for each student ....( )
3) We need to share tools ....( )
4) There are not enough for students - the teacher always shows................( )
5) We do not use any tools..( )

17-When using these tools which of these is true

1) In excellent condition ....( )
2) In a very good condition...( )
3) In fair condition ....( )
4) In bad condition...( )
5) In very bad condition..( )

18-Which one of the following best describes the tools in the school's workshop

1) Excellent to understand ....( )
2) Good to understand...( )
3) Satisfactory to understand ....( )
4) Bad to understand ....( )
5) Very bad to understand...( )

This section is about your enjoyment and understanding of the theoretical lessons

19-If you were asked to describe your main theoretical teacher's style of teaching what would it be

1) Very interesting ....( )
2) Interesting ....( )
3) Satisfactory ....( )
4) Not interesting ....( )
5) Boring ....( )

20-If you had to describe the content of your subjects' specialisation lesson what it would be?

1) Very interesting ....( )
2) Interesting ....( )
3) Satisfactory ....( )
4) Not interesting ....( )
5) Boring ....( )

21-Which of the following describes the topics that you study?

1) Very difficult to understand...( )
2) Difficult to understand...( )
3) Satisfactory to understand ....( )
4) Easy to understand..( )
5) Very easy to understand...( )

22-Does the theoretical teacher join the workshop sessions

1) Always ....( )
2) Regularly ....( )
3) Sometimes ....( )
4) Rarely...( )
5) Not at all ....( )

23-In the subjects you are studying, which of these do you prefer

1) The theoretical activities only...( )
2) Mostly the theoretical activities..( )
3) Both the theoretical and practical activities equally ....( )
4) Mostly the practical activities ....( )
5) The practical activities only..( )

24-Does the theoretical teacher inform you of the tasks you will do in the following workshop?

1) Always ....( )
2) Almost always ....( )
3) Sometimes ....( )
4) Rarely...( )
5) Never ....( )

24A-Is there any thing you would like to change to improve your learning in the theory lessons?If there is, please state what that is, very briefly, on the lines provided. You do not have to answer this question if you do not wish to.

....

....

24B-Is there any other problem facing you in your theory lessons? If there is, please state what that is, very briefly, on the lines provided. You do not have to answer this question if you do not wish to.

....

....

This section is about the workshop sessions

25-If you were asked to describe your main workshop teacher's style of instruction what would it be?

1) Excellent to understand ....( )
2) Good to understand...( )
3) Satisfactory to understand ....( )
4) Bad to understand ....( )
5) Very bad to understand...( )

26-Which of the following best describes the connection between the theoretical and practical part of the syllabus?

1) Very closely related ....( )
2) Closely related ....( )
3) Partly related..( )
4) Rarely related...( )
5) Not related at all ....( )

27-Which of the following best describes the working area in the workshop?

1) More than enough space for all activities .... (   )
2) Enough space for all activities .... (   )
3) Just enough space for most activities .... (   )
4) Some small shortage of space .... (   )
5) Very short of space .... (   )

28-Do you wear special protective clothes for the workshop?

1) Always .... (   )
2) Almost always .... (   )
3) Sometimes .... (   )
4) Rarely .... (   )
5) Never .... (   )

29-How much time is allocated for the workshop tasks?

1) More than enough to complete each task .... (   )
2) Just enough to complete each task .... (   )
3) Just enough to complete most tasks .... (   )
4) We are usually short of time .... (   )
5) There is never enough time to complete a task .... (   )

30-What do you think is your benefit from these workshop sessions?

1) Very high .... (   )
2) High .... (   )
3) Satisfactory .... (   )
4) Not high enough .... (   )
5) No benefit at all .... (   )

30A-Is there any thing you would like to change to improve your learning in the workshop practicals? If there is, please state what that is, very briefly, on the lines provided. You do not have to answer this question if you do not wish to.

....

....

30B-Is there any other problem facing you in the workshop practicals? If there is, please state what that is, very briefly, on the lines provided. You do not have to answer this question if you do not wish to...

....

....

This section is about your assessment

31-How often do you get assessed practically?

1) Approximately every lesson ....( )
2) Approximately every week...( )
3) Approximately every month ....( )
4) Approximately every term...( )
5) Never ....( )

32-Do you get feedback on your practical test performance?

1) Always ....( )
2) Almost always ....( )
3) Sometimes ....( )
4) Rarely...( )
5) Never ....( )

33-Does your teacher tells you the main skills and points that will be assessed?

1) Always ....( )
2) Almost always ....( )
3) Sometimes ....( )
4) Rarely...( )
5) Never ....( )

34-How often do you get assessed theoretically?

1) Approximately every lesson ....( )
2) Approximately every week...( )
3) Approximately every month ....( )
4) Approximately every term...( )
5) Never ....( )

35-Do you get feedback on your theory test performance?

1) Always ....( )
2) Almost always ....( )
3) Sometimes ....( )
4) Rarely...( )
5) Never ....( )

Thank you for your help

Appendix 4

The School of Education **University of Manchester U.K.**

Research into technical education
Curriculum improvement

Interest inventory

Dear student,

On the other side of this page you will find 100 boxes, in each of which are the names of two occupations.

You are to select in each box the occupation that you find most interesting, if you only had the choice of those two. Draw a circle round the number 1- or 2- to show which your choice is.

Assume that you would get all the necessary training and help to do the job.

Do not spend a lot of time thinking about your answers. Your first impression is what we require.

If two are almost equally good or bad in your opinion, select the one that is just preferable, even if it is a very small difference.

Ignore the edge boxes with things like PS1 or B2 in them.

Try to complete all the boxes.

Thank you for your help. Your answers will be very important for this research.

Amr Elkersh

The inventory

	PS1	BS1	C1	B1	E1	P1	L1	H1	A1	M1
PS2	1- Physicist 2- Engineer	1- Hospital consultant 2- Physicist	1- Cashier 2- Carpenter	1- Bank teller 2- Mechanical engineer	1- Head teacher 2- Civil engineer	1- Criminal lawyer 2- Design engineer	1- Librarian 2- Plumber	1- Disabled children's welfare 2- Plastering	1- Portrait painter 2-Concrete worker	1- Violinist 2- Builder
Bs2	1- plumber 2- gardener	1- Physiologist 2- Zoologist	1- Statisticaian 2- Botanist	1-Business Manager 2- Physiologist	1- Mayor 2- Veterinary surgeon	1- Trade union arbitrator 2-Environ-mental health	1-Foreign correspondent 2- Hospital consultant	1-Imam or priest 2- Gardener	1-Art critic 2-Bacteriologist	1- Music composer 2-Surgeon
C2	1- Concrete worker 2- Cashier	1- Physiologist 2- Statistician	1- Cost analyst 2- Tax specialist	1- Manufacturer 2- Bank examiner	1- Judge 2-Tax specialist	1- Politician 2- Cost analyst	1- Author 2- Insurance statistician	1- Social services 2- Accountant	1- Artist 2- Auditor	1- Organist 2- Cashier
B2	1- Stonemason 2- Bank teller	1- Anatomist 2- Manufactureer	1- Accountant 2- Retail merchant	1- Retail merchant 2- Manufactureer	1- Member of parliament 2- Wholesale merchant	1- Political speaker 2- Bank manager	1- Newspaper editor 2- Importer	1- Nursery teacher 2- Hotel manager	1- Portrait painter 2- Building contractor	1- Violin soloist 2- Estate agent
E2	1- Electrical Engineer 2- Museum director	1- Zoologist 2- Factory manager	1- Insurance statistician 2- Member of parliament	1- Stock broker 2- City mayor	1- Hotel manager 2- Mayor	1- Publicity writer 2- Army officer	1- Magazine writer 2- Ships captain	1- Imam or priest 2- Head teacher	1- Sculptor 2-Judge	1- Singer 2- Hospital manager
P2	1-Mathematician 2- Criminal lawyer	1-Bacteriologist 2- Advertising manger	1- Bank examiner 2- Trade union arbitrator	1- Estate agent 2- Political speaker	1- Coasfguard officer 2- Editorial writer	1- Criminal lawyer 2- Political speaker	1- Historian 2- Sales manager	1- Social services 2- Insurance salesperson	1- Cartoonist 2- Politician	1- Choir director 2- Sales manager
L2	1-Concrete work 2- Author	1- Botanist 2- Librarian	1- Accountant 2- Lecturer	1- Store manager 2- Lawyer	1 Hospital manager 2- Journalist	1- Sales manager 2- College professor	1- Newspaper editor 2- Magazine writer	1- Counsellor 2- Editor	1 - Design engineer 2- Hisorian	1- Song writer 2- Foreign correspondent
H2	1- Builder 2- Imam or priest	1- Gardener 2- Nursery teacher	1- Purchasing agent 2- Nursing auxiliary	1- Retail merchant 2- Primary Teacher	1- Head teacher 2- Social services	1- Advertising manager 2- Counsellor	1- Lawyer 2- Red Cross	1- Child welfare 2- Ambulance paramedic	1- Stage director 2- New imam or deacon	1- Organist 2- child welfare
A2	1-Mechanic Engineer 2- Traditional Egyptian artist	1- Surgeon 2- Sculptor	1- Tax specialist 2- Textile designer	1- Wholesale merchant 2- Art critic	1- Ships captain 2- Commercial artist	1- Radio commentator 2- Stage director	1- Writer 2- Artist	1- Red Cross 2- Portrait painter	1- Commercial artist 2- Art critic	1- Music teacher 2- Costume designer
M2	1- Astronomer 2- Music teacher	1- Biologist 2- Pianist	1- Cashier 2- Band leader	1- Building contractor 2- Song writer	1- Factory manager 2- Organist	1- Insurance salesperson 2-Violinist	1- Librarian 2- Music composer	1- Nursery teacher 2- Singer	1- Textile designer 2- Orchestra conductor	1- Pianist 2- Violinist

**some changed has been done after the pilot studey on the arab Phd and the student age between 12and 15 years old.this chang was.
1-H1/B2 from (children's home) to (Nursery teacher),2-A1/L2 from (designer) to (design engineer), Ps1/H2 from (Nursing auxiliary) to (Imam) and B1/M2 from (insuramce broker) to (Building contractor).

Appendix 5

Student Pilot Occupations Questionnaire

For the Arab student sample
Age between 14-16 years old in UK

Occupation or Job	I know this Occupation.	I have heard of this Occupation.	I have never heard of this Occupation.
I-Physicist			
2-Engineer			
3-Anatomist			
4-Mechanical engineer			
5-Inventor			
6-Purchasing agent			
7-Automobile dealer			
8-Electrical engineer			
9-Museum director			
10-Criminal lawyer			
11-Author			
12-Astronomer			
13-Clerman			
14-Machineal designer			
15-Landscape architect			
16- Electronic expert			
17-Physician			
18-Physioloist			
19-Zooloist			
20-Statistician			
21-Manufactutuer			
22-Factory superintendent			
23-Bacterioloist			
24-Advertising manger			
25-Botanist			
26-Diplomatic			
27-Horticulturist			
28-Recreation director			
29-Sureon			
30-Sculptor			
31-Auditor			
32-Cost analyst			
33- Tax specialist			

Occupation or Job	I know this Occupation.	I have heard of this Occupation.	I have never heard of this Occupation.
34-Accountant			
35-Retail merchant			
36-Insurance statistician			
37-Campaign manager			
38-Bank examiner			
39-labor arbitrator			
40- Textile designer			
41-Cachier			
42-Banker leader			
43- Banker			
44-Business manager			
45- Investment broker			
46-City mayor			
47-Real estate			
48-Pollitical speaker			
49-Store manager			
50-Lawyer			
51-Vocational counsellor			
52-Wholesale merchant			
53-Art critic			
54-Insurance broker			
55-Civil engineer			
56-State engineer			
57-Coast guard officer			
58-Editorial writer			
59-Hospital superintendent			
60-Social service			
61-Commercial artist			
62-Organist			
63-Bridge designer			
64-Public health			
65-Publicity writer			

Occupation or Job	I know this Occupation	I have heard of this Occupation	I have never heard of this Occupation.
66-Sales manager			
67-Y.M.C.A.secretary			
68- Radio commentator			
69-Stage director			
70-Insurance salesman			
7l-Violinist			
72- Foreign correspondent			
73-Importer			
74-Child welfare			
75-Missionary			
76-Columist			
77-Portrait painter			
78-Bulding contractor			
79-Catoonnist			
80-Choir			
81-Costume designer			

Thank you for your help

Appendix 6

Plumber Invitation Poster

Dear plumber

<u>Can you</u>

<u>help?</u>

Research into plumber training in Egypt and UK

Can you spare 15 minutes?

We need to talk to successful plumbers.

We know you are busy!