KNOWLEDGE REQUIREMENTS IN ARCHITECTURE:

A Survey of Attitudes

A thesis submitted to the University of Manchester,

for the degree of Doctor of Philosophy (PhD) in the Faculty of Arts

1998

Ali Alai

School of Architecture

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ABSTRACT

This thesis is based upon the belief that a sound knowledge-base is essential for architectural design but observes that there are differences of opinion about the kinds and extent of knowledge that should be taught.

Recognising that there are different kinds of knowledge used in design and taught in schools of architecture, the thesis initially sets out first to categorise these various kinds of knowledge, considering the possible kinds of knowledge that might be taught. These are divided by subject and by type of knowledge within each subject. Three types are identified and defined: general knowledge, theoretical knowledge and practical knowledge. The difference in the nature of the material, in the same subject area, which may be taught to architects and to other professionals is discussed. Using syllabuses obtained from a number of schools of architecture in the UK, individual items of knowledge were identified and then categorised according to the categories defined.

A questionnaire was compiled using items from within three topic areas, history, construction and architectural practice. This questionnaire was sent to different groups ranging from students to principals of practices. Respondents were asked, in a postal survey, their opinions on the degree to which the subject areas were adequately taught in schools and the necessity for teaching individual items of knowledge. It was therefore possible to compare the responses of the different groups of individuals.

The implication of this research could affect both future architectural research and the design of course syllabuses.

DECLARATION

No proportion of the work referred to in the 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.

ACKNOWLEDGEMENTS

First of all, I express my gratitude to God, who enabled me to complete this study. Then I would like to thank Doctor David T. Yeomans for his unfailing support, patience and encouragement during the process of this research, without which this thesis would not have been completed. He was not only my supervisor but also my father during my stay in the UK.

I would also like to thank my family, especially my wife Mrs. Atefeh Mohammad-Shahi for her constant and considerable patience.

I wish to record my gratitude to all the teachers and staff in the School of Architecture at the University of Manchester, for their kind support. Finally, I wish to extend my gratitude to all teachers, students and architects who participated by filling in the questionnaires for the survey and also those staff who helped me to administer the documents in the Schools of Architecture.

Ali Alai
November 1998

INTRODUCTION

This thesis is based on the belief that knowledge is an indispensable basis for architectural design but observes that there are considerable differences of opinion about the kinds and extent of knowledge that should be taught. Other researchers have sought the opinions of practitioners or of educators about what should be taught in schools[1], but the essence of this work has been to compare the opinions of different groups of people.

It is important to note that knowledge is different from information and experience and knowledge is of different kinds. For example, what is taught in schools of architecture, as knowledge and skills, may range from simple facts which are directly (or indirectly) applied in design to more fundamental theses upon which these pragmatic elements draw. The problem for the teacher is to strike the balance between providing immediately applicable information and developing the foundations upon which later knowledge and understanding will be built i.e. education for later career development. Schools and practices are both providers of knowledge, but of rather different kinds. The basic and theoretical knowledge of an architect plays a vital part in his/her career, but practices do not usually provide this kind of knowledge. These will be discussed more in chapter one.

---

[1] This will be discussed in more detail in chapter two.

The main objective of this research is to look at the differences of opinion about the requirements for architectural knowledge. The first step in this investigation is to categorise the different kinds of knowledge used in design and taught in schools of architecture. This subdivision of knowledge must go beyond the simple division into subjects and must address the differences in knowledge type referred to above. Knowledge taught to architectural students may be categorised according to three principal variables. First there are the *subjects* within which there are those used (directly or indirectly) in design and those which are required by architects for other reasons, such as architectural management. Secondly, knowledge within each subject may be broadly divided into three categories: general knowledge, basic theoretical knowledge and the practical knowledge derived from the latter. Of course knowledge of how to do something is not always derived from theoretical knowledge. It may also be derived from practice. Such 'tacit knowledge' is an essential element in the practise of any skill but has to be learnt 'on the job'. This is explained in more detail in chapter one, together with some explanations about the reasons why this kind of knowledge is excluded from this research. Some general knowledge is essential for the study of any subject. For example, the study of architectural history would be meaningless without some background in general history. Subjects vary in the extent to which they draw upon theoretical knowledge but subjects in the engineering disciplines, such as structures and service engineering, have tended to lay a strong foundation in theory before developing the practical knowledge used in design. Practical knowledge in subjects related to design activities is more concerned with the details of construction and is usually used in the final stages of design. Some practical knowledge, actually required for design, may not be used in the design studio but be required for later practice, such as health and safety issues or codes of practice. It is worth noting that practical knowledge is more changeable than general and theoretical knowledge; it is the kind of knowledge which changes in technology may make obsolete. One can actually identify a progression from general knowledge, through theoretical knowledge to practical knowledge. This division is called the 'level of practicality' in this study.

The third major variable is the end-user of the knowledge. While subjects such as environmental control and structural design are taught to architects, it is engineers who will be practising in these areas. Thus, we have two types of usefulness, one that is directly useful to architects and one that is useful to other professionals e.g. service or structural engineers. This affects the content of practical knowledge and might inform the way in which the basic theory is taught. We will see that consideration of this is outside the scope of this thesis but the issue may be dramatically illustrated by the possibility of teaching structures to archaeologists. This would be approached in quite a different way from teaching the subject to engineers.

To assess the kind of material being taught, an analysis of course syllabuses in schools of architecture was carried out. This was the only practical way to address this question and if it did not reveal what was actually taught, it showed what people thought it was important to teach. All schools of architecture in the UK were asked for their course syllabuses. Slightly less than half provided sufficiently detailed replies.

Five courses were common to almost all schools of architecture: structures, construction and materials, history of architecture, architectural practice and environmental control. Each course syllabus consists of a list of items which can be considered as items of knowledge and the list of these was categorised as described above.

To reduce the large amount of data (items of course syllabuses) to manageable proportions, analysis was restricted to just three subjects: "Architectural practice" as the only non- design-related subject, "Construction and materials" as a representative of technical knowledge and "History of architecture". This third subject was chosen because the preliminary analysis of syllabuses showed that it differed from other subjects. It was shown to be one of the most theoretical subjects with the least amount of practical applications.

Items of knowledge also fell into natural groups revealing the "topics" being taught. It quickly became clear that while there were some topics dealt with in every syllabus, there were those that were frequently, but by no means universally taught and some that might appear in only one or two syllabuses. These last perhaps reflect the special interests of a particular teacher; aspects of the subject that might be regarded as rather esoteric. This led to the 'concept of esotericism' among knowledge topics. Briefly, those topics taught by most schools were defined as less esoteric subjects and those occurring less frequently defined as highly esoteric subjects. More explanation about the whole procedure and methodology of categorisation is provided in chapter three.

The data collected from the course syllabuses illustrates what schools intend to teach, but the issue that I wish to address is what others (students and professional architects) thought important. What subjects do they think should be taught and at what level of practicality? To what extent is there general agreement on this? For example, if there were general agreement then there would be no esoteric topics taught.

Other works, such as those by Seidel (1994), Gartshore and Mayfield (1989a & 1990), Mackinder (1980) and Mackinder and Marvin (1982), have also looked at what people believe should be taught, but in each of these cases the researchers looked at single groups of people and, because they asked different questions, comparisons are difficult. By asking the same questions of different groups it was possible to compare what different groups of people believed should be taught: students, their teachers and their eventual employers. There were eight groups of respondents in this survey: first-year and third-year undergraduates, B. Arch. or diploma students, teachers, heads of schools, junior and senior architects and principals in practices.

Of all these, two kinds of question were asked: Did people think that enough of a particular subject was taught in schools and did they think that particular items of knowledge should be taught? A questionnaire was designed addressing both the adequacy of and necessity for teaching the three selected subjects.

A selection of items was made for the questionnaire to determine whether there was any relationship between perceived adequacy of teaching in each subject area and the necessity for teaching certain subjects. For example, one might think that enough history was being taught precisely because one disregarded the importance of the subject.

The process of selection of items was carried out in three phases. At first, all of the items in each course syllabus were divided into the three levels of practicality. This enabled the topics to be identified. Then, the frequency of topics was noted to determine 'esoteric levels'. Finally, under each level of practicality and esotericism, the clearest topics and items were selected for inclusion in the questionnaire. This process is explained in more detail in chapter three.

The questionnaire was sent to 30 schools and about 200 practices in the UK. A total number of 461 responses was received. Data was analysed in three different ways: views on the adequacy of the teaching in selected subjects, views on the necessity for teaching certain topics and the relationship between these two views. The full scope of the procedure and analysis will be examined in chapter four, however a summary of some general points might be of interest here. Results generally showed that different groups of respondents have different attitudes about the requirements for knowledge. For example, the attitudes of teachers are not similar to those of students and practitioners and the attitudes of junior architects differ from those of experienced architects. Results also showed that the attitudes towards different subject courses and also towards different levels of practicality are different. For example we found that architectural practice is not taught frequently enough in schools, while there is uncertainty about the adequacy of the teaching of history. It was also found that people understand the need for practical knowledge and also that basic and theoretical underpinnings are appreciated and wanted.

The survey showed that there are differences in attitude between different groups of respondents. However, the differences that were found were not those that might have been expected. It could have been expected that there would be a division between the views of 'academicians' and 'practitioners', with some consistency of views within each of these two groups. In the event it was not found to be so. There were greater differences between academicians treated as a group and practitioners treated as another group, than had been anticipated. An implication of this is that we can treat neither as one homogeneous group. Chapter five deals with these comments and also considers some implications for further research.

Chapter One:

KNOWLEDGE AND ARCHITECTURE

"Let him be educated, skilful with the pencil, instructed in geometry, know much history, have followed the philosophers with attention, understand music, have some knowledge of medicine, know the opinions of the jurists, and be acquainted with astronomy and the theory of heavens."

Vitruvius, Book 1, article 3[1].

While the definition of knowledge is a matter of debate among philosophers, our concern here is with its definition in the context of education. Bloom (1956: 29), describes knowledge as ". . . something which is filed or stored in the mind of the individual". Then he says of knowledge (1956: 201) that it ". . . involves the recall of specifics and universals, the recall of methods and processes, or the recall of a pattern, structure, or setting"[2]. He recognises that knowledge is something that one can recall from the mind but does not specifically differentiate between information and knowledge, a distinction which is important in the context of this study. In order to be more precise, knowledge will be defined here as information already known to or understood by the individual, in contrast to information which is not yet part of the

---

[1] Cited by Cuff (1989).

[2] Note that in saying this, Bloom is distinguishing between knowledge of facts and knowledge of processes. This is important in considering the education of professionals because both kinds of knowledge are commonly taught. The difficulty is that a knowledge of processes may be acquired as much from practice and so through informal teaching; e.g. in studios as much as in the formal classes which this study addresses.

individual's consciousness. A definition of knowledge is also given by Cole and Cooper (1988), which is relevant to the explanation above. They say that "Knowledge can be seen as simply internalised information". But more particularly they consider 'professional knowledge' as that knowledge which is "information assimilated within a profession".

When knowledge is put into practical use, it gradually becomes a part of experience, which then makes further use much easier. A definition of "experience" is given in a report by the International Council for Building Research Studies (CIB, 1978: 85) which states: "Experience is knowledge which has been applied in practice".

Facts are seen either as passing across the boundaries from information through to experience or the boundaries of knowledge and experience expand outward (Fig 1-1).

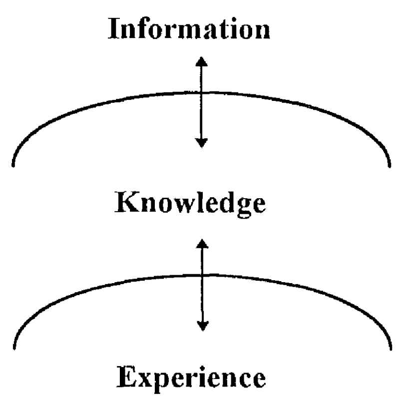

Fig 1-1: The gradual progression of information towards knowledge and experience.

The important point to recognise is that we need to distinguish between information, knowledge and experience. What is taught in schools[3] is expected to be a part of

[3] Here I mean schools of architecture.

students' knowledge, even if there is not enough time for it to become a part of their experience through use. Students are sometimes trained to use information and also to become familiar with sources of information. The way in which knowledge may be used, and where to look for it will gradually become part of their knowledge and (hopefully) their experience, which is again one of the objectives of education.

It is useful to mention two points here. One is that there is a distinction between having knowledge and using it. A complex procedure is involved when knowledge is being used, which is a subject of discussion in psychology and education[4]. The focus of this study is the former, which is the possession of knowledge.

Secondly, there is also a distinction between "knowing what" and "knowing how" i.e. knowledge of fact and knowledge of how to perform. Knowing how is knowledge of a process. In regard to this study, in particular, a designer needs two kinds of such operational knowledge. First he must know how to perform the operations involved in design and should be in possession of all the necessary facts. However, when his knowledge is inadequate, information must be sought and so a knowledge of how to obtain this information is required. This is a second kind of knowing how, a distinction already discussed by Vincenti (1990: 13). This kind of knowing how is important in this study, while a knowledge of design processes, the first kind of knowing how, is not.

---

[4] Bloom (1956, part II) discusses this in greater detail.

Information and knowledge in architecture

Information and knowledge have a vital role in the practice of architecture[5]. Burnette (1979) says that it is a professional's [architect's] access to relevant information, his build-up of knowledge and his ability to apply this information and knowledge appropriately, which distinguishes his judgement from that of a lay person.

This makes the professional's role increasingly difficult because for a long time architects have been confronted by an increasing growth of information. During the last half century, information has expanded rapidly within all the subject areas with which architects have to deal. Cole and Cooper (1988) pointed out that around the middle of the last century, the body of information required for architectural practice could be contained within a single book, such as Gwilt and Papworth's *Encyclopaedia of Architecture* (1876). Bradfield (1983, citing Hall 1981) notes that in less than twenty-five years (between 1968 and 1980) the volume of bibliographical references available alone has increased nearly seventy times.

New information is provided by research activities[6], the results of which are then filtered and repackaged in order to produce building information (Bullivant, 1959). Apart from this, building information may be produced as a result of questions raised

[5] It is worth noting that any discussion in this chapter without considering architecture as a profession may cause misunderstandings.
[6] For further explanation about the production of information, the reader should refer to Vincenti (1990).

directly from construction activities or problems. Design involves predicting the in-service performance of the designed artefact and this is done on the basis of the information available, which may be the result of scientific activity. However, this is an imperfect process, occasionally leading to failure, so information may be generated as a result of the investigation of such failures[7]. But the recognition of the imperfect nature of the process has also led, for example, to the development of some user-participation or post-occupancy studies; relatively new types of scientific research (Kernohan et al., 1992; Sanoff, 1992). This building information in turn is expected to be used by building professionals (here architects) in their projects[8]. Just as building information expands every day, so professional knowledge and experience expand into the area of building information (Fig 1-1).

Nobody actually expects every individual to be in possession of all the information available as a part of his knowledge. But individuals differ, both in their amount of knowledge and in their ability to seek appropriate information. For example, there are clear differences between younger and more experienced architects, in the amount of their knowledge. However, it would be wrong to infer that it is age alone that determines the ability to increase knowledge. Individuals go from education into

---

[7] Several researchers have discussed the question of building failures and the information feed-back which is useful for architects and building professionals. As an example we can refer to: Yeomans, D. T. (1988), or Coleman, A. (1990).

[8] There is also another kind of information which is not a matter of debate in this study but needs to be mentioned. This kind of information is specific to projects, so it is better to name this "Project Specific Information". This information is usually provided in the programme or brief report and the content would be about site, client requirements or any information relevant to specific projects.

different kinds of practice and their opportunity to increase the knowledge that they have will be influenced by their experience of practice and the information sources to which they are exposed. Educators should presumably take account of this in the preparation they provide for practice, especially in giving guidance on the acquisition of information. It is apparent therefore, that not only knowledge but also the ability to seek appropriate information is important, since they are mutually dependent. Knowledge will be increased in relation to an individual's ability to obtain information, which in turn depends upon a knowledge of information sources and the individual's knowledge of how to interrogate these sources. This supports the value of the initial knowledge which is gained during education in schools.

Requirements for knowledge

First of all it is helpful to note that "knowledge requirements in architecture", is rather a general expression and does not distinguish knowledge which may be required in different parts of the world, either different countries or different geographical regions. The point to note here is that different countries will present different kinds of problem requiring different knowledge (Orbasli & Worthington, 1995). This makes the phrase much more ambiguous, because different cultures, geographical regions or different economic conditions may call for a variety of requirements. Even if problems are the same, however, the legislative framework within which professionals work will define their roles differently and may have a consequent effect on the knowledge that they need. This study is focused on the education of architects in the UK, but both the methodology and results may be used elsewhere. The extent to which the results may be applicable elsewhere will be discussed in chapter five.

Knowledge for architects has been a matter of debate, at least since half a century ago. The Oxford Conference can be considered as an initial attempt at restructuring architectural education and its requirements. For example, Llewelyn Davies (1957) in his report for the conference, introduces knowledge as a raw material for design and categorises architectural knowledge as *means of building* i.e. structure, materials and techniques, and *needs* i.e. functional and physical requirements. He also considers the importance of the social sciences as a kind of knowledge required in architecture. Since the Oxford Conference, efforts have been made to change and develop architectural education in order to make designers more scientifically literate, as well as to produce, filter and repackage information to make it more easily applicable and accessible[9]. This is done through initiating post-graduate degrees, introducing new courses in schools, increasing technical education, introducing examinations to enter the practice, establishing information services and technical bureaux (Cole & Cooper, 1988).

But, still architects are under pressure, both because of accusations made about their lack of appropriate knowledge and also their ability to cope with recent changes necessary in the profession (Cole and Cooper, 1988; Cuff, 1989). Some researchers

---

[9] Of course another strategy could be to restrict the architects' task by assigning roles to other professionals!

blame the educators and believe that architectural education has not responded appropriately to new requirements and so needs to change its traditional methods of teaching in some way (Salama, 1997). There are also other researchers who blame professionals for not responding appropriately to social or technical aspects in design activities (Cuff, 1991; Mackinder, 1980). These all directed me towards looking at practising architects to see how they would use information and knowledge.

Functions of information and knowledge in architectural practice

To investigate the conditions surrounding information acquisition and knowledge use in architectural design activities, a preliminary study was conducted in the summer of 1996. The primary objective of conducting a survey among the practices was to determine whether it was possible to trace the use of information and knowledge in architectural design activities. A secondary aim was to identify methods that might be used in further research. The preliminary study began with a one-week free observation in a medium-sized architectural practice. Observations were made of individual activities, design meetings and discussions and library searches. There were also some interviews with designers. I personally took part in some design activities and also looked through some project documents[10].

Following this, formal interviews were conducted and observations made in eight offices around Manchester and Stockport. The initial observation had helped to

[10] A summary of important notes is given in Appendix 1; part one.

establish a formal structure for these subsequent investigations which could thus be carried out in a much shorter time. Three particular tasks were addressed in this investigation:

1) Interviews with the principals of the practices. The interviews were conducted in order to find out about the number of architects, the information available and its collection system, and whether the practice had applied for the 'Quality Assurance' certificate.

2) To examine the kind of information which was being kept by each practice[11].

3) To observe the way in which the information was used.

This survey had two major findings as follows:

1) It is rare to see architects reading information in order to gain knowledge in practice. Architects usually draw on their own store of knowledge. Where this proves inadequate, they may draw upon their colleagues' knowledge. This confirmed observations by Mackinder and Marvin (1982: 9-11) who found that architects would prefer to refer to their own or their colleagues' knowledge or experience rather than to seek written information. It also illustrates the existence of a sort of shared knowledge in architectural practices whose extent and quality depends on the number of experienced professionals and their speciality[12]. This is related to the earlier comment about the opportunities which young architects have to increase their knowledge. It

---

[11] A summary of findings is given in Appendix 1; part two.
[12] Further explanation about the concept of 'shared knowledge' is given by Allen, T. J. (1970).

will be partly dependent upon the shared knowledge within the practices in which they work but also upon the kind of tasks which they are given and so upon their need to draw upon that shared knowledge. Mackinder and Marvin (1982: 9-11) also pointed out an outstanding unwillingness by designers to consult written data, and an attendant preference for relying on experience[13], partly because consulting written data was seen as time-consuming. A consequence of this is that sources of general knowledge are rarely available within architects' offices. This will be explained further later on. Mackinder and Marvin also pointed out that architects referred to information merely as a means of solving specific problems rapidly. In another work, Tzamir and Churchman (1989) also found similar behaviour by students. As a result of their survey they found that "...the dominant sources of knowledge on which the students relied were their own experiences , feelings and ideas". An additional point, also made by Lera, Cooper and Powell (1984), is that throughout the process of designing, the types of information that designers choose and/or the choices that they make at each stage of design, are likely to be affected by their predisposition. It could mean that architects tend to design in the same style, they will presumably be drawing on and referring to the same body of knowledge. It also confirms previous comments that architects mainly refer to a piece of information which they already know about i.e. they know the location of a body of information but need to look up specific data.

[13] The word 'experience' used by Mackinder and Marvin, applies to both meanings of knowledge and experience, which has been discussed previously in this thesis.

We can conclude from our observation that architects usually do not refer to written information for finding something new, or gaining new knowledge, but for those things which are difficult to memorise. This is more obvious in the work of engineers who usually use their handbooks for rapid reference to constants and figures.

It is worth noting that professional practice here in the UK has recently been affected by the development of Quality Assurance systems. These require that sources of information be kept in a central library[14]. Naturally, employees will be reluctant to do this with their own books, and it may also be inconvenient for frequently-used information which they will want to keep near their desks[15]. Thus, 'quality assurance' may have an affect on the way information is handled within the office and thus may in turn effect behaviour. This theory needs more appropriate investigation.

2) The kind of information that architects normally hold in their offices, and keep up-to-date, is practical information, that is, information for their daily work in practice, such as manufacturers' data, building regulations, British Standards, specifications and tender documents, some legislation, manuals and journals. The amount of other kinds of information, such as text books or technical abstracts, is very small and usually very old, most commonly belonging to the principals of the practices. Thus, the kind of knowledge which architects may possess during their work in practice is practical

---

[14] I found this, during interviews with principals of practices.
[15] See Appendix 1; part two.

knowledge and there is no possibility of gaining basic knowledge even if someone wishes to.

It was clear from the observations carried out and from material available in offices, that gaining knowledge is not an easy and routine matter during daily work in architectural practices. It is also clear that the kind of knowledge that architects usually obtain during their years of experience in practice is mostly 'practical knowledge'[16]. It is exceptional for them to have an opportunity to gain general and basic knowledge during this time, unless they have a personal interest and gain knowledge in their spare time out of the office[17]. However, we should note that the RIBA, in common with a number of other professions, is now requiring that their members demonstrate time spent in continuing professional development (CPD). The extent to which the knowledge which they gain as a result of this falls into different categories of knowledge has not been specified by the professional body and so will presumably vary from person to person, depending upon both personal inclinations and opportunities, although it may also be affected by office policy (Yeomans & Neary, 1995: 5-6). The long-term effect of this remains to be seen.

---

[16] This term will be explained in greater detail in chapter three.

[17] Mackinder and Marvin (1982: 57), reported that architects often think about their work, sketch on the backs of envelopes, discuss schemes informally with their colleagues in social situations in time away from the office.

Context of research

'Architecture' cannot be regarded simply as a pure art nor as a simple profession (Kaye, 1960; Crinson & Lubbock, 1994). Thus, knowledge in architecture is neither just artistic knowledge nor just professional knowledge, for both will be involved. Architectural design is not carried out only by a few special people around the world (Prak, 1984). Any-one who is interested could be educated as an architect. So in general we can deduce that architectural education should provide opportunities for every-one to obtain 'necessary knowledge' in the field. Now the obvious question is what is this 'necessary knowledge'?

In earlier parts of this chapter we considered the need for a primary basic knowledge for architects which would enable them to develop their knowledge in the future. This knowledge is usually obtained through education in school and its quality will help them to be able to use and understand much greater kinds of information in the future. It will also enable them to acquire it faster and have greater confidence in seeking it. This basic knowledge will enable graduates to work on variety of activities. During our investigation in architectural practices, we also considered the importance of practical knowledge in the day-to-day practising of architecture. This kind of knowledge is often obtained in practising architecture and not through education. Therefore it seems that people in education may be interested in different kinds of knowledge from people in practice.

Statement of research

As an initial assumption, this study assumes that two sets of perceptions are likely to exist about the 'requirements for knowledge in architecture'[18]. One belongs to the academicians: teachers and heads of schools and the other to the practitioners: principals and architects in practices. This means that if, for example, we conduct a survey asking a group of teachers what are the knowledge requirements in architecture their answers will probably be influenced by their particular interest in architectural education, while another group of respondents (practitioners, for instance) may consider their own architectural activities in framing their answers and perhaps be influenced by the experience they have. A survey will be conducted as part of this study to confirm/ disprove this assumption.

The difference between education and practice in architecture is actually a matter of debate among researchers. Stevens (1995) believes that two separate cultures exist in the schools and practices of architecture. He argues that students are being trained in schools for an unrealistic fantasy land, a professional world, that does not exist, and says that "...architectural education is only partly a vocational training (reproducing producers)... also producing consumers of the general culture of the dominant groups in society". Of course this is not unique to architectural education: medical education is based largely on hospital practice and taught by hospital practitioners, while the

---

[18] 'Requirements for knowledge in architecture' is placed in inverted commas, in order to remind the reader about the discussions in earlier parts of this chapter.

majority of doctors will eventually find themselves in general practice. In another study Buchanan (1989) points out that almost all schools of architecture failed to perceive changes being confronted by and within the architectural profession. Cuff (1989: 188-189) takes a more positive attitude than some other commentators and believes that the distinction between school and practice is a natural difference between two different environments, education and apprenticeship. However, she confirms that a rather disorganised situation has not allowed those entering the profession to gain necessary skills or knowledge relevant to the changing requirements for practice.

One important point to note here is the extent to which educators focus on practice. Some believe that education should look towards the needs of practice while others see it as conducted only on its own terms. This difference in focus also affects researchers. There are those like Seidel (1994) who are concerned to obtain the views of practitioners because again they believe that education should, at least in part, serve these needs, or Salama (1997) who also takes this same view and, for improving studio teaching, looks at the ways in which it is possible to make architectural projects in schools of architecture more realistic. Other researchers focus entirely on the views of educators but in some cases it is not actually clear whether or not they have the same beliefs. We can be sure that Mackinder and Marvin (1982) were concerned with the needs of practice but it is not clear whether Gartshore and Mayfield (1990) were interested in practice or not.

What we may be sure of is that those researchers who believe in the importance of either environment as the determinant of knowledge requirements i.e. school or practice, may also have different opinions about the 'knowledge requirements'. For example this difference became obvious during discussions in a conference at the IAAS in York[19]. It was said by some researchers that "science is no longer a paradigm for architectural knowledge and that a technological context to the curriculum could receive little justification" (Cited by Symes, 1997). This is actually different from the opinions of those researchers who produced the HMI report (1985), regarding the current conditions of teaching science and technology in schools of architecture. They commented that "an unacceptably high proportion of students pass through the courses without acquiring or being required to demonstrate a knowledge of fundamental principles of building science, economics and practical construction technology" (Cited by Gartshore & Mayfield, 1989b). This is similar to what practitioners believe about this. The results of a survey conducted by Denis Mills Associates (1988) also show that 87% of architects believe that more attention is needed, in architectural training, to practical aspects of building construction.

What we are seeing here is the kind of difference in views postulated earlier. We know that there is a difference of view, the question is, in what ways is it different? The relevance of this question can be seen from a conclusion drawn by Symes (1997) that

---

[19] Perspectives on Architectural Education (11-12 Nov. 1996), Institute of Advanced Architectural Studies, York.

some researchers believe that practitioners might prefer students to have only a *general understanding of building*. Even if educators believe in the importance of technology teaching, the question is what kind of technology teaching, i.e. what kind of technological knowledge should be taught? A diverse set of opinions also exists in discussions on other aspects of architectural education, such as studio teaching, briefing and programming or assessment. For example, in Symes (1997) again we read that the impression given by a number of researchers about assessment in architecture is that "...precise performance should not be defined in advance, students would develop their abilities to greatest advantage if they were applauded for *offering a personal response* to problems and contexts. . . [However], it was also argued [by other researchers] that students needed, or even on occasion demanded, clear and straightforward objectives and clear and precise evaluation of their abilities to meet them"[20]. There are also debates about the response by schools of architecture to recent changes which have occurred in the practice of architecture. Some believe that there is little in the curriculum that reflects how the nature of architectural practice has changed (Alexander, 1996). However, that there are such differences of opinion is only an impression derived from a range of different bodies of research; an impression which will be explored in more detail and will also be quantified in the course of this research.

There is also a second assumption which will be investigated in this study. It seems possible that architects' opinions about the requirements for knowledge change over

[20] Of course the two are not incompatible although debates are often conducted as if they were.

the time (from school to career and onwards). Either that, or the knowledge requirements in architecture are changing over the time. In a survey by Seidel (1994), nearly 80% of principals said that architects need to receive training on 'client relations', while just 13% of them said that they received adequate training in this field. This suggests that the need for this kind of training was not fully appreciated by their teachers. In contrast, in Gartshore and Mayfield's report (1989b), senior architects said that the perceived skills of students in 'client issues' were equal to their expectations. According to scales provided in that survey, they generally expected only a moderate understanding of the issue. Whatever their expectations is, we can conclude that senior architects are satisfied with the operation of schools, which is different from what principals believed about their education in this matter. There is probably an age difference between these two groups of respondents i.e. principals and senior architects, and also a difference between their activities and responsibilities in the practice. Therefore, this difference of opinion could have three causes: the kind of knowledge which is taught to students has changed over the years, peoples' opinions may change over time because of better understanding of the knowledge requirements, or finally it is possible to assume that people are unable to make accurate judgements about their own level of knowledge. Another intention here, therefore, is to explore if there are changes in requirements for knowledge over time.

Other researchers have tried to explore the requirements for knowledge in architecture, on the basis of students', teachers' or architects' opinions, selecting respondents to match the nature of the question they are exploring. The opinions of respondents obviously depend upon the environment and its culture in which the respondents are working. However, it is important to note that these studies have their own objectives and none of them particularly examined in detail the attitudes about the requirements for knowledge. It is the comparison of perceptions among members of both environments (schools and practices) which is the point of focus in this study. On the other hand, it is not possible to use the results of earlier research to compare the views of academicians and practitioners, because the questions asked by each were different. Nor is it possible to develop our research on the basis of the findings of these researches, nor to come to any universal judgement by using their conclusions. However, it is possible to adopt some of the methodologies and processes used in these studies and develop them for the particular objectives of our research. For this reason, two studies have been selected which will be discussed in the next chapter.

In this research particularly, I try to show that individuals' opinions about architectural knowledge and its requirements differ and may depend on the individuals' activities. This will be investigated through working on the attitudes of different groups of people, in school and in practice. Individuals in different activities, such as in practices or schools of architecture, are likely to have different opinions about the requirements for architectural knowledge. In order to obtain a broad and complete perspective in our investigation we need to explore the ideas of as many different groups of respondents as possible.

Methodology of approach

Our investigation could be based on the requirements for practising architects asking, for example, what knowledge is essential to a practice. Alternatively it could be based on the requirements for architectural education asking, for example, what knowledge should be imparted to students. Naturally it would be expected that there would be a connection between the two. Some knowledge needs to be imparted within schools of architecture which will then be used in later practice, However, it is not necessarily taught because it is so needed. It may be taught for quite other reasons, because it is clear that in architecture, as well as in other kinds of professional education, knowledge is provided which is never directly applied in practice.

The problem involved, when trying to work out the kind of knowledge which is needed in architectural practice, is also to identify the boundary of professionals' responsibilities. Practising architecture requires the participation of a number of professionals who deal with buildings or the built environment, such as engineers, planners or quantity surveyors. The problem is in defining who should do what and how much of it, without which, it is not possible to identify the kind of knowledge that is needed in each profession. Cuff (1989) believes that "Since it is not always clear who has the authority to delegate responsibilities, even assigning responsibilities can be difficult in architectural practice". So for example, if we found that somewhere in the world architects are responsible for the structural design of their buildings, we would expect that kind of knowledge to be required to be taught in schools of architecture there. This is an exaggerated example, but today we are confronted by various responsibilities of architects which are handed on to other professionals, such as checking the costs of the construction, calculating the energy use, providing detailed drawings and so on. The problem is that such a redistribution of roles is not officially regulated (at least not in Britain), so we may find some architects who have, or need to have, responsibilities for a greater part of the job overall than others. This becomes obvious when comparing the activities of sole practitioners in rural areas with those of specialist architectural firms in big cities.

The issue is not simply what kind of knowledge needs to be taught but whether sufficient of each kind of knowledge is taught. A kind of detailed investigation is necessary, under the topics of knowledge in architecture. In this case we need to prepare a list of topics or items of knowledge.

There are two possible ways of preparing such a list. One is through consulting course examination documents and the other is through examining course syllabuses. There are some problems in choosing the first sets of documents. First of all, the examination documents are not usually available to everyone and secondly in order to create a complete list of titles covered, it would be necessary to analyse several examination documents from different years. So it was thought that one of the best ways to prepare a list of items of knowledge which is taught in schools of architecture is to carry out an analysis of course syllabuses, as the only practical way to address this question. If it did not uncover what was actually taught, it showed what people it thought was important to teach[21]. Access to and extracting from this kind of information is much easier than the other sorts of information available such as examination documents[22]. However it has some disadvantages. For example course syllabuses do not include the philosophies involved in teaching processes such as explanation about the reasons behind the selection of items, or the kind of knowledge that might be taught in studio classes.

During this survey I was not perturbed that I did not have access to all items of knowledge taught in schools, as this is rather an unrealistic desire. The intention was to develop a methodology based on the information sources and the time available.

It would be helpful to see how others have worked out similar issues. In the next chapter, we will look at two recent studies, concerning architectural knowledge and its requirements, in more detail. The main reason for this investigation is to trace the process and the methodologies used in these studies. Some implications of their results however, may also be used later.

---

[21] This method had its own limitations and ambiguities. See below, pp. 77-78.
[22] A full examination of course syllabuses will be presented in chapter three.

Chapter Two:
PREVIOUS STUDIES

In previous studies, researchers have explored architects', teachers' or students' opinions about the knowledge requirements in architecture and have also observed their behaviour during daily work or study in school (Mackinder, 1980; Mackinder & Marvin, 1982; Seidel, 1994; Gartshore & Mayfield, 1990).

Two particular studies have been selected for discussion here in more detail. These studies explored academicians' or practitioners' ideas about the knowledge requirements in architecture. The surveys were conducted with a sample of respondents, selected mainly from different environments: school or practice.

The sections below précis the contents of their report with comments on its relevance to this study.

The teaching of science and technology in UK schools of architecture.

By: Dr. Philip J. Gartshore and Ian A. Mayfield

January 1990.

Three main objectives were stated for this research. One was to examine the educational aims of schools of architecture. The second was to identify the particular methods of teaching science and technology employed in the schools. The third, was to investigate the attitudes and expectations of students - on entry to the schools - towards science and technology teaching. This last objective is of particular interest to our work, because one of the groups explored here comprises first-year students.

A letter was sent to the heads of departments of all schools of architecture in the UK to ask for their participation. Among them ten schools replied favourably, but only six supplied sufficient information for analysis of the objectives and content of the courses at that stage. However, a selection of five schools was made based on the findings of a previous study by the same group of researchers which suggested that, on the basis of the A-level background of the students of each school, they could be divided into three groups: a science group, an arts group and an intermediate group (Gartshore & Mayfield, 1988). So five schools were selected; two from the science group, two from the arts group and one from the intermediate group.

Data collection was based first on the completion of questionnaires by students and secondly on interviews with staff in the schools.

Questionnaires filled by students

Two sets of questionnaires were used: one for the incoming first-year students and another follow-up, which examined changes in students' attitudes at the end of the first year. In both surveys the same group of students was used. Students were asked to score their answers from 1 (indicating a low score or negative attitude) to 5 (a high score or positive attitude).

The topics dealt with were 1) their impression about their schools, 2) their views about architecture and the work of architects, 3) their views about the subjects in the curriculum and also 4) about the teaching methods. The students' views in sections 2 and 3 above is of interest to our study, so will be discussed in more detail.

Views on the work of an architect

The aim of this section was to examine the perceptions of students about the architectural profession, to discover the origins of these perceptions, and also to compare these views with those of the staff. The list of activities selected for this part of the survey was based on the RIBA plan of work. This list was also used in an earlier study about practical training (Gartshore & Mayfield, 1989b). These activities are:

- Promoting the practice.
- Talking to clients.
- Background research.
- Design at the drawing board.
- Technical investigations.
- Selecting materials.
- Project management.
- Cost planning.
- Supervising construction.

Students allocated a score both for the *importance* they attached to particular activities in the work of an architect and for their personal level of *interest.*

'Talking to clients' and 'design at the drawing board' received the highest mean both of importance and interest by the students. We may assume that 'talking to clients' seems to be viewed by students more as a 'design' activity than a 'commercial' activity, indicating that design activities are seen to be the most interesting and important (Gartshore & Mayfield, 1990: 17).

Except in 'design at the drawing board' students scored the importance of an activity higher than their interest. The gap between interest and importance was widest for practical activities such as 'project management' and 'cost planning'.

To compare the views of architects with students, the results of an earlier study (Gartshore & Mayfield, 1989b) were included in their discussion. In this study, practising architects scored the ability expected of trainee architects, and the ability actually perceived. Practising architects perceived lower abilities than expected for all activities (listed before). However the gap between expected and perceived abilities varied considerably. In 'design at the drawing board', 'background research' and 'investigating technical aspects of the design', the architects had high expectations and perceived the greatest ability. Conversely both expected and perceived abilities were lowest in 'promoting the practice', 'talking to clients', and managerial aspects such as 'cost planning' and 'project management'. The initial expectations of architects varied widely, compared to the importance attached to these abilities by the students, who regarded most activities as quite important. Except in 'background research', 'design at the drawing board' and 'technical investigations', for which the expectations of architects were generally equal to the level of importance stated by students, in other activities the expectations received lower scores. In most cases the perceived scores by architects were higher than interest levels allocated by students.

There are two important points here which highlight some difficulties in comparing the attitudes of students and architects. First of all, although the list of activities was the same, different questions were asked of the students and the architects i.e. students were asked about the importance of the activities and their interest, while architects were asked about the abilities expected from students and the abilities actually perceived (Gartshore & Mayfield, 1990: 16). Secondly students were asked about the work of fully-qualified architects, whereas architects referred to trainee students in their year out (Gartshore & Mayfield, 1990: 17).

The importance of particular subjects in the curriculum

A list of subjects which might be expected to form part of an architect's education and training was used in this part. This list was a composite drawn from subjects in the curricula of the five schools, covering a broad spectrum of science, arts and social science, to include both 'mainstream' and peripheral subjects.

No explanation is provided about the process and the methodology which they used for the selection of subjects.

Students were asked to state their own views about the *importance* of each subject in architectural education and their own level of *interest*, in both questionnaires; i.e. when they entered the school and also at the end of the first year. One of the aims of the research in this part was to examine the changes in attitude during the first year, another was to compare the findings with the views of the staff. Therefore the same list was given to interviewed members of staff so that their views could be compared[1]. The selected subjects in the list were:

- Art history
- Materials science
- Freehand drawing
- Draughtsmanship
- Building economics
- Environmental physics
- Planning (urban, regional, rural)
- Computing
- Environmental psychology
- Architectural history
- Building services
- Aesthetics
- Communication
- Building Construction
- Law
- Landscape design
- Photography
- Sociology
- Management
- Energy use in buildings
- Structures
- Mathematics
- Philosophy

---

[1] It is important to indicate a note which was given by the authors about the validity of statistical measures in this section. The scores allocated by staff are single values [probably because the staff were interviewed just once], so the correlations relating to staff scores are therefore used to provide general indicators only and should not be regarded as statistically valid.

Interviews with staff

Structured interviews with heads of departments and specialists teachers of science and technology were conducted by visiting the schools. The intention was to compare their views with those of the students. Some of the information particularly sought in these interviews was:

a) The educational aims and objectives of the degree course.

b) The educational objectives of science and technology tutors.

c) Differences in approach between the head of department and the specialists in science and technology.

Results

Raw data from staff interviews and the two student questionnaires were analysed. A summary of some of the findings is as follows:

- The 'importance' scores of first-year students about the selected subjects in each school for the follow-up questionnaire were highly correlated with their views at the first stage; there was little difference in responses.
- There was also high correlation between views of students from different schools at each stage, suggesting that students coming into schools of architecture have a uniform view of the relative importance of subjects in the curriculum.
- The high correlation between the responses of students about the 'importance' and level of 'interest' of most of the selected subjects indicated a strong measure of agreement between these two factors.

- Students' views correlated more highly with those of science tutors at the time of the second questionnaire than the first. Therefore staff attitudes may influence student thinking.

- Few significant changes occurred consistently for all schools. Philosophy was regarded as more important by the end of the first year in three of the four schools. Mathematics, on the other hand, was seen as less interesting in three of the four schools.

- Certain practice-related subjects - building economics, planning, building services, law and management - were also seen as less interesting or less important at a majority of schools (by students).

- The categorisation of schools, based on the A-level profiles of their students, as "scientific", "intermediate" and "arts", is only partly confirmed by this research. The staff of the two schools in the "arts" category placed stronger emphasis on science than on arts, yet these schools are perceived by students to emphasise arts more strongly. The "intermediate" school has a strong technical tradition but was seen by students, contrary to their initial expectations, to be somewhat weak on the science side. Of the two in the "science" group, one school did place a very strong emphasis on technology, but the other stood firmly in the "liberal arts" tradition of architectural education.

These explanations could mean that there was no relation between school categories and teaching.

- In general, heads of schools and science and technology tutors agreed about the philosophy of their schools i.e. to be specialised (in arts, science or social aspects) or to produce generalists.

- There was general agreement among staff that, in principle, that science and technology is an inseparable aspect of design.

This result is provided in a form which might be disputed by some. The staff were interviewed on a face-to-face basis. They also knew what the research was about. Therefore they 'knew what to say'. They were also possibly self-selected; interested in the research and its aims. It would be interesting to know what proportion of part-time staff were interviewed and what proportion of studio teachers were among the interviewees, but this information was not provided.

- The objectives of the specialist staff teaching science and technology varied. Most had a pragmatic approach centred on design activities (the 'practical overview' approach), but some staff adopted a 'purist' approach and imparted a thorough theoretical understanding of the subject (the 'bed-rock' approach).

It was not actually possible to ascertain whether the results were affected by the syllabuses or not, because the schools were not identified.

- The importance of the integration of science and technology teaching into design was stressed. Heads of schools took a more positive view than specialist staff of the degree to which this was achieved.

- There was no sign that students rejected science and technology subjects in favour of arts subjects as a result of their first year in schools of architecture. It might be argued that the attitudes of students, at the first year of study, could not reflect the requirements for architecture but reflect the views of young entrants (shared by all of them). Besides, it is unlikely that their attitudes would change in one year in schools.

In general, two features of this survey are of interest here. One is the selection of items of knowledge, which were from *course syllabuses*. However there was no clear methodology for this selection[1]. The other feature is the idea of *comparing* the views of students with those of the staff, both in the first and second questionnaires. However, two issues need to be discussed here. First of all, the validity of comparing the attitudes of students with those of staff, by the method used, is questionable (already discussed). Secondly, it would have been better to compare the attitudes of third-year students (instead of first-year students) with early entrants. This would have given a better comparison between what is expected (when entering) and what is received (during three years of study).

[1] See below, pages 62 and 63.

The Knowledge needs Architects Request.

By: Professor Andrew D. Seidel

1994.

Two objectives were stated for this study by Seidel. These were:

i) To bring about improvement in the physical environment.

ii) To cause architecture to be regarded as a licensed profession (which means a respected and protected profession).

The first objective was described as a shared goal with which all educators might agree, however the second objective needs three particular requirements in order to be achieved. If a profession is to be licensed, the first requirement is that members should possess some special knowledge, and that special knowledge must address some particular aspects of professional practice seen to be essential to the public interest. In architecture this second requirement, according to Seidel, is that this knowledge should focus on public health, safety and welfare. The third requirement is that there be legal sanctions leading to a measure of public trust in the profession. The survey focused on the first requirement i.e. what special knowledge architects in practice believe they need. It was based on the results of a questionnaire sent to 1197 principals of firms in the UK, with a 52% response rate, and also on interviews with a number of practitioners. The questions covered different aspects of architectural practice[2].

---

[2] The results are also given in Symes, et al.(1995).

Three questions from this survey are of interest to our study:

1) How much time do principals spend during an average week on a given activity?

2) In what areas does an architect need to receive training?

3) In what areas did they receive adequate training?

Results

The results of answers to question (1) are shown in Table 2-1. Answers to question (1) are reduced to those data that show activities on which the principals spend 20% or more of their time i.e. more than one day per week. The idea is that one day per week (20% of the principals' time), is a significant enough period of time to know something about that subject.

Items	Spend one day or more per week *
Building design	72.0
Production drawings	60.3
Site supervision	50.6
Meeting with clients	39.9
Co-ordinating consultants	37.9
Writing specifications	24.1
Recruiting clients in person	14.6
Meeting with project managers	12.9
Developing construction budgets	12.6
Managing office finances	12.1
Writing agreements	11.8
Negotiating new work	10.3
Recruiting clients by mail	7.3
Staffing office	7.3
Developing office procedures	6.6
Recruiting clients by telephone	6.1
Establishing fee structures	6.0
Estimating work requirements	5.2
Working with marketing or public relations specialists	3.6
Publicising work	3.1

Table 2-1: Ranking of activities on which principals spend one day or more per week.
* Number of principals (in percentages).

The table shows that building design, production drawing and site supervision are the three activities that occupy most of the time of principals in practices. However, it is better to keep in mind that the figures also show that, for example, 28% of the principals spend less than one day a week on building design. It is also obvious from the figures in the table that management-related areas require the time of a great many principals.

The results of answers to questions (2) and (3) are shown in Tables 2-2 and 2-3. Figures in Table 2-2 show the percentage of principals who agree about the necessity for teaching selected topics to architects.

Items	Percent *
Building technology	96.6
Schematic design	94.3
Brief preparation	93.8
Specifications and codes	90.9
Communication	90.8
History of architecture	85.5
Computer-aided design	85.5
Structural and mechanical	84.5
Urban design and planning	81.1
Office management	80.6
Budget management	80.3
Client relations	79.3
Project management	79.2
Production	78.3
Interior design	77.9
Construction management	77.5
Human behaviour	72.8
Computerisation	67.8
Marketing	64.9
Research	61.5
Accounting	57.3
Real estate development	46.8
Facility management	43.4

Table 2-2: Ranking of knowledge areas about which principals agree an architect needs to receive training.

Items	Percent *
History of architecture	86.7
Schematic design	85.5
Building technology	79.8
Structural and mechanical	75.1
Urban design and planning	58.2
Specifications and codes	51.4
Interior design	51.0
Production	49.7
Brief preparation	48.5
Research	41.7
Human behaviour	41.5
Communication	34.0
Construction management	30.1
Project management	20.3
Client relations	14.9
Office management	14.3
Budget management	13.2
Computer-aided design	10.8
Real estate development	11.6
Facility management	10.2
Accounting	10.1
Marketing	8.8
Computerisation	7.0

Table 2-3: Ranking of knowledge areas about which principals agree received adequate training.

We can see that 'building technology' is at the top of the list. 'Schematic design' and 'brief preparation' are also among the highest subjects. It is interesting to note that nearly 94% of principals think that architects need to receive training in 'brief preparation' or programming. We might add that this is seldom, if ever, taught in schools. The figures in Table 2-3 show the percentage of principals who agree that they received adequate training in selected topics. It is shown in the table that 'history' and 'schematic' design are at the top. But principals think that did not receive adequate training in management topics. Even those who believed they did not need much training still did not receive what they believed they needed. However, these all indeed say little about the actual amount of teaching that they need, or that was actually given.

Seidel's findings were also analysed by Salama (1997: 64-65), who calculated, for each item, the differences between what architects see as needed for practice and what they feel their training has prepared them for (Tables 2-2 & 2-3). Then he separated the items into three categories. The first category represents the range of difference from -1.2% to 30%. The second category represents the range of differences from 30% to 50% and the third category represents the differences from 50% and more. It is important to note that a high percentage means that the gap between what is needed and what was received is large, which indicates the areas which need more attention in schools. According to his calculation, category one (the difference between what is needed and what they did receive is low) includes 'history of architecture', 'schematic design', 'building technology', 'structural and mechanical design', 'urban design and planning', 'interior design', 'research', and 'facility management'. The second category (the difference is medium) includes 'specifications and codes', 'brief preparation', 'human behaviour', 'construction management', 'real estate development', and 'accounting'. The third category (the difference between what is needed and what they did receive is high) includes 'communication', 'project management', 'client relations', 'office management', 'budget management', 'computer-aided design', 'marketing', and 'computerisation'.

This analysis shows that management and practice issues need the most attention. It is also important to note that computer-aided design and computerisation are both recently-developed knowledge in architecture and it is not surprising that principals think it is necessary for architects to have training in this area and probably the lack of teaching of this kind of knowledge during their education, some decades ago, is also clear.

Two features of Seidel's research are of interest here. One is the list of items which he has selected for the questionnaire. As with the previous research by Gartshore and Mayfield, the methodology of selection of items is not clear here[3]. The second feature is the idea of asking two sets of questions and *comparing* them. The questions are:

a) Does an architect need to receive training in selected subjects?

b) Did they (principals) receive adequate training in (the same) selected subjects?

---

[3] See below, pages 62 and 63.

As already explained, the results from comparing the responses to these questions could provide information about those subjects which architects need to be taught and whether or not the principals received adequate knowledge of them during their education. These questions are about the knowledge which architects need in practice - as mentioned by the principals, and also the condition of architectural education when the principals were being educated. This is quite useful data. This survey, however, did not provide information about the requirements for knowledge in architectural education nor about the condition of architectural education today.

In order to be able to do that, we need to revise the questions a little. For example, the questions could be altered as follows:

a) Does an architectural graduate need to receive training in selected subjects?

b) Do architectural students receive adequate training in (the same) selected subjects?

This method of questioning, modified from Seidel, is used in the survey conducted in this study, and is explained in detail in chapter 3. The problem raised by both surveys concerns the selection of items as the basis of the questionnaire and a method of selection now needs to be considered - before which it would be helpful once again to look at the items selected in previous research.

Selection of items of knowledge for survey

Both Seidel and Gartshore/Mayfield began with a list of subjects or items of architectural knowledge. The responses and conclusions drawn may depend upon the nature of their lists. A list of items selected in both studies is given in Table 2-4 below.

Subject Categories	Seidel's Research	Gartshore/Mayfield's Research
History & theory of architecture	History of architecture	Architectural history Art history
Design	Schematic design Interior design	Landscape design
Structural knowledge	Structural (& mechanical) design	Structures
Environmental knowledge	[Structural &] mechanical design	Building services Energy use in buildings Environmental physics Environmental psychology
Construction and materials	Building technology Construction management	Building economics Materials science Building construction
Urban design and planning	Urban design and planning Real estate development	Planning (urban, regional, rural)
Practice and job management	Specifications and codes Brief preparation Human behaviour Production Computerisation Communication Client relations Project management Office management Budget management Facility management Accounting Marketing Computer-aided design	Computing Communication Management Draughtsmanship Freehand drawing
Others	Research	Mathematics Philosophy Sociology Photography Law Aesthetics

Table 2-4: List of items of knowledge used in Seidel and Gartshore/Mayfields' survey.

The items are also categorised according to the subjects to which they are presumed to belong, as there was no explanation in either study about the methodology of the selection of items.

Each of these studies focused on some aspects of architectural knowledge, so the selection of items was based upon their particular objectives - architectural practice in Seidel's survey and scientific and technical knowledge in that by Gartshore and Mayfield. This may be seen by the emphasis which these studies have put on different subject categories. For instance, in Seidel's list there are some detailed items such as 'office, project, budget and facility management', while items like 'structural and mechanical design' are combined together. On the other hand, in Gartshore/Mayfield's there are detailed items like 'energy use in building', 'environmental physics' or 'environmental psychology' which are listed individually, while 'management' (a broad heading), has not been divided into relevant categories (Table 2-4).

Chapter Three:
SURVEY OF ATTITUDES

In the previous chapter, we showed that other authors, such as Seidel (1994) and Gartshore and Mayfield (1990), have looked at what people believe should be taught, but in each of these cases the researchers have looked at individuals or a few groups of individuals and asked different questions. The intention in this survey is to ask similar questions of different groups of people.

This chapter deals with the design of a questionnaire for this survey. The intention is to explain the thought processes behind the structure of the questionnaire, accompanied by explanations about the methodology of analysing the data.

The main objective in designing the questionnaire was to discover whether or not different groups of people have the same attitudes towards the requirements for knowledge in architecture. So two issues need to be considered here:

1) Locating different groups of respondents.

2) Defining the requirements for knowledge.

Groups of respondents

Eight groups of respondents were selected for this survey. They were first-year and third-year undergraduates, B. Arch. or diploma students, teachers, heads of schools, junior and senior architects and principals in practices.

First-year students were selected because their attitudes show how architecture may look from the stand point of young entrants. It may be assumed that the students chose architecture on the basis of their initial beliefs.

Third-year students were selected because their attitudes show what schools have offered them and also what they have experienced during their years in school.

Final-year students have spent one year in practice, and they have some knowledge of practice, so they could compare this with what they have been taught in school.

The validity of students' opinions, compared with those of teachers or practitioners, might be questioned. However, students' opinions are likely to be based upon the quality and scope of the training or education which they have received. Backlund, et al. (1990) have demonstrated that students are able to make consistent, reliable judgements about the instruction given to them.

Teachers were selected because they are responsible for educating students. Heads of schools were selected because they are usually the policy-makers in schools.

Junior architects were separated from senior architects, because it was assumed that their attitudes might be different. Senior architects have the most contact with graduates. They are also more involved in the process of architectural activities than junior architects or even principals.

Principals of practices were selected because they are leaders of architectural practices, and their attitudes are probably different from those of senior architects because they are also involved in official duties.

Requirements for knowledge

In order to check the requirements for knowledge in architecture, two issues were considered: first, what 'knowledge' should be taught in schools of architecture? and secondly, is enough of this 'knowledge' taught in schools? The methodology of asking two related questions is adopted from Seidel (1995). However, some changes have been made, which will be explained. First of all, by using the word 'knowledge', I mean subject courses which are taught in schools of architecture. Secondly the target here is architectural students. Therefore, two questions for the survey are constructed as follows:

a) Do you think architectural students need to be taught about X (subject course)?

b) Do you think architectural graduates are taught enough about X (subject course)?

In a basic way, answers to the questions above may be analysed separately. For example, all responses to question (a) will be analysed together and separated from all responses to question (b). These will be done respectively.

One of the aims of designing questions related to each other (as above), is also to provide information for cross-tab[1] analysis; i.e. analysing responses to both questions simultaneously. For example, one might consider how many of those who agree with the necessity for teaching a selected subject, also agree that it is taught adequately. This kind of analysis will be examined in some appropriate cases. For further elucidation we can look at example one.

[1] The word 'cross-tab' comes from cross tabular.

Example one: a-1) Do you think architectural graduates are taught enough about 'architectural practice'?

b-1) Do you think architectural students need to be taught about 'architectural practice'?

Let us assume that a group of ten respondents answered these questions. Table 3-1 is an assumption of possible answers. A combination of responses to both questions divides respondents into four groups, those who said "yes" or "no" to both questions and those who said "yes" and "no" to either of the questions.

a-1 / b-1	Yes	No	Total
Yes	3	4	7
No	1	2	3
Total	4	6	10

Table 3-1: Cross-tab analysis of answers to question a-1 and b-1.

Table 3-1 shows that three of the respondents believe that not only do students need to be taught about architectural practice but also have been taught enough of this knowledge in schools. It means that they believe in the necessity for teaching this knowledge and also believe that schools have acted adequately in this matter. Four others also think that it is necessary to teach architectural practice, but do not believe that schools provide enough of this kind of knowledge. One individual believes that students do not need to be taught about architectural practice, although they are taught enough in schools. He/she might even think that they are taught more than enough and that schools waste their time by providing such knowledge. There are also two others who think students do not need to be taught about architectural practice but even so whatever has been taught was not sufficient. This may indicate that they believe that students should not be taught architectural practice in schools because schools can not sufficiently cover such a subject.

Asking questions about subjects in their general and broad context, as in the example given, obviously would not provide enough detailed information for measuring different attitudes about knowledge requirements. What we need is a detailed investigation of the material that is taught in schools. This is done by using items or topics from course syllabuses. Referring to the previous example, architectural practice is a course subject which includes a variety of items and topics, such as 'client relations', 'contract law' and 'project management'. This is why it is better to provide a combination of both general and detailed questions by using *subject courses* and *detailed items*. In this case, we asked about the adequacy of teaching subject categories in the first part together with the necessity for teaching detailed items in the second part. This will enable us to compare individual attitudes about the meanings of *adequate* in the first groups of questions. This method is further explained in example two.

Example two: a-2) Do you think architectural graduates are taught enough about 'architectural practice'?

b-2-1) Do you think architectural students need to be taught about 'office administration'?

b-2-2) Do you think architectural students need to be taught about 'contract law'?

Instead of asking questions about the necessity for teaching a subject course such as 'architectural practice', two items are selected: 'office administration' and 'contract law'. Individuals might have different attitudes about the necessity for teaching these items. Let us imagine again that ten participants answered these questions. In order to see how people reacted in responding to the second groups of questions, we need to provide a table for cross-tab analysis of answers to both questions (b-2-1 and b-2-2). Table 3-2 is a cross-tab analysis of answers to questions in the second group.

b-2-2 b-2-1	Yes	No	Total
Yes	4	3	7
No	1	2	3
Total	5	5	10

Table 3-2: Cross-tab analysis of answers to questions b-2-1 and b-2-2.

Providing such a table shows attitudes to the necessity for teaching selected items - from those who believe that both items are needed to those who believe that none is needed. In our example, four respondents believe that both items need to be taught, while two of them think that neither of the items is necessary. This indicates that two different attitudes may exist: one belonging to those who believe more is needed and one to those who believe less is needed.

We can also be more precise. For example, we can divide this table into two, one for those who said "yes" to the first question (a-2) and one for those who said "no". Tables 3-3 and 3-4 are cross-tab analyses of answers to questions b-2-1 and b-2-2, but divided by those who believe graduates are taught enough architectural practice and those who do not hold this belief.

b-2-2 b-2-1	Yes	No	Total
Yes	2	1	3
No	0	1	1
Total	1	3	4

Table 3-3: Cross-tab analysis of answers to questions b-2-1 and b-2-2, from those who answered "yes" to question a-2.

b-2-2 b-2-1	Yes	No	Total
Yes	2	2	4
No	2	0	2
Total	4	2	6

Table 3-4: Cross-tab analysis of answers to questions b-2-1 and b-2-2, from those who answered "no" to question a-2.

This breakdown enables us to see whether all those who think that not enough of a subject is taught also believe that both the selected items need to be taught. In this sample, less than half of them (two) think so (Table 3-4).

Now consider that instead of two questions in the second group, we provide a list of questions using a variety of items. Answers to these questions will provide a broad perspective of attitudes about the necessity for teaching different items.

It is also worth noting that, when questions in both groups are addressing the same thing with the same phrase, 'architectural practice' (example one), for instance, this may reveal the purpose behind the questions, so the respondents may modify their responses based on this awareness. Therefore, selecting different kinds of content in each group i.e. subject courses and detailed items, could reduce the possibility of such problems occurring.

The examples illustrate the kind of conclusion which might be drawn from a cross-tab analysis of the results. Even at this stage, it is clear that the replies would not be very different from each other. For example, it would be rare to see people absolutely denying the necessity for teaching some items or topics. This is partly because the items or topics will be chosen from course syllabuses which are already part of the schools' curriculum[2]. However, the intention here is to trace the differences of opinion between different groups of people, even if these differences are tiny. So, for example, the answers to the questions above could be scaled into more detailed measures, instead of merely "yes" and "no", such as: 'strongly agree', 'agree', 'neither disagree/nor agree', 'disagree' and 'strongly disagree'. In this case, the differences of opinion will be distinct from each other in the strength of their scales.

Now the question is what items and subjects should be selected for this survey? In order to answer this, first we need a list of course syllabuses from the schools of architecture. In early spring 1997, all schools of architecture in the UK were asked to send their course syllabuses[3]. Near half of them (seventeen schools) sent information, while fourteen of them provided sufficiently detailed replies, suitable for this study[4].

Course syllabuses are normally written by teachers. Each course syllabus usually consists of a variety of subjects which are taught in different years. Each subject course consists of a list of detailed expressions of teaching material which can be considered as 'items of knowledge'[5]. The main reason for asking for syllabuses was to obtain a list of items of knowledge but it is quite clear that a survey can not be conducted which asks questions about all of the items contained in course syllabuses, so a selection needs to be made. In order to make a well-balanced selection of all the kinds of knowledge in

---

[2] In contrast, there might be some items which do not appear on the course syllabuses, or may occur in only a few of them, which people believe should be taught. This raises the concept of the esotericism of items which will be discussed in the next section.
[3] A full list of Schools of Architecture in the UK. is given in RIBA (1996).
[4] See Appendix 2, for a list of Schools of Architecture who participated in this survey.
[5] It is assumed that what is taught in schools eventually become a part of students' knowledge.

the survey, it was decided first to categorise the items and then to select a number of them.

Subject courses

Five subject courses were common to almost all schools of architecture: structures, construction and materials, history of architecture[6], architectural practice and environmental science. Subject courses have different characteristics. Some of them may be considered as those used (directly or indirectly) in design e.g. history of architecture or construction and some as those which are required for other reasons e.g. architectural practice. In order to be more precise about the materials taught, we need to extract the items of each subject course. A total number of 1362 items of knowledge was derived from the subject syllabuses of fourteen schools of architecture (Table 3-5).

Subjects	No. of items
Construction and Materials	380
History of Architecture	227
Architectural Practice	166
Environmental Science	338
Structures	251
Total	1362

Table 3-5: The number of items derived from fourteen course handbooks.

As it is impracticable to conduct a survey asking about the necessity for the teaching of all these items, a selection had to be made. One possible way was to include items selected at random, but this would not have yielded a satisfactory result, because we

[6] History of architecture in some course syllabuses is combined with theory.

could not be sure that our selection would be a well-balanced representation of the material that is taught. Another way might be to categorise items into groups with similar characteristics and select from within the groups. This could provide a better balanced selection of items with different characteristics. The obvious categories would be subject courses, as in Table 3-5. The next step would be to categories the items of each subject based on their characteristics. In order to do this it would be necessary to be familiar with the items of knowledge in course syllabuses.

Items of knowledge

Different expressions have been used by teachers for explaining the contents of items of knowledge. An item listed in a course syllabus may cover a whole lecture or a part of it. This actually depends on the structure of the course. Teachers may assemble similar material into quite different course structures. Therefore the terms (both the words and phrases) used to describe these items and the ways in which they are assembled, can vary among different teachers. As an example we can compare the vocabulary used by different teachers for some items of syllabuses in construction and materials courses:

1- Flat roofs.

2- Delight in detail.

3- Brick cladding to steel frames; structural principles and connections.

4- The anatomy of a building; ground, floors, walls, roofs, doors, windows, stairs and building services.

We can see that a number of the terms are used in different course syllabuses which could indicate the content of each. Clearly 'delight in detail' is the most vague in terms of the knowledge that will be taught, although it is very precise in indicating the architectural intention of the classes. The term 'Flat roofs', presumably implies all aspects of the construction of flat roofs such as insulation, materials, construction, structures, detailing and performances, but based on general explanations. The term 'Brick cladding to steel frames, structural principles and connections', refers to a specific issue and is presumably based on detailed explanations. In contrast, item (4) is a combination of many items which may or may not involve any detailed explanations. This variety of expressions in course syllabuses is even more problematic if an attempt is made to extract information about the content, in order to sort and categorise them.

A close look at the items of each subject course shows that they also have different characteristics and are sometimes unevenly balanced among the schools. For instance, some are about design skills, some reflect general background and some are about regulations. On the other hand, it was found that some items are repeated in the course handbooks of several schools, whilst some are repeated in a few only.

It will be helpful to consider how knowledge may be categorised, by reviewing some other studies. Bloom (1956: 30), in a general approach, categorises knowledge from simple facts such as: "insects have six legs" to more complex behaviours, such as: "knowledge of theories and structures". He continues that these categories may be distinguished within specialities or fields of knowledge. Elsewhere, in a rather scientific and engineering approach, Vincenti (1990: 195-199) categorises knowledge first into knowledge for production and knowledge for design; then, in a more qualitative approach, he categorises engineering knowledge into "descriptive" i.e. knowledge of fact or actuality and "prescriptive" or knowledge of procedure or practice, and "tacit knowledge", by which he means knowledge of skill and judgement.

These are a few examples to illustrate the different ways in which researchers have chosen to categorise knowledge and it is clear that each depends upon the author's purpose. Therefore an extensive survey in this domain would be of little value in this study. What is required here is a set of categories applicable to the practice of the art or discipline of architecture. Unfortunately, there exists no detailed investigation into categorisation of architectural knowledge[7].

In a study comparing a selection of European schools of architecture, Orbasli and Worthington (1995: 61-64) categorised the contents of the schools' curriculum. This was a subject category and did not include detailed material. These categories are:

A) Basic background subjects, such as history, theory, basic science and social sciences.

B) Building construction and process, such as building physics, construction and science, building services, construction economics, management and law.

C) Understanding of the surroundings, such as the study of the urban and surrounding environment, topography, surveying and recording (skills).

---

[7] As far as I know.

D) Project preparation and design, such as presentation techniques and architectural design.

E) Complementary studies, such as conservation and historic buildings, interior design, research and written dissertations and other optional courses.

There is also another subject category provided by RIBA & ARB (1997). This report partly provides guidance on the content of courses leading to examinations in *Architecture*, part 1 and part 2. This guidance includes a general category of knowledge for teaching in schools of architecture. These subject categories are as follows:

- The cultural context of architecture.
- Environmental design, constructional and architectural technologies.
- Professional studies and management.

Unfortunately, none of these studies and reports went beyond subject categories, towards a more detailed description of the kinds of knowledge that could be taught under each subject. Therefore it was necessary for me to draw-up my own categories. In the next section we will try to categorise items of course syllabuses, based on their characteristics.

Categorisation of items of knowledge

First of all, it is important to note that, in order to make the process of categorisation easier, each subject was considered separately.

Several attempts were made, but not all were successful. The first attempt was to categorise the items under a 'qualitative' and 'quantitative' division. For example, some words such as 'analysis' or 'calculating', used in the context of items, indicate quantitative aspects in comparison with other words such as 'basic principles' or 'introduction' which suggest a more qualitative approach. Then items were divided according to the presence of such words in their text. Unfortunately, merely relying on words does not enable an accurate judgement to be made about the whole meaning of an item i.e. to make such judgements requires more detailed information about the content and material of the item. Besides, there are many items which do not include any such quantitative or qualitative phrases or there are items which have a combination of both types of phrases. Thus it is not possible to decide in which category they belong.

Another attempt, similar to the previous one, was to categorise the items by searching for specific words or phrases used such as: 'timber', 'history' or 'detailing'. Unfortunately this attempt was not successful either. This was partly because words are used with different meanings so that the existence of the same word in two items does not provide sufficient information to put the items into the same category. For example, consider these two items: 'property of timber' and 'timber construction'. These two could belong to two different categories i.e. property of materials and construction systems, while using the same word, 'timber'.

Finally, items were examined carefully to try to determine their unique characteristics; in other words, I was looking for what distinguished them from all other items. This was a difficult task, because it needed a very close familiarity with all of the items in each subject category, their meanings and expressions. Each course syllabus had to be read several times to provide enough knowledge and confidence to determine the relevant categories. It was, however, a satisfactory method, because it was applicable to most of the items and for all subject courses. The process needed considerable effort and time, and it was clearly impractical to do this for all the subjects. Therefore, to reduce the large amount of data to manageable proportions, analysis was restricted to just three subject categories: 'Architectural practice' as the only non- design-related subject, 'Construction and materials', as a representative of technical knowledge and 'History of architecture', as a representative of rather theoretical knowledge.

After reading and discussing the items with a number of experienced teachers (in a variety of subject areas, both in Manchester and Liverpool), it gradually became apparent that items could be divided according to their 'generality' or 'practicality' in each subject category.

Levels of Practicality

Items of knowledge within each subject may be broadly divided into three categories according to their generality or practicality. They can be as general as 'what is construction and why study it?' or can be as practical as the 'design of masonry walls'. Items of knowledge are divided under three categories as: 'general knowledge', 'basic theoretical knowledge' and the 'practical knowledge'. I propose to call this division the 'level of practicality'.

General knowledge

This is introductory knowledge and does not have practical implications. The characteristics of general knowledge in all three subjects were rather similar. Some general knowledge is essential for the study of any subject. For example, the study of architectural history would be meaningless without some background of general history. General knowledge may include general scientific or general historical knowledge, such as 'material morphology' or 'history of civilisation'. There are also other items such as 'Why do we study architectural history?' or 'introduction to construction and materials' which were categorised as general knowledge.

Basic or theoretical knowledge

This category consists mainly of facts or concepts. Subjects vary in the extent to which they draw upon basic and theoretical knowledge but subjects in the engineering disciplines have tended to lay a strong foundation in theory before developing the practical knowledge used in design. Basic and theoretical knowledge may have different implications in each subject category. For example, in the subject 'construction and materials', basic and theoretical knowledge is particularly related to building or the built environment and could be explained as knowledge that is indirectly used in design activities. As an example we can refer to the 'process of construction' or the 'properties of building materials'. Basic and theoretical knowledge in the 'history of architecture' may be considered to be the knowledge of styles and theories, such as 'Renaissance architecture' or 'the concept of transparency in Baroque architecture', which may also be used indirectly in design activities. However, this category may also be sub-divided into two further categories here: descriptive or analytic. Descriptive knowledge merely describes issues, such as 'Le Corbusier: early works up to 1920' but analytic knowledge, such as 'the relationship between the nineteenth century and Post-Modernism' analyses them[8]. In contrast to 'history' and 'construction', basic knowledge in 'architectural practice' may be considered as a kind of basic practice or management knowledge, which has no relation to design activities, such as 'marketing' or 'financial management'.

Practical knowledge

It is clear from the name that practical knowledge is applicable in practising architecture. Items of practical knowledge in 'construction and materials' are always applicable in the final stages of design activity or are used when the practical aspects of design need to be developed, such as 'building standards and codes' or 'detailing design'. There are also other kinds of practical knowledge in 'construction and materials'. These items are related to site activities, such as 'site investigation' and 'site analysis'. As these items are rather different from the previous ones, they were categorised separately. Practical knowledge in the 'history of architecture' may be

[8] It is worth noting that in some cases it was not possible to define whether an item is descriptive or analytic. In these cases such items were left undecided.

considered either as conservation knowledge or as recent theoretical issues concerning social and cultural debates in designing new buildings. Both of these may or may not be included in the history course syllabuses of schools. 'Timber restoration in historical buildings' and 'difficulties in understanding the cultural forces that shape buildings and cities' are two examples of practical knowledge in the history of architecture. Practical knowledge in 'architectural practice' is related to office or practice activities. This also includes project-related activities. 'Tendering documentation' and 'project management' are examples of practical knowledge in architectural practice. A complete list of items of knowledge, categorised under levels of practicality, for the three chosen subjects, is provided in Appendix 3.

There were some items in course syllabuses that could not be assigned to any of the above categories. These had one of the following characteristics:

1) There were items within the syllabuses of some subjects which could more properly be transferred to other subjects. These items were first transferred to relevant subjects and then subdivided under the categories in the normal way.

2) Some items were so ambiguous that it was not possible to categorise them. These items were placed into an 'unknown' category.

Another variable should also be considered in our categorisation. This is the end-user of the knowledge. While we teach subjects such as environmental control and structural design to architects, it is engineers who will be practising in these areas. Thus, we might assume that there are two types of usefulness, one that is directly useful to architects and one that is useful to other professionals, such as service or structural engineers. This could affect the content of practical knowledge and might also inform the way in which the basic theory is taught. Consideration of this is outside the scope of this thesis and may be developed in the future, but the issue may be dramatically illustrated by the possibility of teaching about building structures to archaeologists[9]. This would be approached in quite a different way from teaching the same subject to engineers.

When the items of knowledge had been categorised, they were assembled into some broad natural groups revealing the *topics* being taught. For example, such items as 'steel elements', 'properties of concrete' or 'timber in building construction' may all be considered in a topic like 'Properties of building materials'. A full list of topics derived from items of knowledge is given in Appendix 4. However, a summary list is provided in Table 3-6.

	History of architecture	**Construction & materials**	**Architectural practice**
1	Introductory [1]	Introductory and history [1]	Introductory and history [1]
2	Pure history [1]	Manufacturing of building materials [1]	Team work, management and leadership [2]
3	History of art [2d]	Construction of exterior elements [2]	Financial management [2]
4	History of architecture (general) [2d]	Construction of interior elements [2]	Marketing [2]
5	History of architecture (abstract issues) [2d]	Common construction systems [2]	Forms of practice and office organisation [2]
6	Architectural theories and styles [2a]	Complex construction systems [2]	Quality Assurance [2]
7	Practical function of history of architecture [3]	Properties of common building materials [2]	Legal principles[2]
8		Properties of uncommon building materials [2]	Architects' responsibility, contract and service [2]

[9] Such a course is taught in the Department of Archaeology at the University of York.

	History of architecture	Construction & materials	Architectural practice
9		Material problems [2]	Other players [2]
10		Process of construction [2]	Planning and development systems [2]
11		Traditional construction [2]	Architectural employment [2]
12		Building conservation [2]	Project planning [3]
13		Detailing building elements [3]	Cost planning [3]
14		Cost (estimates, planning & exercise) [3]	Tendering [3]
15		Regulation requirements [3]	Procurement [3]
16		Specification [3]	Client relations [3]
17		Fire protection [3]	Compliance with planning and building regulations [3]
18		Health and Safety issues [3]	RIBA plan of work [3]
19		Bills of quantities [3]	
20		Existing buildings and failures [3]	
21		Elements and materials on site [3]	
22		Site analysis and establishment [3]	
23		Surveying [3]	

Table 3-6: Summary list of topics derived from course syllabuses of three selected subjects.
Numbers in brackets indicate the levels of practicality.

Esoteric levels

It quickly became clear that while there were some topics dealt with in the syllabus of every school, there were those that were frequently, but by no means universally, taught and some that might appear in those of only one or two schools. These last perhaps reflect the special interests of a particular teacher; aspects of the subject that might be regarded as somewhat esoteric. This led to the 'concept of esotericism' among knowledge topics. In general we can say that 'esotericism' is a measure of perceived importance by teachers. Briefly, those topics taught by the majority of schools were defined as less esoteric topics and those occurring less frequently defined as highly esoteric topics. Apparently when a topic is considered as highly esoteric, all items of knowledge under this topic become highly esoteric. A total number of 14 schools provided materials for this study. In order to define a measure for the 'esoteric levels', those topics which appeared in the course syllabuses of nine or more schools have been categorised as low esoteric topics and those which appeared in four or less schools have been considered as high esoteric topics. Those between, have been considered as medium esoteric. A complete list of topics and their 'esoteric levels', separated by subjects, is given in Appendix 4.

As already noted, the process for the categorisation of the items described above depends upon personal judgement so that the final grouping is open to debate. Here the intention was to categorise items according to the syllabuses themselves. The problem of overlaps is a problem common to all kinds of categorisation and it is inevitable. The only way in which a more reliable division might be attempted is by interviewing all the teachers concerned; an impractical task. An alternative would be to produce a list of items for teachers to respond to, checking off the list those items that they teach. However this too, has its drawbacks, the most obvious being that items taught by some teachers might be omitted from the list. It might also present problems of interpretation, in this case, the interpretation of the items by the responding teachers.

Selection of items for the questionnaire

In the previous section, items of course syllabuses were categorised into different levels of practicality and also into different 'esoteric levels'. When categories for choosing the questions had been decided, any item or items could be selected. However some characteristics were considered for this selection. The selection of items or topics was based on their coherence, both in meaning and in text and also on their distinction from each other. It was an intention not to select ambiguous items, and also to avoid selecting similar ones. In some categories there was no item available or the available items were not appropriate for selection. The number of selected items under each level of practicality and esotericism, in each subject category is given in Table 3-7[10]. In detail, 18 items from construction and materials, ten from the history of architecture and nine from architectural practice were selected. Therefore 37 items were selected from 45 topics in the course syllabuses[11].

		History of architecture	Construction & materials	Architectural practice	Total
General knowledge	*Low esoteric*	*0*	*1*	*0*	*1*
	Medium esoteric	*1*	*1*	*1*	*3*
	High esoteric	*2*	*1*	*1*	*4*
	Total	**3**	**3**	**2**	**8**
Basic & theoretic knowledge	*Low esoteric*	*5*	*2*	*1*	*8*
	Medium esoteric	*0*	*2*	*2*	*4*
	High esoteric	*1*	*3*	*2*	*6*
	Total	**6**	**7**	**5**	**18**
Practical knowledge	*Low esoteric*	*0*	*2*	*0*	*2*
	Medium esoteric	*0*	*4*	*1*	*5*
	High esoteric	*1*	*2*	*1*	*4*
	Total	**1**	**8**	**2**	**11**
Total		**10**	**18**	**9**	**37**

Table 3-7: Number of selected items from each level of practicality and esotericism.

More items were selected in construction and materials both because this subject included more items than the others and also covered site knowledge. In some cases it was possible to choose more than one topic or item in each category. The underlying issue was whether or not respondents thought that architectural students need to receive enough information about these particular items or topics. Table 3-8 illustrates a full list of items selected for this part of the questionnaire.

---

[10] For a full list of items indicating their levels of 'practicality' and 'esotericism', please refer to Appendix 3.
[11] See Table 3-6 for the listed topics.

Subject categories	Levels of practicality	'Esoteric levels'	Selected items or topics
Cons.	1	W	What is construction and why study it?
Cons.	1	M	The historical developments of iron and steel.
Cons.	1	H	Manufacturing process of bricks.
Cons.	2	W	Cladding systems.
Cons.	2	W	Properties of common building materials.
Cons.	2	M	Construction of internal walls and partitions.
Cons.	2	M	Construction sequence.
Cons.	2	H	Timber infestation.
Cons.	2	H	Properties of less-common building materials, such as plastics.
Cons.	2	H	Traditional construction methods.
Cons.	3	W	Designing and detailing masonry walls .
Cons.	3	W	Designing and detailing joints at the junction of roofs and walls.
Cons.	3	M	Fire protection with regard to internal finishes.
Cons.	3	M	Methods of estimating building cost.
Cons.	3 site	M	Site investigation and site analysis.
Cons.	3 site	M	Fabrication and assembly of steel frames.
Cons.	3	H	Building failures.
Cons.	3	H	Health and Safety issues.
His.	1	M	The work of some twentieth century engineers.
His.	1	H	Why we study architectural history and what is history.
His.	1	H	General cultural history.
His.	2 analytic	W	Venturi, Rogers and Foster's idea of complexity and technology.
His.	2 analytic	W	The style of Baroque and French Rationalism.
His.	2 analytic	H	Architecture and politics.
His.	2 descriptive	W	Palladian architecture.
His.	2 descriptive	W	Victorian architecture.
His.	2 descriptive	W	Frank Lloyd Wright's Chicago house.
His.	3	H	Understanding the cultural forces that shape buildings.
Arch. Prac.	1	M	The historical development of the architectural profession .
Arch. Prac.	1	H	The structure of the construction industry .
Arch. Prac.	3	M	Evaluation of appropriate procurement methods.
Arch. Prac.	3	H	Handling client relations.
Arch. Prac.	2	W	The architects' responsibilities and liabilities.
Arch. Prac.	2	M	Construction contract law.
Arch. Prac.	2	M	Social management skills.
Arch. Prac.	2	H	Office financial management.
Arch. Prac.	2	H	Marketing their services.

Table 3-8: A full list of topics and items of knowledge selected for the third part of the questionnaire.

The Questionnaire

The questionnaire comprised two main sections: 'face data' or personal information and questions about both the adequacy of and the necessity for teaching selected subjects[12].

Face data

Face data was different for the four groups of respondents i.e. students, teachers, heads of schools and architects. Some questions, such as those concerning, age and gender, were common to all groups. Other questions were specific for each group, such as the year which the students are in, the courses in which teachers are involved, the architects' years of experience and the size of the practices. Questions identifying the respondents were not asked, unless they wanted to receive a summary of the results of the research.

The schools' questionnaires were coded, in order to identify them. This information was needed for comparing views in different schools[13]. Questionnaires received from each practice were also coded separately. This information was also needed to compare views of practitioners in different practice sizes.

The type of the questionnaires provided both for architects and principals of the practices was the same, but the title and the introductory letter were different. Architects could be subdivided into juniors and seniors according to their years of experience after graduation. There was not a clear theory of where to place the

---

[12] See Appendix 5 for a detailed content of the questions.
[13] However it is not intended to name the schools in the text.

boundary between this division. The assumption was to distinguish between novice architects, who work supervised, and those experienced architects, who may have responsibility for running a job. According to my own previous experiences and the observations in the preliminary study, it was decided to set this division at the fifth year after graduation[14].

Main questions

This section consisted of two main parts. The first part was a list of questions about the adequacy of the teaching of the three selected subjects: history of architecture, construction and materials and architectural practice. The underlying issue was whether or not respondents thought that architectural graduates have received enough information about these particular subjects[15]. So three questions were asked in this part, as follows:

Do you think architectural graduates are taught enough about:

1) History of Architecture?

2) Construction and Materials?

3) Architectural Practice?

---

[14] There may be an inaccuracy/error implied in this selection. However, based on the results, it proved to be a right choice in this study.

[15] The meaning of the term 'graduates' in the questionnaire was questioned by some of the respondents who, although responding to the questions added a note, pointing out that this might refer either to graduates after the first three years or on completion of the part II course. Curiously the only respondents to do this were the teachers. It seems to have been clear to everyone else that a graduate means a student who has completed the whole of the formal training passing the part II qualifying examination, whether that be a BArch or Diploma. It is also important to note that those teachers who were used in the initial trials of the questionnaire had no difficulty with this.

Respondents had to score their answers on a five-point scale as follows: 1) Strongly disagree 2) Disagree 3) Neither agree nor disagree 4) Agree 5) Strongly agree.

The second part of this section was a list of questions about the necessity for teaching certain items or topics to the students. The items chosen for this part were selected from course syllabuses and were under different subject categories (as explained in the previous section). This part consisted of thirty-seven questions which were arranged randomly. A five-point scale was also provided for scoring the answers, which were the same as those in the previous part. So thirty-seven question were asked under this heading:

Do you think architecture students need to be taught about (selected items or topics)?

One aim of the questionnaire design was to keep its size to a minimum, both to encourage respondents to answer and also to simplify its administration. The number of questions and their format in three parts was so arranged in order to keep it to a single page printed on both sides.

No redundant questions have been included as a check for consistency. This was partly for the reason given above. Consistency can be checked by carrying out parallel interviews, but it was important to ensure that the respondents were not prompted to produce particular responses by recognising the significance of the questions. This might have occurred if such a method had been adopted. It may be possible to devise questionnaires that include checks for consistency but it would be preferable to do this looking at individual subject areas. The possibility of such a work is considered in the conclusions.

Received responses

The questionnaire was sent to 30 schools and 200 practices in the UK. An approximate total number of 1800 copies of the questionnaire (1200 for schools and 600 for practices) was produced. The questionnaires for the schools were sent either to heads of schools or to those volunteering. Each batch of the questionnaires was accompanied by instructions for the method of administration. The questionnaires for the practices were sent to the principals of each practice. For the first 100 practices, the method of selection was based on a random selection from the RIBA directory of practices (RIBA, 1995b). The idea was to choose one practice from each 60 in the list. Because the received responses were not quite sufficient, it was decided to choose another 100 practices. These were again selected randomly from the handbook.

A total number of 461 responses was received both from schools and practices. A list of the number of received questionnaires, divided by the eight groups of respondents, is provided in Table 3-9.

Groups	**Total**
Students; year one	61
Students; year three	83
Students; final-year	80
Teachers	74
Heads of schools	7
Architects; juniors	30
Architects; seniors	53
Principals	72
Total	**461 ***

Table 3-9: Number of received responses separated by groups of respondents.
* One of the students did not identify the year of his/her study.

The percentages of received responses are not the same in all groups. This was obvious from the early stages. Obtaining data from the schools was much easier than from the practices, because they are interested in research, the number of schools is few and easy to contact and also each school has more potential respondents. In contrast, most practices in the UK are run by sole practitioners or consist of one or two architects (RIBA, 1995a), so that in order to get enough responses one needs far more contacts and so far more letters. On the other hand they are probably not as interested as academicians in filling in the questionnaires.

According to data given in the handbook of registered Schools of Architecture in the UK by RIBA (1996), an approximate number of 9500 students is studying at schools of architecture, so the percentage of received responses is about 4% of the total population. In the same report, there is a total number of 35 registered Schools of Architecture, so the percentage of received responses from heads of schools is about 20% of the total population. Based on data given by RIBA (1995a), the number of full-time employment architects in the UK was about 20,500 in 1995. Based on the same reference, 51% of architects are principals of partnerships or sole practices and 21% of them are salaried architects in practices. This means that responses received from principals are about 0.7% of the total population and responses received from junior and senior architects is about 2% of the total population. The result of the received responses is an attempt based on the limitations of time and effort.

Chapter Four:
SUMMARY OF PERCEPTIONS

In this chapter, the responses of the 461 participants to the 40 questions is analysed. The intention is to discover the respondents' views about different subject courses and then to investigate the differences between their views[1].

Responses will be analysed in three different sections:

1) Attitudes about the adequacy of knowledge. In this section we will use the responses to only the first three questions in the questionnaire about the adequacy of knowledge.

2) Attitudes about the necessity for knowledge. In this section we will use the responses to thirty-seven of the questions about the necessity for knowledge.

3) A combination of both adequacy and necessity responses. In this section we will use all responses in both previous sections.

Respondents are generally divided into their separate categories and their answers compared, but in some cases it was found useful to group some or all respondents together e.g. all students might be compared with all teachers. It was also useful sometimes to divide the respondents in each group e.g. teachers who teach a certain

---

[1] Statistically, the null-hypothesis in general would be that there is no difference among groups of participants about the adequacy of or necessity for teaching different subject courses. This is a general statement that could also be applied on specific occasions such as: 'there is no difference between students and their teachers about the necessity for teaching the history of architecture'.

subject from those who do not teach that subject. In a similar way, we may separate views about different subjects or even aspects of subjects but may also find it useful to group these together. None of this was done according to any pre-conceived plan, but subdivisions or aggregates of data were decided in response to the results seen.

Comparisons will be made between either responses to different subjects or responses of different groups of respondents, so data may be categorised on the basis of these two parameters.

To make the comparisons easier, data will be presented through graphs (named as figures). In some cases, tables also will be used. Figures and tables have been produced mainly on the basis of the 'frequency of responses', but on some occasions they were produced based on the 'means of responses'. As further explanation about these methods, an example is provided below:

Let us imagine that we want to analyse three groups of data as follows:

Respondent one: 1 1 1 2 2 3 3 3 4 4[2]

Respondent two: 1 2 1 2 3 3 3 4 4 4

Respondent three: 3 2 2 3 4 4 4 4 5 5

Each group of data consists of ten values and may be considered as the responses of one respondent to ten questions[3]. Responses could have scores from 1 to 5 indicating a

[2] 1= Strongly disagree, 2= Disagree, 3= Uncertain, 4= Agree, 5=Strongly Agree
[3] It would also be possible to consider these as the responses of ten respondents to a single question.

range of responses from 'strongly disagree' to 'strongly agree'. Responses in each column could also belong to a particular variable e.g. selected questions[4].

1) Analysing data using the method of 'frequency of responses'

In this method we count the frequency of each value in each group of data. The frequency of values in our example are as follows:

Respondent one: $n_1= 3$, $n_2= 2$, $n_3= 3$, $n_4= 2$ and $n_5= 0$.

Respondent two: $n_1= 2$, $n_2= 2$, $n_3= 3$, $n_4= 3$ and $n_5= 0$.

Respondent three: $n_1= 0$, $n_2= 2$, $n_3= 2$, $n_4= 4$ and $n_5= 2$.

The figures above show that respondent three has produced a higher frequency of 'agree' and 'strongly agree' responses than the other two respondents. Respondent three also produced no 'strongly disagree' response. This means that in general, respondent three agrees more about the variables than the other two respondents. On the basis of the figures, there is also a greater similarity of responses between respondent one and respondent two.

2) Analysing data using the method of 'means of responses'

Another possible way of analysing data is to provide the mean of responses of each respondent. It is important to note that in this case we assume that our variables are

---

[4] If we assume that these are the responses of three respondents to ten questions, the answers of the three respondents to the first question by order are: 1, 1 and 3. Or it could be the responses of ten respondents to three questions. In this case, the answers of the three first respondents to question one are 1,1 and 1.

interval[5]. In our previous example the average of responses would be as follows:

Respondent one: 2.4

Respondent two: 2.7

Respondent three: 3.6

In general, the figures above could mean that respondent three has stronger agreement with the selected questions than respondent two, and respondent one has the least agreement of all.

Respondents were asked to respond on a 5-point scale, but when analysing data using the method of 'frequency of responses', it was decided to reduce the data to three points: 'dissatisfied', 'uncertain' and 'satisfied'. The main reason for this was the small number of responses at both ends of the scores, that is 'strongly dissatisfied' and 'strongly satisfied'. It was also difficult to conduct appropriate statistical tests with the small number of data in these scores. Therefore, in each relevant case, the frequency of responses to all three scores, 1,2 or 3, was counted. It is also important to note that the number of responses is not similar in the different groups of respondents. In order to be able to compare them together, it was decided to use the percentage of frequencies. Figures provided using this method are indicated by the percentage sign (%) near the left-hand legend. Therefore, each individual curve in the graphs represents

[5] Our example is similar to an example given in Bryman & Cramer (1997; pp 40-41). They also provide a definition for the second kind of 'interval' variables on page 58 of their book as follows: "Variables which strictly speaking are ordinal, but which have a large number of categories, such as multiple-item questionnaire measures. These variables are assumed to have similar properties to 'true' interval variables". For example when there are five options of scores, variables could be considered as 'interval'.

the proportion of responses of one group divided into the three scores (for an example, please refer to Figure 4-2). But in the method of 'means of responses', 5-point scales were used in analysing the data. In these cases the mean of responses based on five scores was calculated: 1, 2, 3, 4 and 5. Figures provided using this method are indicated by the mean abbreviation (M) near the left hand legend (for an example, please refer to Figure 4-1).

A valid comparison of responses also needs appropriate statistical tests. Different statistical tests may be used in each method of analysis explained above, and choosing an appropriate test depends on the data that is going to be analysed. In most cases when comparing the responses of different groups of respondents, the method of 'frequency of responses' is used. In these cases it was decided to apply the 'Chi-square' test[6]. In comparing different subjects, using the responses of all groups, we sometimes use the method of 'means of responses'. Differences of responses in this method will be tested by the 't-test'[7]. The level of significance in most cases, is also located as α=0.01. All statistical tests and graphs are produced by SPSS (v.8) package.

One of the difficulties in the analysis is that the number of heads of schools is very small and this makes comparisons with larger bodies of data for other groups of respondents

[6] This has been decided based on suggestions made by two researchers (Seidel from the USA and Houton from the University of Liverpool) who have done similar research and also on information given in two books: Seigel and Castellan (1988) and Bryman & Cramer (1997) about statistical tests.
[7] It is important to note that generating such a test needs interval values and also a normal distribution of responses. It has already been decided that we can consider our values as 'interval' here. Besides, the responses of each group of respondents (separately) proved to follow a normal distribution (in each section). See Appendix 8.

rather unbalanced. However, I have been reluctant to discard this data because even though the number of respondents is small, they represent a larger proportion of the total population of this group of people. In such a cases, it was not possible to use the 'Chi-square' test. Instead another alternative test such as Fisher's-exact or Mann-Whitney was chosen[8].

[8] Fisher's exact test is an alternative test to the chi-square test when the sample is very small, however it is appropriate for testing two values. In this case I disregarded the 'uncertain' responses.

1) Attitudes about the adequacy of knowledge

In this section we will look at the attitudes of the respondents to the adequacy of the teaching[9] of three selected subjects: history of architecture, construction and materials and architectural practice. The responses to three questions in the first part of the questionnaire are used for analysis in this section. Out of 461 respondents, 457 gave answers to these three questions. Therefore a total number of 1371 responses is analysed. We will first compare the subjects with each other and then look at their attitudes in more detail, respect of each individual subject.

The following pages are laid out by presenting first the figures of the results, then discussing their contents. A summary of the discussions plus some additional comments will also be presented at the end.

General attitudes

The results of the answers of all respondents about the adequacy of the teaching of the three subject courses are summarised in Figure 4-1. This graph has been produced by using the method of 'means of responses'. The scale axis at the left-hand side represents the means of responses and each curve inside the graph represents the summary of all replies relating to one group of respondents.

---

[9] "Adequacy of teaching" may also suggest poor teaching performance in the mind of the reader, which is not meant here. This phrase is a substitute for " taught enough" which is used in the questionnaire but which the author preferred to change in the context of the thesis for greater coherence.

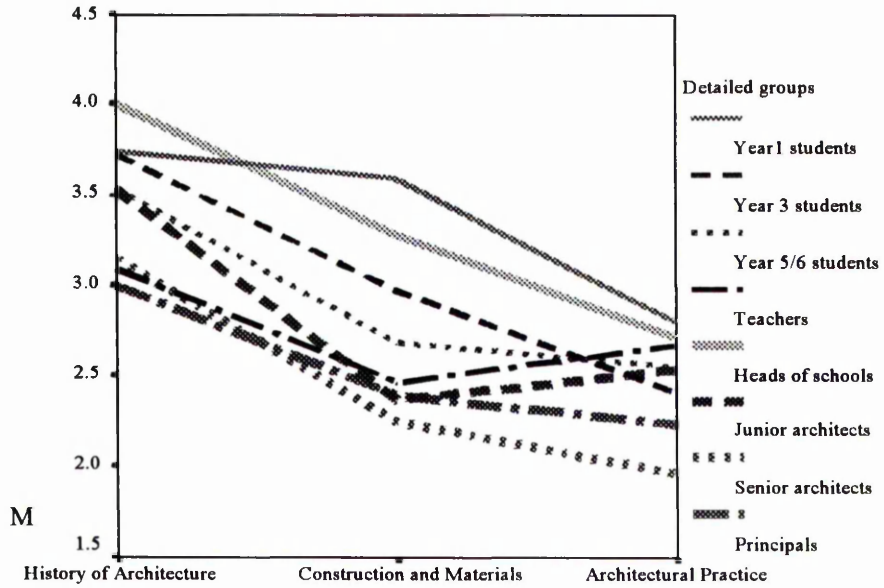

Fig 4-1: Attitudes concerning the adequacy of the teaching of knowledge. Comparison between three selected subjects.

T-tests are calculated to compare the responses of each group about the different subjects. Chi-square test also showed similar results.

	(History- Construction)	(Construction- Architectural practice)
Year one:	T=0.976, P=0.333, NS.	T=5.012, P<0.01, S.
Year three:	T=5.497, P<0.01, S.	T=4.294, P<0.01, S.
Year 5/6:	T=6.063, P<0.01, S.	T=1.096, P=0.276, NS.
Teachers:	T=3.623, P<0.01, S.	T=1.835, P=0.071, NS.
Heads of schools:	T=2.5, P=0.047, NS.	T=1.333, P=0.231, NS.
Junior architects:	T=5.178, P<0.01, S.	T=0.796, P=0.433, NS.
Senior architects:	T=4.564, P<0.01, S.	T=1.819, P=0.075, NS.
Principals:	T=3.768, P<0.01, S.	T=1.294, P=0.2, NS.

It is clear from the graph that opinions about the adequacy of the three subject courses are different. Respondents are more satisfied about the adequacy of the teaching history of architecture than about the teaching of construction and architectural practice. Statistical tests also confirm this. It is clear from the graph that the subject dealt with least adequately is architectural practice. The figure also shows that the groups most satisfied with what is taught in schools are heads of schools and first-year students and the most dissatisfied groups are senior architects and principals in the practices[10].

There were no significant differences between the attitudes of practitioners in different practice sizes concerning the adequacy of the teaching of selected subjects. Statistical tests also showed no significant difference between the opinions of male and female students in this respect. The attitudes of students in different schools were also similar to each other, except in two schools[11]. In one of the schools almost all the students (in all years) were satisfied that all three selected subjects were being taught adequately, while the students (in all years) from the other school were almost all dissatisfied about the adequacy of the teaching of all three selected subjects[12].

We can separate out the different subjects to look at the differences in more detail.

Comparing different subject courses

History of Architecture

In Figure 4-1, we saw that most of the respondents were satisfied with the adequacy of the teaching of history of architecture. Figure 4-2 compares the attitudes of different groups of respondents in this respect. This graph has been produced by using the method of 'frequency of responses'.

---

[10] See Appendix 7; part one, for more detailed statistical calculations.

[11] This is based on students' responses in all years. In total, seven schools provided sufficient responses in all years.

[12] Statistically, there is no significant effect on the results if we deduct these responses from those of the rest of the students.

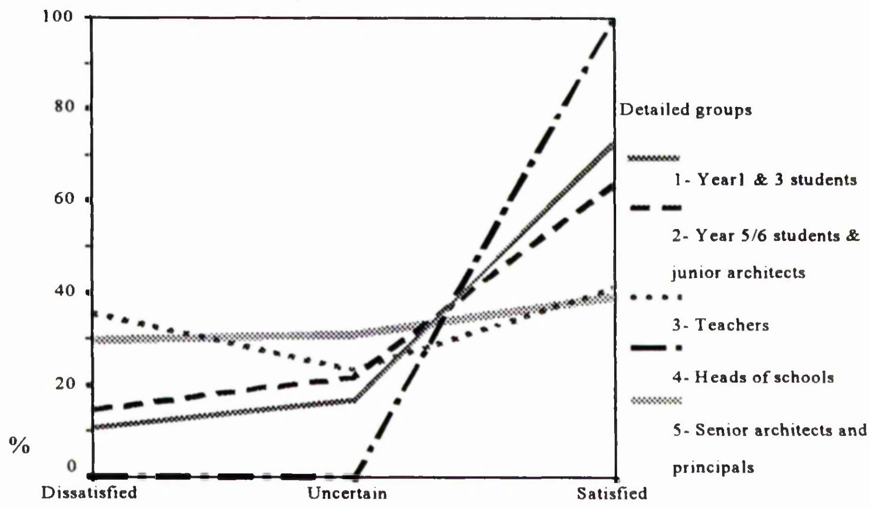

Fig 4-2: Attitudes concerning the adequacy of the teaching of history of architecture. Comparison between groups of respondents.

N(1)= 144, N(2)= 110, N(3)= 73, N(4)= 7, N(5)= 122
Chi-square(1,2)=2.526, NS. P=0.283
Chi-square(1,3)=25.29, S. P<0.01
Chi-square(1,5)=31.439, S. P<0.01
Chi-square(2,3)=12.611, S. p<0.01
Chi-square(2,5)=14.373, S. p<0.01
Mann-Whitney(3,4)=105, S. p<0.01
Chi-square(3,5)=1.571, NS. p=0.456

Because of the similarity of responses between senior architects and principals, junior architects and final-year students, and first and third-year students, their attitudes are combined together in this graph.

In Figure 4-1 we saw that there was general satisfaction about the teaching of history of architecture. But Figure 4-2 shows that the most satisfied groups are students and heads of schools. The rest are rather uncertain. The figure suggests that there is a difference between the attitudes of students (in all years), junior architects and heads of schools with the other groups. Statistical measures also indicate that this difference is significant. Students think that they have received an adequate knowledge of history, while teachers and practitioners (senior architects and principals) are rather uncertain about this. Nearly 70% of students and junior architects are satisfied about the adequacy of the teaching of history of architecture. Even the majority of first-year students (more than 65%), believe that architectural graduates receive adequate knowledge in history of architecture (although one wonders how they thought they knew).

All of the seven heads of schools are satisfied with the adequacy of the teaching of history (in contrast to the teachers). This shows that heads of schools are the most satisfied group regarding this subject. They are also more satisfied than students.

There is no significant difference between the attitudes of teachers and architects (senior architects and principals) in this respect (Fig 4-2). The percentage difference between those satisfied, those dissatisfied and those uncertain is very small i.e. statistically, we have three almost equal groups. In general, senior architects', principals' and teachers' attitudes about history teaching are similar to each other[13]. However, we should not suppose the reasons to be similar. Discounting those teachers, principals and senior architects who are uncertain about history teaching (about 30%), the rest are split in two almost equal groups - those who are dissatisfied and those who are satisfied about history teaching. The question is why more than a third of the teachers and practitioners[14] are dissatisfied about the adequacy of history teaching but nearly 40% are satisfied. Based on the data, the difference in teachers' attitudes does

---

[13] Although the graph suggests more uncertainty among senior architects and principals, this is not statistically significant

[14] Excluding junior architects.

not stem from the subjects that they teach, since the split is the same among teachers who teach history and those who do not[15]. Nor is the difference among practitioners related to the size of the practice or to whether or not the practitioners are involved in teaching activities[16]. Although finding explanations for differences among the members of each group was not an initial objective of this research, a follow-up telephone interview with some of those teachers who were dissatisfied showed that most of them disagreed with the method of teaching history and not with the actual material in course syllabuses. They would prefer to introduce knowledge in project-based teaching rather than in lecture courses exclusively. Telephone interviews with some of those principals who also disagreed about the adequacy of the teaching of history showed that they are mostly interested in the practical aspects of history teaching which they think is no longer part of the education. They referred particularly to measured and detailed drawings of historical buildings and to understanding of how such buildings are designed and built. Actually, the abilities of recent graduates disappointed them in this matter.

Construction and Materials

Figure 4-1 showed that attitudes concerning the adequacy of the teaching of construction and materials differ from those about the teaching of the history of architecture. Most of the respondents were dissatisfied with the adequacy of teaching

---

[15] Statistically there is no significant difference between the attitudes of those teachers who teach history and those who do not. Mann-Whitney test, U= 248.00, NS. p=0.226.

[16] There is no significant difference between the attitudes of principals who are sole practitioners and other principals.

in this subject. Figure 4-3 shows the attitudes of different groups of respondents in this respect. The figure indicates that there is general dissatisfaction about the teaching of construction and materials.

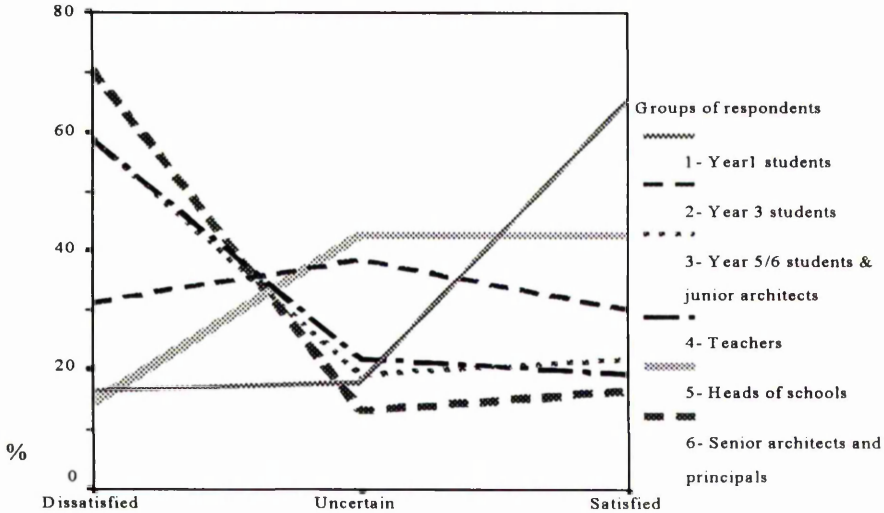

Fig 4-3: Attitudes concerning the adequacy of the teaching of construction and materials. Comparison between groups of respondents.

N(1)= 61, N(2)= 83, N(3)= 110, N(4)= 73, N(5)= 7, N(6)= 122
Chi-square(1,2)=17.885, S. P<0.01
Chi-square(3,4)=.0.321, NS. P=0.852
Chi-square(3,6)=.3.348, NS. P=0.187
Chi-square(2,3)=.15.545, S. p<0.01
Mann-whitney (2,5)=.230.5, NS. p=0.336
Mann-whitney (4,5)=138.5, NS. p=0.027
Chi-square(4,6)= 3.287, NS. p=0.193

Teachers, practitioners and final-year students are similarly dissatisfied with the adequacy of the teaching of construction and materials[17], while this is in contrast with the attitudes of heads of schools. Again we see rather a high level of satisfaction among the small number of heads of schools (or should that be complacency?). It is important to note that there is no significant difference between the attitudes of three groups of practitioners in this respect. There is also no significant difference between the attitudes of those teachers who teach construction and those who do not. This

[17] There is no significant difference between their attitudes.

means that all teachers, whether teaching construction or not, are dissatisfied with the teaching of construction and materials in schools. The figure also shows that first-year students (similar to heads of schools) are highly satisfied about the teaching of construction. While final-year students are highly dissatisfied about it. The attitudes of third-year students fall between those of first and final-year students. This means that there is growing dissatisfaction among students from first-year to final-year about the teaching of construction and materials. Students increasingly feel - as they become more experienced - that they have not received adequate construction knowledge in schools. This is quite different from what we found about the teaching of history.

Architectural Practice

In architectural practice courses the story is very different. The majority of all groups believe that not enough architectural practice is taught (Fig 4-4).

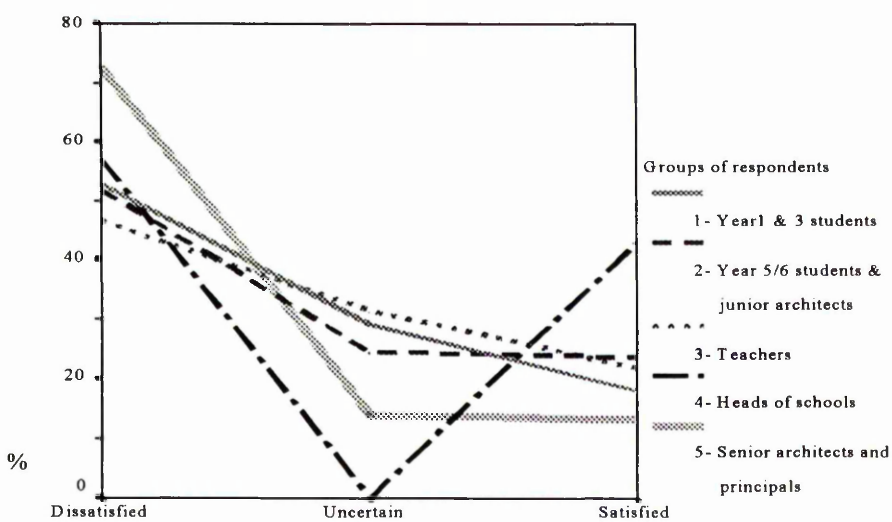

Fig 4-4: Attitudes concerning the adequacy of the teaching of architectural practice. Comparison between groups of respondents.

N(1)= 144, N(2)= 110, N(3)= 73, N(4)= 7, N(5)= 122
Chi-square(1,2)=1.45, NS. p=0.484 Mann-whitney(3,4)=248, NS. p=0.89
Chi-square(2,3)=1.077, NS. p=0.584 Chi-square(3,5)=14.069, NS. p<0.01

There is also a greater agreement between the groups about this than there was for 'construction and materials', about which most groups were also dissatisfied. Nearly half of the teachers are dissatisfied with the adequacy of the teaching of this subject and again there is no significant difference between the attitudes of those teachers who teach architectural practice and those who do not[18] (i.e. half of those who do not teach this subject are also dissatisfied). Even most of the heads of schools, 4 out of 7, are dissatisfied with the teaching of architectural practice. However, it is important to note that about a quarter of teachers (and heads) are satisfied with the adequacy of the teaching of architectural practice and we will look at their attitudes in more detail later on (in section 3). There is no significant difference between the attitudes of students and teachers in this respect (Fig 4-4). But the difference between teachers' and practitioners' attitudes (senior architects and principals) is statistically significant, the latter displaying more dissatisfaction about the teaching of architectural practice. This means that those who are most dissatisfied about the teaching of architectural practice are senior architects and principals of practices, (perhaps to be expected)[19]. First-year students also showed their dissatisfaction about the teaching of architectural practice. One wonders what they were basing this dissatisfaction on, since they can have had little prior experience in this area.

[18] Statistical tests showed no significant difference between their attitudes. Mann-Whitney test, U=159.50, NS. p=0.513.

[19] Or we might say that it is perhaps these who have most need of the knowledge!

Summary and Comments

In general, we found there is a difference between the attitudes of first-year students and heads of schools, and the other groups. The former two showing that they are more satisfied than the rest about the teaching in schools. However, we know that the reasons behind this similarity of attitudes can not be the same. On the other hand, the groups most dissatisfied about the teaching in schools were senior architects and principals of practices. It emerged from the results that most groups of respondents believed history of architecture to be the subject taught most adequately, and architectural practice to be the subject taught least adequately. It is appropriate, however, to review these perceptions in more detail.

All the heads of schools and the majority of students and junior architects were satisfied with the adequacy of the teaching of history of architecture (Fig 4-2). Even the majority of the first-year students believed that architectural graduates receive adequate knowledge in history. But just one third of the teachers, senior architects and principals were satisfied with the teaching of history in schools. This shows a similar attitude between teachers and practitioners in this respect. We found, however, that the reasons behind this similarity are different. Those teachers who were dissatisfied generally did not like the methodology of teaching history, and would like history to be taught through project-based issues rather than exclusively through lectures. An example might be eliminating a stair case in a historical building and asking students to design one. In this case, they would need to understand the historical aspects of the period in which the building was constructed[20]. One might consider whether the procedure of applying such a method is better done through studio classes, lecture courses, or both. This depends upon whether teaching is restricted to the practical issues or whether it also covers the theoretical background upon which practice depends. A definite answer to the question above actually needs further investigation, and the results of research by Salama (1997), are worth considering here. Professor Salama conducted a survey on studio teaching, based on a questionnaire filled in by 75 architectural design instructors from 28 schools of architecture in 13 countries. One of the important results of his survey concerns the integration of knowledge in design studios. He concludes that "the current design studio does not provide adequate knowledge, and does not offer a tutorial environment that allows students to simultaneously acquire and apply a body of knowledge". His survey shows that studio classes do not usually provide an appropriate environment for applying knowledge, and this needs further development[21]. It appears to be counter to the ideas of the teachers dissatisfied with the usual method of teaching history in lecture classes.

In contrast to teachers, principals were also dissatisfied about the teaching of history, because of the content of the curriculum. According to the performance of recent graduates, they think that practical issues in history is no longer a part of the education of architects. By "practical issues" principals mean, for example, detailing or the ability

[20] An example, in the early stages of education, could be measuring historical buildings.
[21] Unfortunately, the experiment has not been repeated in sufficient detail in Salama's book (1997), so I was not able to judge the reliability of the findings.

to refurbish historical buildings. This is different from what principals revealed about their own training (Seidel, 1994). Seidel asked principals of practices in the UK a similar but subtly different question. He asked about the adequacy of history training but his question was about the teaching which the principals themselves had received and not about what their graduate employees had experienced. In his case, more than 87% of the respondents reported adequate training in the history of architecture, far different from our respondents' views about recent graduates. If memory has not dimmed with time, comparison of our results with what Seidel found suggest that either history teaching has changed and become worse, or the importance of some part of it i.e. practical issues, has increased, both of which could be a reason for the dissatisfaction expressed by those architects about history teaching.

It is important to note here that the model of architectural education which exists in the UK is one that fits the students for a wide range of different kinds of architectural practice. The UK does not have a system to prepare individuals for specialist practice. Students may go on to design hospitals or to be involved in conservation work. To put it more generally, the UK needs, or should aim to provide, general education in architecture and not a training in specific branches of architecture. This could be a reason why theoretical issues are valued highly compared with practical issues in schools.

We also found that all practitioners, teachers and final-year students were dissatisfied with the teaching of 'construction and materials' (Fig 4-3). But heads of schools and first-year students are generally satisfied with the teaching of this subject. This shows a great difference between the attitudes of teachers and heads of schools in this respect. Third-year students are rather uncertain about the adequacy of teaching in this subject. A combination of the attitudes of all three groups of students shows that as they become more experienced, they increasingly feel that they have not received adequate construction knowledge in schools. This shows a weak performance by the schools in this respect, a conclusion which is also supported by the majority of teachers and practitioners.

Almost all groups of respondents believed that 'architectural practice' is not taught frequently enough in schools of architecture: even first-year students believed so (Fig 4-4). Most of the heads of schools (4 out of 7) also believed that architectural practice is not taught enough. This clearly shows the similarity of attitude, between all groups of respondents, about the teaching of architectural practice. An implication of this is that schools of architecture do not perform adequately in this respect. The attitudes of students in different schools also confirms this point[22]. However, some of the teachers and heads of schools (about 20%) are satisfied with the teaching of architectural practice. One might conjecture that these are either ignorant about the needs of practice or think that such knowledge can be gained within practice itself. But we can see that the latter perception - that practice knowledge can be or should be gained in practice - is not supported by the practitioners who already work in practices (Fig 4-4).

[22] See page 100.

In general, we found that one of the most satisfied groups about teaching in schools are heads of schools. One begins to suspect of these responses from heads that "they would say that, wouldn't they"; that is, that heads are declaring satisfaction with the teaching in their schools because they bear responsibility for the schools. If this is so, their responses may be considered as complacency and may thus be discounted, as a response for public consumption which may not reflect their real attitude but which may affect policy decisions within their schools.

2) Attitudes about the necessity for knowledge

The second aspect of the analysis concerns respondents' beliefs in the necessity for teaching particular items derived from the course syllabuses of the three subjects. As already explained, in total, the responses of 461 respondents to 37 questions are analysed in this section[23], ten questions having been selected from history of architecture, 18 from construction and materials and 9 from architectural practice. For a full list of selected items, please refer to Table 3-8 in chapter 3.

As before, figures and analysis of data have been produced on the basis of the method of 'frequency of responses' or on some occasions 'means of responses'. The only difference here is the number of questions in each subject. For example, when considering attitudes about the necessity for teaching the history of architecture, the responses to ten questions selected in this subject, will be analysed. The items of knowledge for the questions in this part of the questionnaire were selected from course syllabuses. The items were also selected from different categories, providing a diverse set of knowledge items. Therefore within each subject area, the items in the list are assumed to be representative of what is actually taught within the schools. This is ensured by making the proportion of items within different categories in the list approximately proportional to those across the range of syllabuses obtained (obviously,

[23] This means that a total number of 17057 responses will be analysed. There are 146 missing responses among these, so the total number of valid responses is 16911.

an exact correspondance is not possible because of the small number of questions being asked). Thus for example, the proportion of practical or highly esoteric items in the list is approximately proportional to those in the complete collection. A high rate of scoring 'necessary' by a respondent is now assumed to mean exactly the same as similar high rate of scoring 'necessary' given by another respondent even though the actual items for which this high value is given may be different, because the questions are representative of what is taught as a whole. For this reason we can simply count the number of high scoring responses in order to obtain a measure of the importance given to that subject. So it is possible to say that the perceived necessity for selected items in each subject is likely to be representative of the perceived importance of the teaching in that subject. For example, a higher rate of 'necessary' answers to history questions shows a higher belief in the importance of the teaching of this subject. It is also implicit in the above that we can compare different respondent groups by means of their responses.

Because of the variety of parameters in this section, responses concerning the necessity for teaching certain subjects, will be analysed under four different headings:

- General attitudes.
- Attitudes about the subject courses.
- Attitudes about different levels of practicality.
- Attitudes about different 'esoteric levels'.

General attitudes

Of the total responses to all questions about the necessity for teaching, 61% expressed a need to teach the selected items, 28% expressed uncertainty, whilst only 11% expressed the unimportance of selected items. As a general result, this shows a tendency towards belief in the importance of teaching three selected subject courses. This will also affect the shape of our figures in this section, but the issue is the strength of opinion among different groups of respondents and between different subject courses. Differences between opinions will be shown by statistical tests in each appropriate case.

Figure 4-5 represents the attitudes of different groups of respondents about the necessity for teaching knowledge in schools of architecture. Merely by looking at the figure, it will be seen that the proportion of responses of different groups of respondents seems similar, but the difference is statistically significant. This is due to the large amount of data.

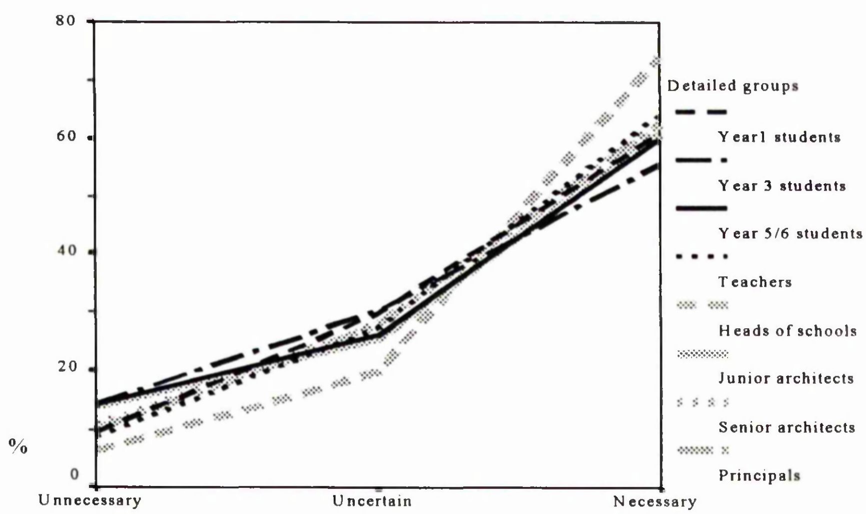

Fig 4-5: Attitudes concerning the necessity for teaching knowledge in general. Comparison between groups of respondents.
For a full list of statistical tests please refer to appendix 9, part II

As may perhaps be expected, teachers and heads of schools produced more 'necessary' responses concerning the teaching of selected subjects (Fig 4-5), while students (year 3 and 5/6) and junior architects produced the least 'necessary' responses. For a better comparison, it would be helpful to use 'means of responses'. Table 4-1 represents the means of responses of different groups of respondents. Figures in the table show that the means of teachers' and heads of schools' responses are higher than those of the other groups, while third and final-year students and junior architects produced lower means of responses concerning the necessity for teaching knowledge in schools.

	Heads of schools	Teachers	Principals	Senior architects	Year 1 students	Junior architects	Year 5/6 students	Year 3 students
Means of responses	3.77	3.73	3.67	3.66	3.64	3.58	3.56	3.52

Table 4-1: Ranking different groups of respondents by means of their responses concerning the necessity for teaching three selected subjects.

According to the statistical tests, the greatest differences in attitude are between third-year and final-year students, taken as a single group, with senior architects and principals, taken as another[24]. Their attitudes show differences in respect to twelve questions (out of 37) used in the questionnaire. The attitudes of teachers also show differences compared with students, senior architects and principals (in an average of eight questions out of 37). The attitudes of heads of schools also show differences compared with final-year students and senior architects.

The statistical tests show no significant differences between the attitudes of final-year students and junior architects about the necessity for teaching knowledge. Nor are there significant differences between the attitudes of heads of schools and first-year students in each individual item. According to the statistical measures, the difference between the

[24] For a full list of statistical calculations please refer to Appendix 7; part two.

attitudes of senior architects and principals is also very small. Their attitudes show differences in five selected questions out of 37. For better comparison, however, it is useful to consider the 'means of responses' separated by subjects. Figure 4-6 represents the means of responses of different groups of respondents in three selected subjects.

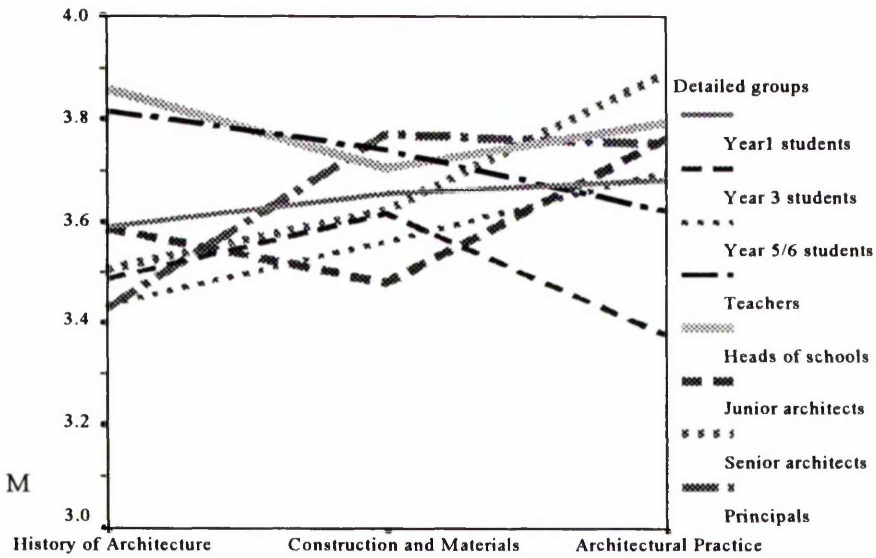

Fig 4-6: Attitudes concerning the necessity for teaching knowledge. Comparison between three selected subjects.

T-tests are just calculated to compare the responses of each group about different subjects. Chi-square test also showed similar results.

	(History- Construction)	(Construction- Arch. Practice)	(History- Arch. practice)
Year one:	T=1.524, P=0.128, NS.	T=0.527, P=0.598, NS.	T=1.711, P=0.087, NS.
Year three:	T=3.131, P<0.01, S.	T=5.836, P<0.01, S.	T=2.212, P=0.027, NS.
Year 5/6:	T=2.897, P<0.01, S.	T=3.084, P<0.01, S.	
Teachers:	T=1.807, P=0.71, NS.	T=2.739, P<0.01, S.	
Heads:	T=1.407, P=0.161, NS.	T=0.798, P=0.426, NS.	T=0.504, P=0.615, NS.
Jun. archs:	T=1.490, P=0.137, NS.	T=3.842, P<0.01, S.	T=2.113, P=0.035, NS.
Sen. archs:	T=2.348, P=0.019, NS.	T=5.221, P<0.01, S.	
Principals:	T=8.033, P<0.01, S.	T=0.437, P=0.662, NS.	T=6.301, P<0.01, S.

The figure clearly indicates that the attitudes of different groups of respondents differ with respect to the necessity for teaching different subject courses. Statistical tests show that there are significant differences in the attitudes of practitioners towards 'history' and towards the other subjects[25]. History of architecture is thought to be less necessary than the other two subjects. The attitudes of teachers and heads of schools do not show any significant difference in this respect, that is, there is not so much difference between the importance of different subjects for them. It is also important to note that their responses to history show a higher mean than those of practitioners i.e. they regard it more highly.

The figure also shows a significant drop in the value that third-year students place on teaching 'architectural practice' (in comparison with construction). This is actually in contrast to the responses of junior architects, who believe that architectural practice is much more important than construction and materials.

Third-year students, final-year students, senior architects and principals believe that construction and materials is more necessary or is more important than history of architecture. On the other hand senior architects, final-year students and junior architects believe that architectural practice is more necessary or is more important than construction and materials. This is rather different from the attitudes of teachers and heads of schools, who placed a similar degree of importance on all three subjects.

In general, there is no significant difference between the attitudes of students in different schools, but statistical calculations showed that female students valued knowledge more than male students. Their attitudes showed significant difference in all three subjects.

[25] Excluding junior architects.

The attitudes of practitioners in different practice sizes also showed some differences from each other. Their attitudes will be considered in more detail later on.

Comparing different subject courses

History of architecture

Figure 4-7 shows that teachers and heads of schools gave the highest 'necessary' responses to the questions about history teaching, in comparison with other groups. Perhaps those who believe most strongly in the value of history are teachers and heads of schools.

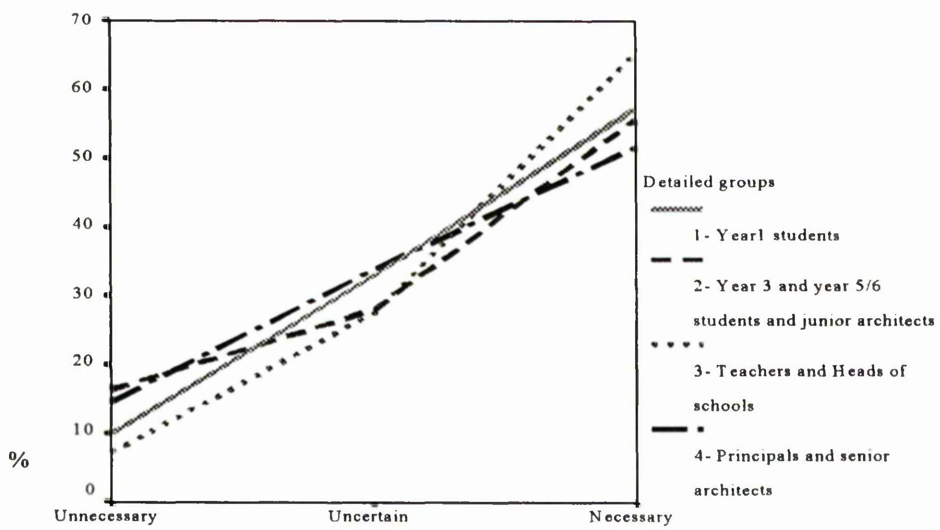

Fig 4-7: Attitudes concerning the necessity for teaching history of architecture. Comparison between main groups.
N(1)= 602, N(2)= 1919, N(3)= 810, N(4)= 1223
Chi-square(1,2)= 17.155, S. P<0.01. Chi-square(3,4)= 45.222, S. P<0.01.
Chi-aquare(1, teachers)= 7.472, NS. p=0.024.
Chi-square(1, heads of schools)= 7.726, NS. P=0.021.
Chi-square(year three students, 4)= 9.182, NS. P=0.057.

More than 65% of teachers' responses expressed a belief in the necessity for teaching the items presented, (this percentage is even higher among heads of schools). They therefore attach a higher importance to history than other respondents. Practitioners produced the highest frequency of 'uncertain' responses, together with the lowest frequency of 'necessary' responses. The difference between the attitudes of teachers and practitioners is statistically significant in this respect. The most uncertain groups about the necessity for teaching history are senior architects and principals. Among all three groups of students, those in the first year produced the highest frequency of 'necessary' and also the lowest frequency of 'unnecessary' responses, when asked about history. Their attitudes are similar to those of teachers and heads of schools in this respect.

Figure 4-8 compares the attitudes of those teachers who teach history with the rest of the teachers, to the necessity for the teaching of history.

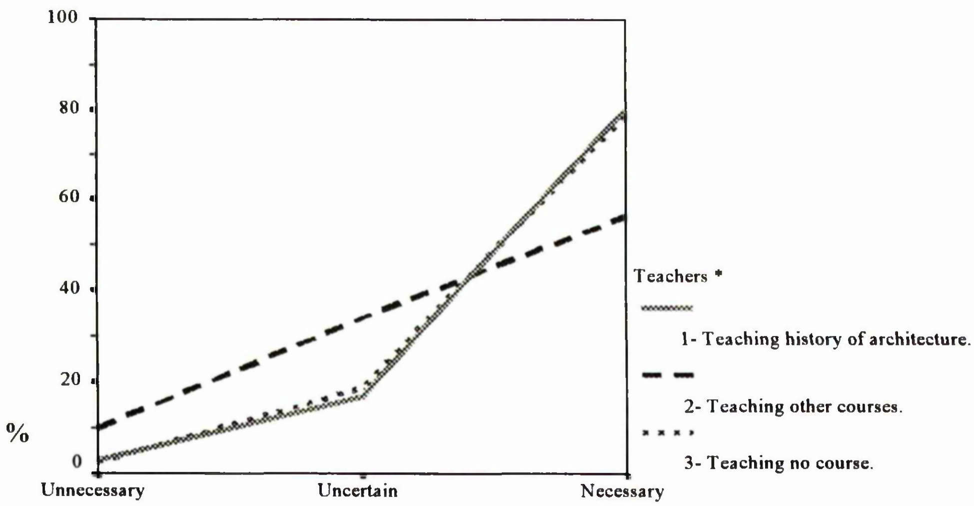

Fig 4-8: Attitudes concerning the necessity for teaching history of architecture. Comparison between teachers who teach history and those who do not.
N(1)=140, N(2)=530, N(3)=100.
Chi-aquare(1,2)= 28.452, S. p<0.01.
* Those heads who teach are also counted.

Those teachers who do not teach history do not believe in the necessity for teaching this subject as much as those who teach history, a not unexpected result. It is also interesting to note that the attitudes of those teachers who do not teach any lecture course in school are similar to those of history teachers. They also produced a high frequency of 'necessary' responses. This is not an unexpected result either, because most of these teachers are studio instructors who are presumably interested in the theory and history of architecture. This is an assumption which needs further investigation before it can be proved.

Construction and Materials

Figure 4-9 compares the attitudes of three groups about the necessity for the teaching of construction and materials. Heads of schools and teachers produced the highest frequency of necessity responses in this respect, while students produced the lowest.

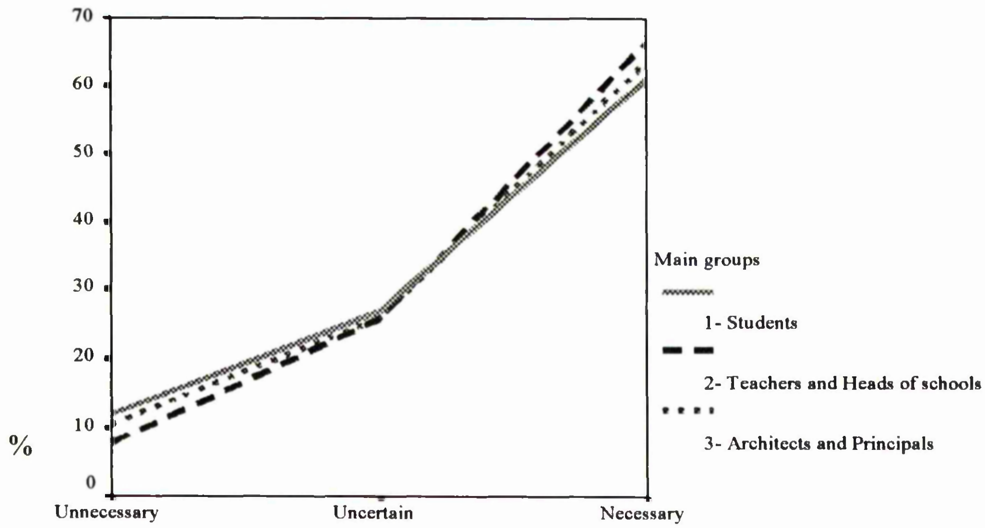

Fig 4-9: Attitudes concerning the necessity for teaching construction and materials. Comparison between main groups.
N(1)=4037, N(2)=1454, N(3)=2739.
Chi-square(1,2)= 22.701, S. $p<0.01$. Chi-square(2,3)= 8.873, S. $p=0.012$.

Among the different groups, heads of schools, teachers and principals produced more 'necessary' responses to questions about the teaching of construction, than others (Fig 4-10).

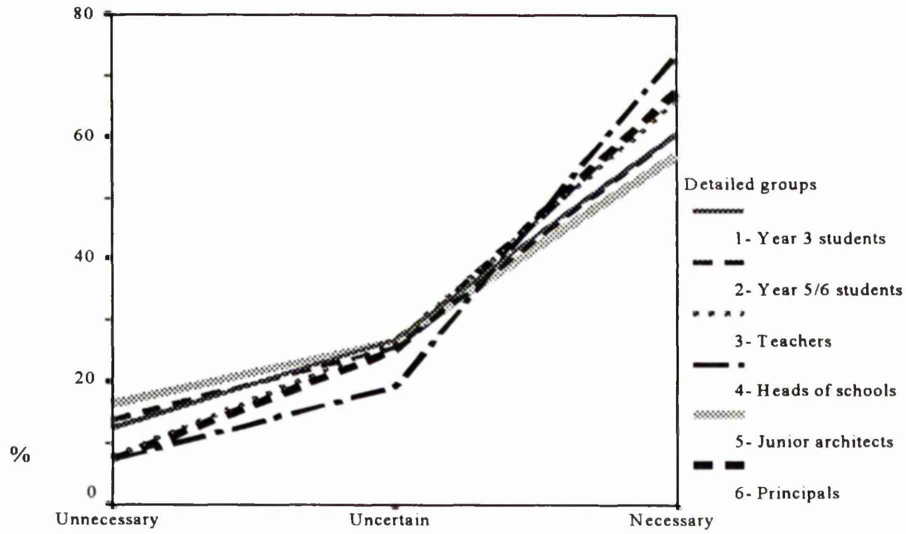

Fig 4-10: Attitudes concerning the necessity for teaching construction and materials. Comparison between selected groups.
N(1)= 1489, N(2)= 1436, N(3)= 1329, N(4)= 125, N(5)= 536, N(6)= 1273
Chi-square(2,5)= 2.916, NS. P=0.233 Chi-square(3,6)= 0.879, NS. p=0.645
Chi-square(3,4)= 3.417, NS. P=0.181 Chi-square(5,6)= 38.173, S. P<0.01
Chi-square(1,3)= 17.925, S. P<0.01.

Principals produced a high frequency of 'necessary' responses, like teachers, while junior architects produced the least frequency of 'necessary' responses among all groups.

As in the case of history of architecture, those teachers who teach construction and materials believe more strongly in the importance of teaching this subject than the other teachers (Fig 4-11), but in contrast to history, the attitudes of those teachers who do not teach any lecture course (e.g. studio instructors) are similar to those who do not teach construction.

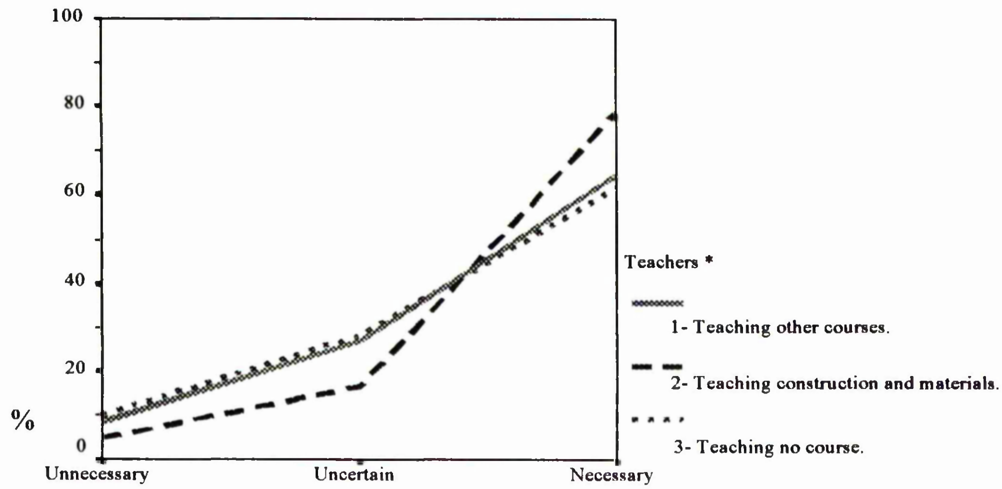

Fig 4-11: Attitudes concerning the necessity for teaching construction and materials. Comparison between those who teach construction and those who do not.

N(1)= 969, N(2)= 234, N(3)= 180.
Chi-square(1,2)= 16.17, S. p<0.01.
* Those heads who teach are also counted.

Architectural Practice

The majority of the responses of most groups of respondents show that architectural practice knowledge is believed to be necessary (Fig 4-12).

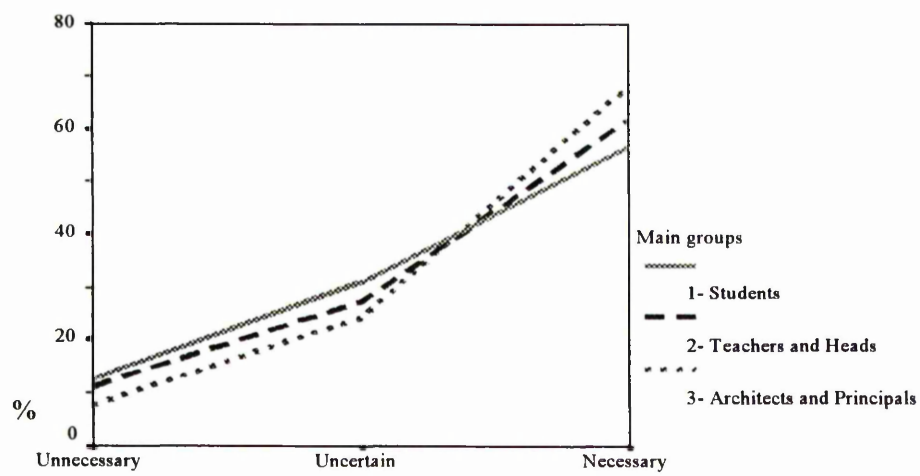

Fig 4-12: Attitudes concerning the necessity for teaching architectural practice. Comparison between main groups.

N(1)= 2019, N(2)=726, N(3)=1372.
Chi-square(1,2)= 5.491, NS. P=0.064. Chi-square(2,3)= 11.187, S. p<0.01.

In contrast to history and construction, in which teachers and heads of schools show more interest, here it is practitioners who believe more strongly about the necessity for teaching architectural practice, and the attitudes of principals, junior and senior architects do not differ significantly in this matter. The attitudes of heads of schools are also similar to those of teachers and have been combined in the graph.

Students' attitudes show an interesting pattern in different years (Fig 4-13). Students in their third year show a decrease in their belief in the need for architectural practice knowledge, compared with first-year students. Perhaps they are simply less concerned about this subject at that stage of their education, because in final-year (after spending one year in practice) they again show a greater belief in the necessity for this subject.

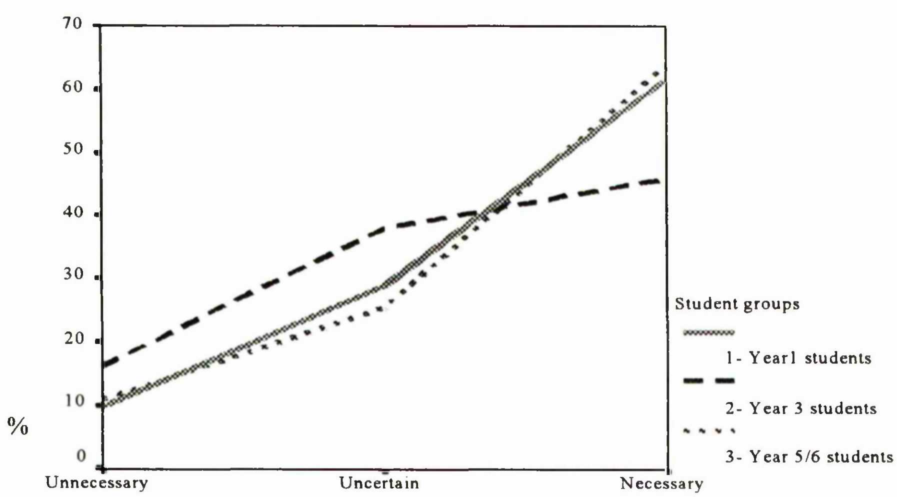

Fig 4-13: Attitudes concerning the necessity for teaching architectural practice. Comparison between student groups.

N(1)=547, N(2)=744, N(3)=719
Chi-square(1,3)= 32.267, S. $p<0.01$

Figure 4-14 compares the attitudes of teachers with those of practitioners about the necessity for teaching architectural practice.

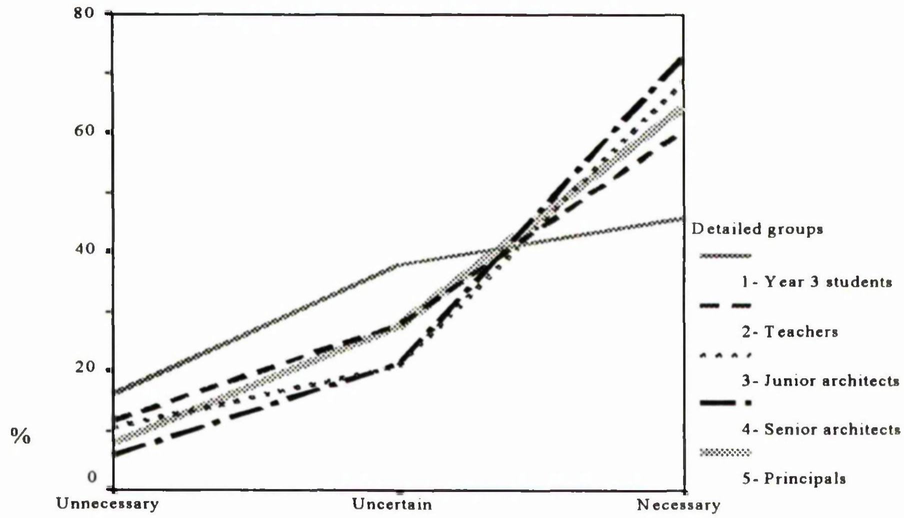

Fig 4-14: Attitudes concerning the necessity for teaching architectural practice. Comparison between teachers and practitioners.
N(1)= 744, N(2)= 663, N(3)= 268, N(4)= 465, N(5)= 639
Chi-square(2,5)= 5.625, NS. P=0.06 Chi-square(1,2)= 29.654, S. P<0.01
Chi-square(4,5)= 8.804, S. p=0.012

The figure shows that teachers are more like principals than senior architects in this respect. Statistically, there is significant difference between the attitudes of teachers and principals in this respect. Third-year students' attitudes also show significant difference from those of teachers. Senior architects produced a higher frequency of 'necessary' and also lower frequency of 'unnecessary' and 'uncertain' responses. There is a significant difference between the attitudes of senior architects and principals here.

As with history and construction, teachers who teach architectural practice believe more in the need for teaching this subject than the other teachers (Fig 4-15). The attitudes of those who do not teach any lecture course (e.g. studio instructors) are similar to those who do not teach this course. This means that (as well as for construction) studio instructors did not value architectural practice.

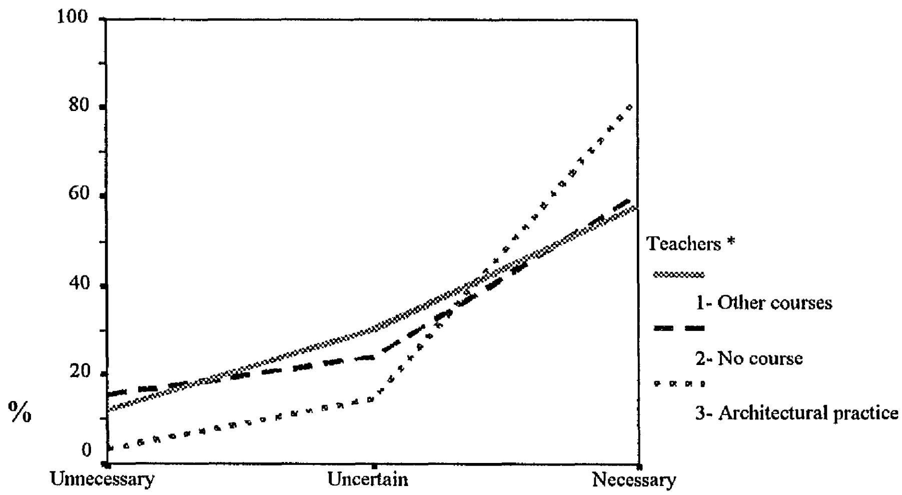

Fig 4-15: Attitudes concerning the necessity for teaching architectural practice. Comparison between those who teach architectural practice and those who do not.

N(1)=540, N(2)=89, N(3)=62

Chi-aquare(1,3)= 12.718, S. $p<0.01$.

Practitioners in different practice sizes

Analysis of responses of practitioners in different practice sizes showed that they indicated different attitudes about the necessity for the teaching of three selected subjects. Before any discussion, it is important to note that in this analysis practices are divided into three groups; small (1-5 architects), medium (6-14 architects) and large (15 or more architects)[26]. It might also be helpful to examine the number of received responses in each group of practices (Table 4-2).

	Small practices	Medium practices	Large practices	Total
Junior architects	8	8	13	29
Senior architects	6	17	30	53
Principals	37	12	22	71
Total	51	37	65	153[27]

Table 4-2: Number of practitioners who filled in the questionnaire, based on the practice sizes.

[26] Divisions were made on the basis of detected differences.
[27] Two of the practitioners did not state the years of their experience.

In carrying out this analysis, I have assumed that the size of practice will influence the attitudes of senior architects and principals, because of their working experience. However I assume that junior architects have not had sufficient time for their views to be influenced by these different working environments[28]. Therefore, although the figures for junior architects are presented, they have not been discussed in detail.

History of architecture

Figure 4-16 compares the attitudes of practitioners concerning the necessity for the teaching of history of architecture. The figure shows that senior architects in medium-sized practices did not value history as much as their principals, although in large practices it was senior architects who valued history more than principals. There was no significant difference between the attitudes of principals and senior architects in small practices.

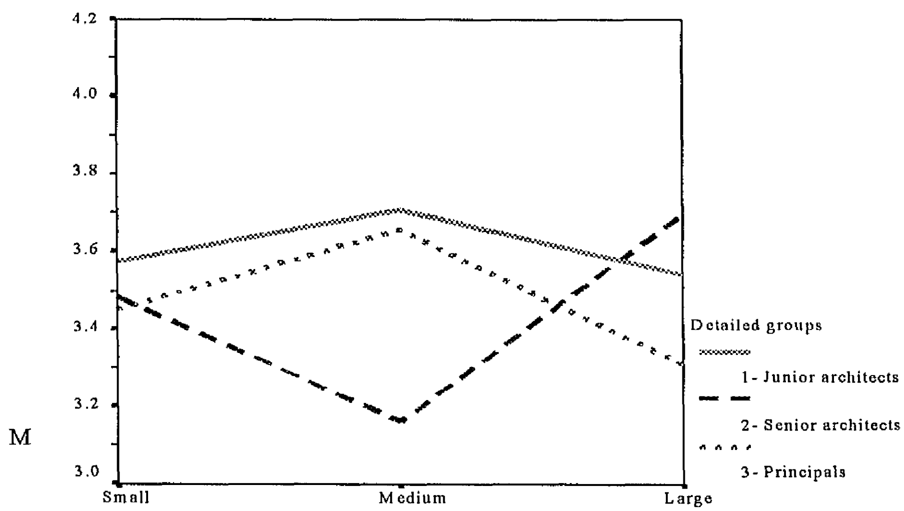

Fig 4-16: Attitudes concerning the necessity for teaching history of architecture. Comparison between practitioners in different practice sizes.
Chi-square (2,3 in medium)= 27.992, S. P<0.01. Chi-square (2,3 in large)= 13.77, S. P<0.01.

---

[28] There is also the problem of the small sample size in this category.

Construction and materials

Figure 4-17 compares the attitudes of practitioners concerning the necessity for the teaching of construction and materials.

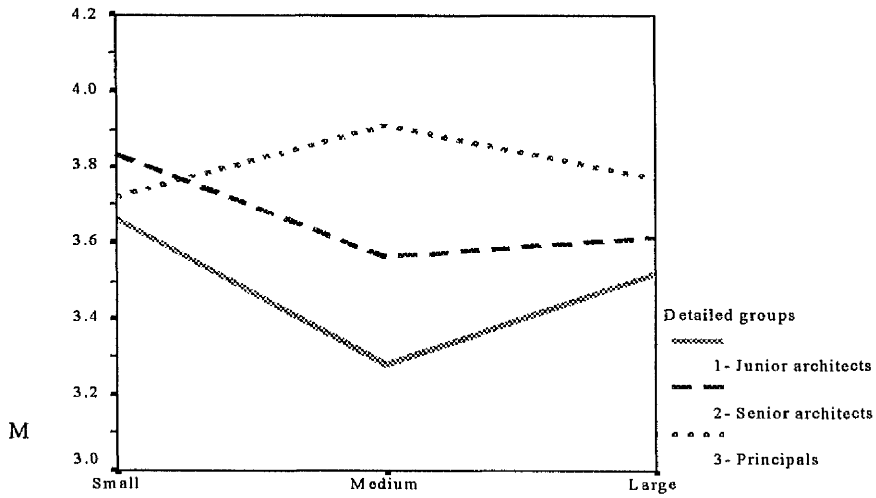

Fig 4-17: Attitudes concerning the necessity for teaching construction and materials. Comparison between practitioners in different practice sizes.
Chi-square (2,3 in medium)= 10.189, S. P<0.01.
Chi-square (2,3 in large)= 6.728, NS. P=0.035.

A comparison of small and large practice shows that there is no significant difference between the views of individuals of different degrees of seniority. It is only in medium-sized practices that differences are found. In medium size practices, principals value construction more highly than either junior or senior architects.

Architectural practice

Figure 4-18 compares the attitudes of practitioners concerning the necessity for the teaching of architectural practice. There is no significant difference between the attitudes of practitioners in medium and large practices in this respect. But senior architects in small practices valued architectural practice more than their principals, possibly because they see themselves as becoming principals in the future and are concerned about the handling of practice issues.

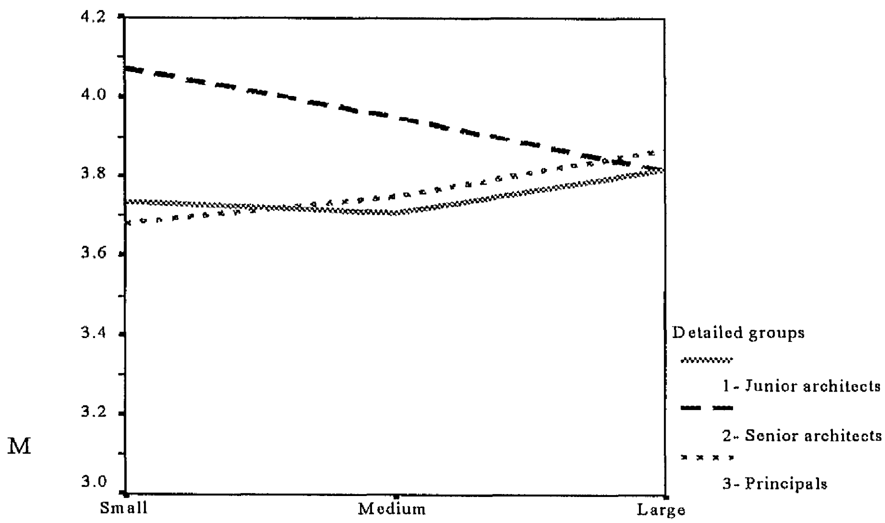

Fig 4-18: Attitudes concerning the necessity for teaching architectural practice. Comparison between practitioners in different practice sizes.
Mann-whitney (2,3 in small)= 6860, S. $P<0.01$.
Mann-whitney (2,3 in medium)= 6264, NS. $P=0.029$.

Attitudes concerning different levels of practicality

Before considering attitudes towards the necessity for teaching at different levels of practicality, it is necessary to say that the analysis in this part is based on the categorisation of selected items under each level of practicality, as defined earlier. One might conjecture whether the selected items are appropriate representatives of the categories, and therefore whether the answers given are a true representation of respondents' views about the levels of practicality at which subjects should be taught. There are two concerns here; one is about the accuracy of the categorisation of the items i.e. are the items categorised properly? The other is whether the small number of selected items in each category allows reasonable inferences to be drawn. Both of these issues were discussed in a previous chapter, however a fresh review might be useful here.

- Categorisation of items was based on a "judgement" made about "written expressions" in course syllabuses. The written expressions of course syllabuses do not provide absolute information to establish accurate categories, but they may be considered as representative of material that is taught in schools. Judgements were made by: 1) reviewing the items in order to become familiar with them, 2) listing the items under selected categories and finally 3) checking the lists with at least one specialist in the subject field. At this stage, a high level of agreement was found between the judgements I made and those of the specialist teachers.

- Items in each category were not selected from the list at random, instead they first eliminated from the list where their descriptions in the syllabus was most ambiguous. The intention here was to reduce the problem of differences in interpretation of the meanings of items by the respondents. Another intention was to select items from different topics. As already explained in a previous chapter, 37 items were selected from 45 available topics[29]. After the selection, the list of items in the questionnaire was again checked for clarity of meaning. It was also explained in a previous chapter that a decision was made to limit the number of selected items in each category, in order to minimise the length of the questionnaire, both to achieve accurate responses[30] and also to encourage as many responses as possible[31]. So the number of selected items in each category was a good compromise, both in terms of covering the categories and also of minimising the length of the questionnaire. We still can not be sure, however, that the selected items are absolute representatives of all items in each category. The selections made here are based on judgements that I have made and are open to debate. Therefore, it is important to note that while efforts have been made to make the process as accurate as possible, the analysis provided in this section can not be regarded as certain as that in previous sections.

In the questionnaire, items appeared in random order, so that there was no obvious relationship between items dealing with the same subject but in different categories. It was thus assumed that in making their assessments, respondents would be treating each

[29] See page 83.
[30] See chapter 3.
[31] 30% of the mailed questionnaiers were completed and returned. One reason could be the short length of the questionnaire which was just one page.

item separately and not making any comparison between them. Analysis in this section is separated by different subjects, and in each part starts by a comparison of different levels of practicality.

History of architecture

Table 4-3 shows ten items or topics of history selected under three levels of practicality (1,2 & 3).

No.	Code	Prc.*	Selected items or topics
1	H1H1	1	Why we study architectural history and what is history?
2	H1H2	1	General cultural history.
3	H1M1	1	The work of some twentieth century engineers .
4	H2H1	2a	Architecture and politics.
5	H2W1	2a	Venturi, Rogers and Foster's idea of complexity and technology.
6	H2W2	2a	The style of Baroque and French Rationalism.
7	H2W3	2d	What Palladian architecture looks like.
8	H2W4	2d	What Victorian architecture looks like.
9	H2W5	2d	What Frank Lloyd Wright Chicago house looks like.
10	H3H1	3	Understanding the cultural forces that shape buildings.

Table 4-3: Selected items or topics in history of architecture.
* Levels of practicality.

Three items are selected from level 1, which is general knowledge (Nos. 1,2 & 3). The first question is a general introductory item, the second concerns general history and the third one is about the history of science. Six topics or items are selected from level 2, which is basic or theoretical knowledge. They are of two kinds: analytic (Nos. 4,5 & 6) and descriptive (Nos. 7,8 & 9). The last topic in history is selected from level 3, which is practical knowledge. Before considering each category in detail it is useful first to compare them together. Figure 4-19 represents the attitudes of all respondents concerning the necessity for teaching of different levels of practicality in history. Basic analytic and basic descriptive knowledge are separated in this figure.

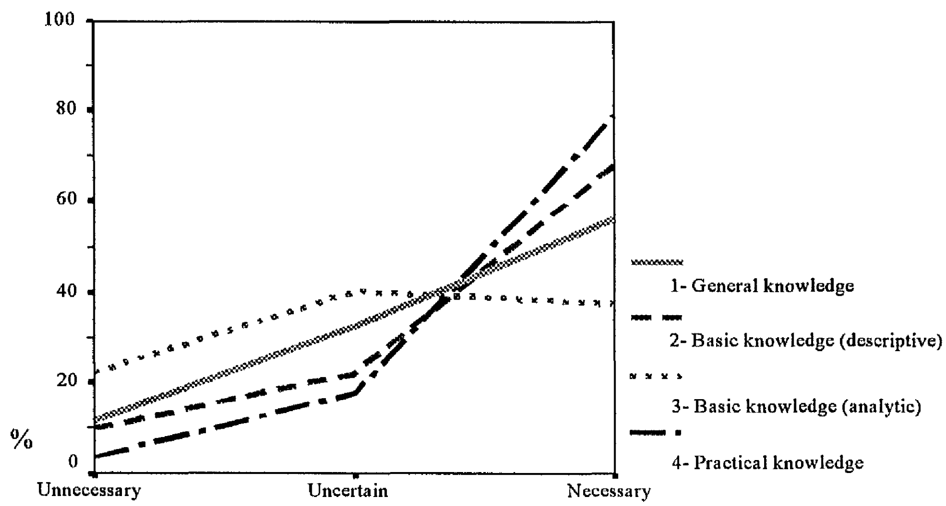

Fig 4-19: Attitudes concerning the necessity for teaching history of architecture. Comparison between levels of practicality.
N(1)= 1374, N(2)= 1372, N(3)=1360, N(4)= 458
Chi-square(1,2)= 44.285, S. $p<0.01$.
Chi-square(2,4)= 25.353, S. $p<0.01$.

Comparing all levels, practical knowledge in history shows the highest frequency of 'necessary' answers. In fact, the largest number of respondents believed this to be necessary. This means that practical knowledge is thought to be the most important category in the history of architecture. Nearly 80% of the responses express the necessity for teaching this category. Before any further explanation, it is important to talk about the very peculiar nature of the only item selected in this category. First of all the item selected is "understanding the cultural forces that shape buildings". This is actually a theoretical, as much as historical, issue. Other items and topics in the practical category of the history subject are of a similar nature. Indeed, it is possible to imagine some other kinds of practical issues in history, such as 'restoration' or 'construction and detailing of historical buildings'. However these are not usually taught as part of history[32]. Some of these kinds of topics may be taught in construction or, in some schools, as a separate course named 'conservation'. The selection was simply made from what was available in syllabuses. Secondly, just one question was selected in this category which may be considered as a weakness. As already explained, because of the small number of items in course syllabuses under this category, there was a limitation in the number of selected items. On the other hand, the selected item is not a specific detailed item, it is a topic that covers a wide range of issues. All these reasons could explain the positive interest among respondents.

According to Figure 4-19, basic analytic knowledge received the lowest frequency of 'necessary' answers. In total, just about 35% of responses expressed the necessity for teaching this category. Three items were selected under this category: 4) Architecture and politics, 5) Venturi, Rogers and Foster's idea of complexity and technology, 6) The style of Baroque and French Rationalism. Among these three, the lowest frequency of 'necessary' answers was given for "the style of Baroque and French Rationalism" (less than 25% of respondents thought that this item needs to be taught), although it is interesting to note that this item (or items like this in the same topic) is taught in many schools[33]. The highest frequency of 'necessary' answers was given for 'architecture and politics' (but still less than 50% of responses revealed the opinion that it is

---

[32] Such items were not found in history course syllabuses.
[33] See Table 4-7.

necessary to teach this item). On the other hand, there is also a high frequency of 'uncertain' responses to these questions (Fig 4-19).

Basic descriptive knowledge received the highest frequency of 'necessary' answers after practical knowledge. The highest frequency of necessary answers in this category belongs to "What a Frank Lloyd Wright Chicago house looks like" (more than 65% of respondents thought that it is necessary to teach this item). However it is better to look at the attitudes of different groups of respondents concerning each category.

General knowledge (1)

Figure 4-20 shows the attitudes of the three main groups of respondents concerning the necessity for teaching general knowledge in history. Teachers and heads of schools have stronger belief than the other groups in the necessity for teaching this category.

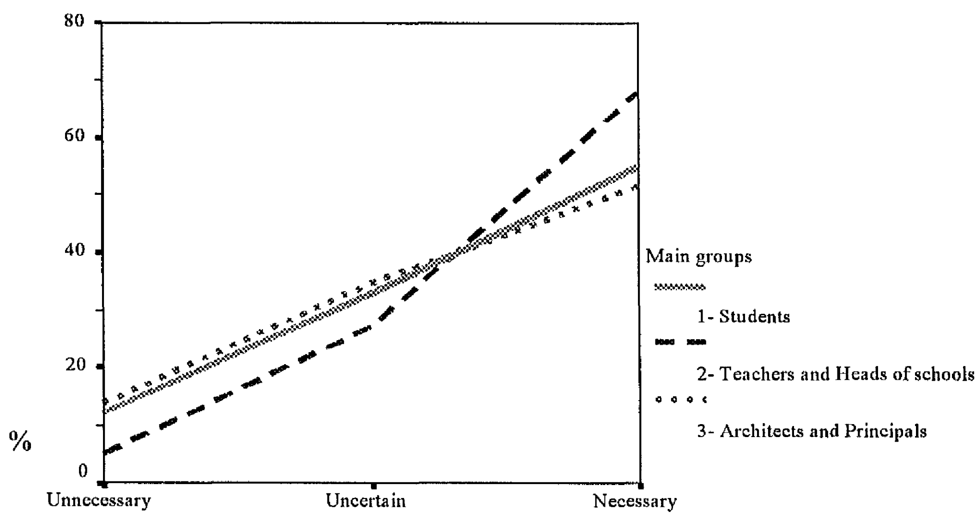

Fig 4-20: Attitudes concerning the necessity for teaching general knowledge in history. Comparison between main groups.
N(1)= 673, N(2)= 243, N(3)= 458
Chi-square(1,2)= 16.077, S. $p<0.01$.
Chi-square(1,3)= 1.416, NS. $p=0.493$.

Statistically, there is no significant difference between the attitudes of teachers and heads of schools in this respect. It is also true of the attitudes between students and practitioners and even within the groups. But the difference between the attitudes of teachers and heads of schools, compared with practitioners, is significant.

Basic analytic knowledge (2a)

Figure 4-21 shows that the attitudes of the three main groups of respondents, concerning basic analytic knowledge, are very uncertain. Teachers and heads of schools again have the strongest belief in the necessity for teaching this category. It is important to note that heads of schools have the strongest belief about the necessity for teaching this category while the principals have the lowest.

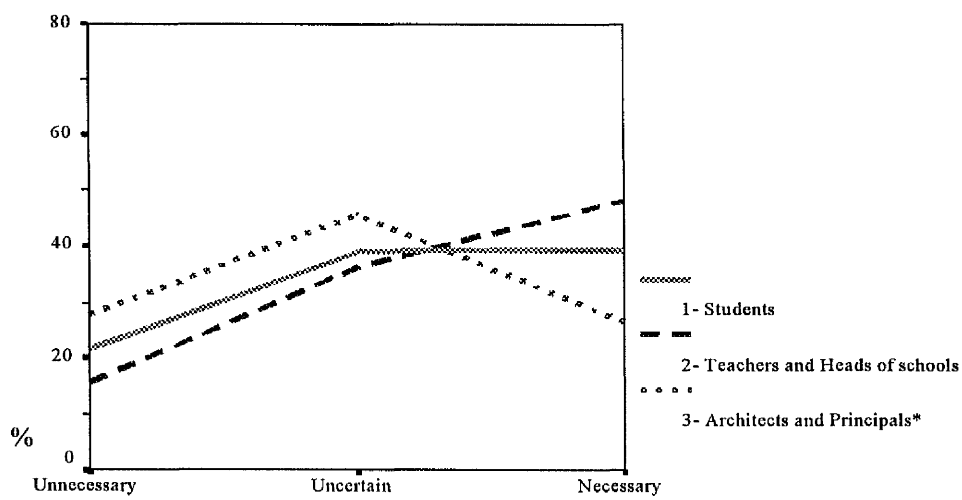

Fig 4-21: Attitudes concerning the necessity for teaching basic analytic knowledge in history. Comparison between groups of respondents.

* Junior architects responses are added to students, due to their similarity.
N(1)= 665, N(2)= 243, N(3)= 364
Chi-square(2,3)= 31.508, S. P<0.01. Chi-square(1,3)= 17.926, S. P<0.01.

Statistically, there is significant difference between the attitudes of students and practitioners in this respect. It is also true of the attitudes between teachers and practitioners. But there is no significant difference between the attitudes of detailed groups within each of the three main groups: students, teachers and heads and practitioners.

Basic descriptive knowledge (2d)

Practitioners' belief in the necessity for teaching basic descriptive knowledge is as great as teachers' (Fig 4-22).

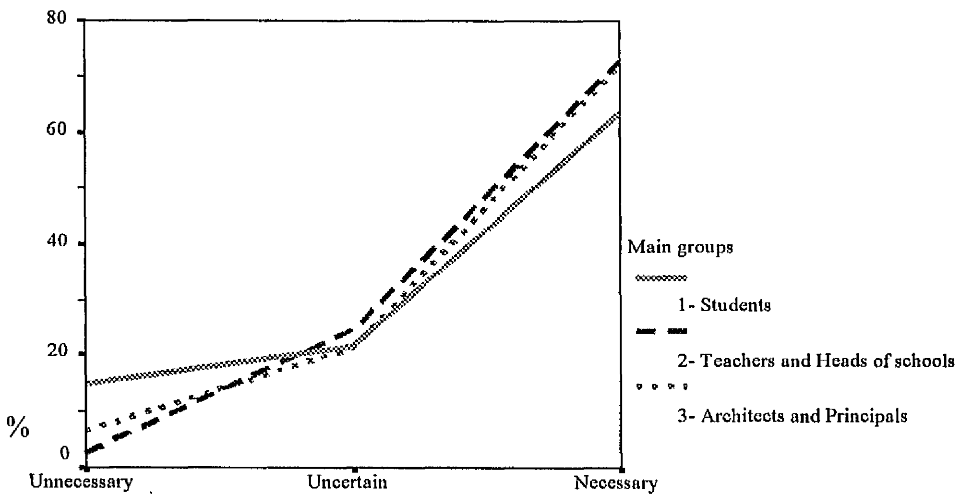

Fig 4-22: Attitudes concerning the necessity for teaching basic descriptive knowledge in history. Comparison between main groups.

N(1)= 675, N(2)= 243, N(3)= 454
Chi-square(1,2)= 26.247, S. p<0.01.
Chi-square(2,3)= 5.625, NS. p=0.06.

However, there is significant difference between the attitudes of junior and senior architects in this respect (Fig 4-23). Senior architects are the most uncertain group about the necessity for teaching basic descriptive knowledge.

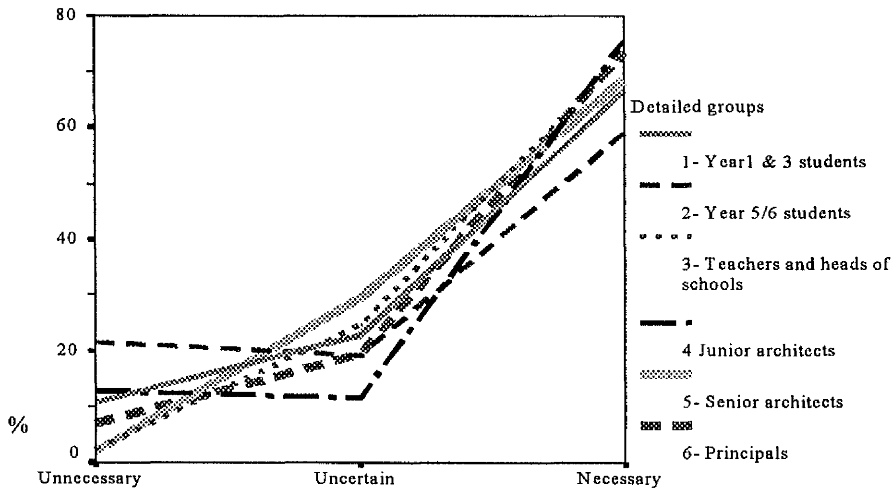

Fig 4-23: Attitudes concerning the necessity for teaching basic descriptive knowledge in history. Comparison between detailed groups.

N(1)= 432, N(2)= 240, N(3)= 243, N(4)= 86, N(5)= 156, N(6)= 212
Chi-square (year 1 and year 5/6 students)= 18.624, S. $P<0.01$.
Chi-square (5,6)= 9.106, S. $P=0.011$.
Chi-square (4,5)= 19.34, S. $P<0.01$.

Students in total produced the lowest frequency of 'necessary' responses (Fig 4-22), and final-year students produced the highest frequency of 'unnecessary' responses among all the groups (Fig 4-23) i.e. they seem to value it the least. This is in strong contrast to teachers and heads of schools, who together with senior architects, produced the lowest frequency of 'unnecessary' responses.

In respect of the two types of basic knowledge in history, the levels of 'uncertain' and 'unnecessary' responses are higher for basic analytic knowledge (compared with basic descriptive knowledge). It was practitioners and teachers who showed the difference most markedly. It seems reasonable to suppose that if respondents had been asked directly about the importance of teaching the theories underlying the practical knowledge, they would have responded that this was important. But because it was one of the objectives of this survey to explore the real beliefs of the respondents, I did not want them to respond as they thought they should. In this particular case, three items were selected from each of the categories, analytic and descriptive knowledge. Even if architects and students failed to realise that there were differences between the items (that some are analytic and some descriptive) this would certainly have been clear to history teachers. When the responses from all the teachers were combined it was apparent that they were placed a higher value on descriptive knowledge than on theoretical knowledge (see Table 4-4 column 5). This belief was strongly marked among teachers of history, descriptive knowledge being even more highly valued by them than theoretical knowledge. When history teachers were compared with their colleagues, they valued theoretical knowledge more highly. One might expect the perceived values to be reflected in the number of items in each category in the syllabuses, but the ambiguity of many descriptions prevented this comparison from being made.

1 Code	2 Items	3 Categories	4 History teachers	5 All teachers	6 All respondents
H2H1	Architecture and politics.	Analytic	3.86	3.62	3.36
H2W1	Venturi, Rogers and Foster's idea of complexity and technology.	Analytic	3.64	3.36	3.24
H2W2	The style of Baroque and French Rationalism.	Analytic	3.57	3.20	2.90
H2W3	What Palladian architecture looks like.	Descriptive	4.21	3.97	3.70
H2W4	What Victorian architecture looks like.	Descriptive	4.21	4.00	3.70
H2W5	What Frank Lloyd Wright Chicago house look like.	Descriptive	4.21	4.03	3.82

Table 4-4: Means of responses concerning the necessity for teaching analytic & descriptive history knowledge.

Practical knowledge (3)

Teachers and heads of schools believe more strongly in the value of practical knowledge in history (Fig 4-24).

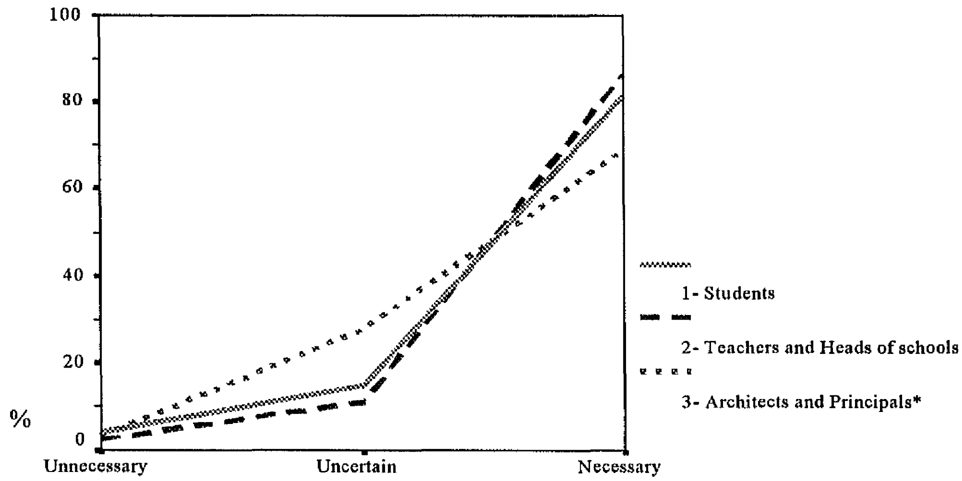

Fig 4-24: Attitudes concerning the necessity for teaching practical knowledge in history. Comparison between groups of respondents.
* Junior architects responses are deducted and added to students, due to their very similar frequencies.
N(1)= 255, N(2)= 81, N(3)= 122
Mann-whitney(2,3)= 4089, S. p<0.01.

All the heads of schools think it is necessary to teach this kind of knowledge. Students and junior architects' attitudes are similar to teachers' in this respect. Principals and senior architects are the groups least certain about the value of this category and also produced the lowest number of 'necessary' responses. There is also no significant difference between their attitudes.

In order to be able to compare the attitudes of different groups of respondents concerning different levels of practicality, we need to use the method of 'mean of responses'. Figure 4-25 summarises the mean of responses concerning the necessity for teaching different levels of practicality in history. The figure clearly shows that teachers and heads of schools have the highest mean of responses at all levels.

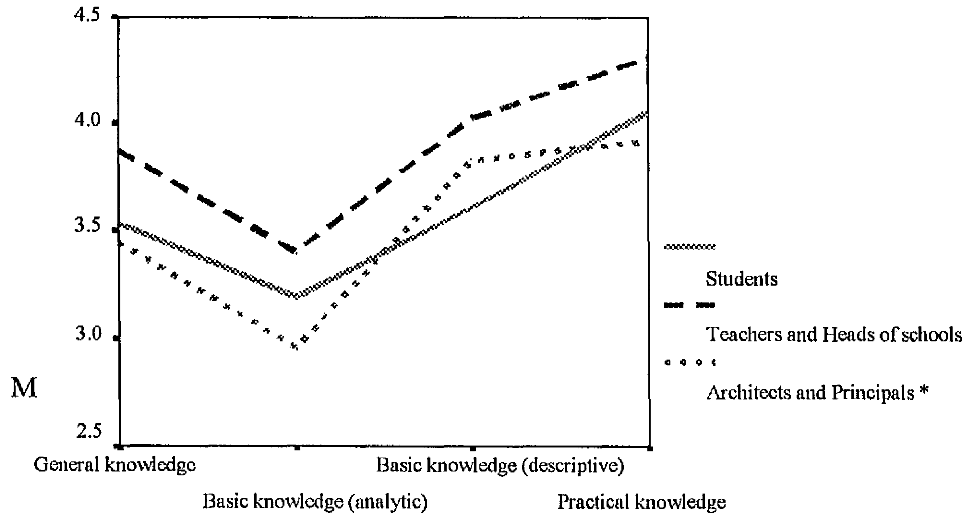

Fig 4-25: Attitudes concerning the necessity for teaching different levels of practicality in history. Comparison between groups of respondents.
* Junior architects responses are deducted and added to students, due to their very similar frequencies.

This also shows that teachers and heads have the strongest belief in the value of history, irrespective of the level of practicality. Comparing different levels of practicality shows that the attitudes are in harmony, except in 'basic descriptive knowledge', where practitioners' attitudes get closer to those of teachers, which means that they have a stronger belief in its necessity than was expected. The figure also shows that the mean of responses is quite high in the practical category.

Construction and materials

Table 4-5 shows eighteen items or topics of construction and materials selected under different levels of practicality (1,2 & 3). Three items were selected from level 1 which is general knowledge, seven items were selected from level 2, which is basic knowledge and six items were selected from category 3 which is practical knowledge. The last two items are site knowledge which is a subdivision of the construction subject.

No.	Code	Prc.*	Selected items or topics
1	C1H1	1	Manufacturing process of bricks.
2	C1M1	1	The historical development of iron and steel.
3	C1W1	1	What is construction and why study it?
4	C2H1	2	Timber infestation.
5	C2H2	2	Properties of less-common building materials, such as plastics .
6	C2H3	2	Traditional construction methods.
7	C2M1	2	Construction of internal walls and partitions.
8	C2M2	2	Construction sequence.
9	C2W1	2	Cladding systems .
10	C2W2	2	Properties of common building materials.
11	C3H1	3	Building failures.
12	C3H2	3	Health and Safety issues.
13	C3M1	3	Fire protection with regard to internal finishes .
14	C3M2	3	Methods of estimating building cost .
15	C3M3s	3s	Site investigation and site analysis.
16	C3M4s	3s	Fabrication and assembly of steel frames.
17	C3W1	3	Designing and detailing masonry walls .
18	C3W2	3	Designing and detailing joints at the junction of roofs and walls.

Table 4-5: Selected items or topics in construction and materials. * Levels of practicality.

Figure 4-26, represents the attitudes of all respondents about the necessity for teaching different levels of practicality in construction and materials.

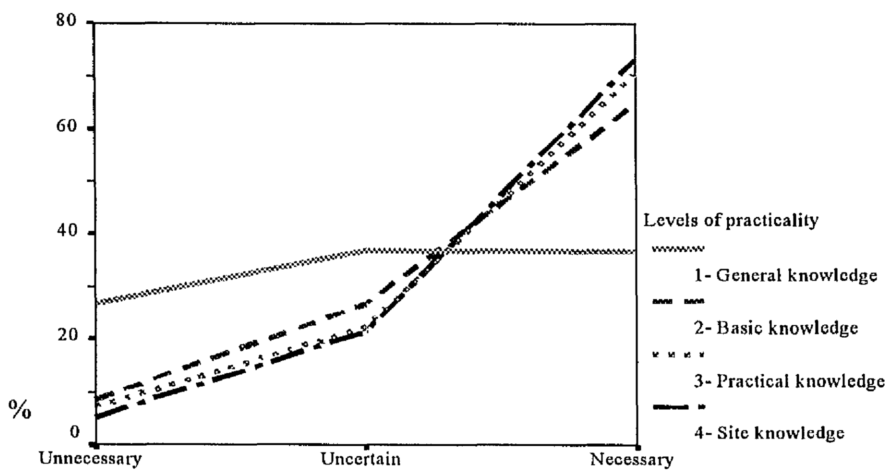

Fig 4-26: Attitudes concerning the necessity for teaching construction. Comparison between different levels of practicality.

N(1)= 1370, N(2)= 3200, N(3)= 2742, N(4)= 918
Chi-square(1,2)= 387.572, S. P<0.01. Chi-square(3,4)= 4.964, NS. p=0.084.
Chi-square(2,4)= 25.543, S. p<0.01.

Site knowledge and practical knowledge received the highest frequency of 'necessary' answers (nearly 70% of answers in each category). The frequency of 'necessary' answers to basic knowledge was also high (nearly 65%). But general knowledge in this subject again received the lowest frequency of 'necessary' answers (about 35%) and also showed the greatest level of 'uncertainty'.

General knowledge (1)

Figure 4-27 represents the attitudes of different groups of respondents concerning general knowledge in construction.

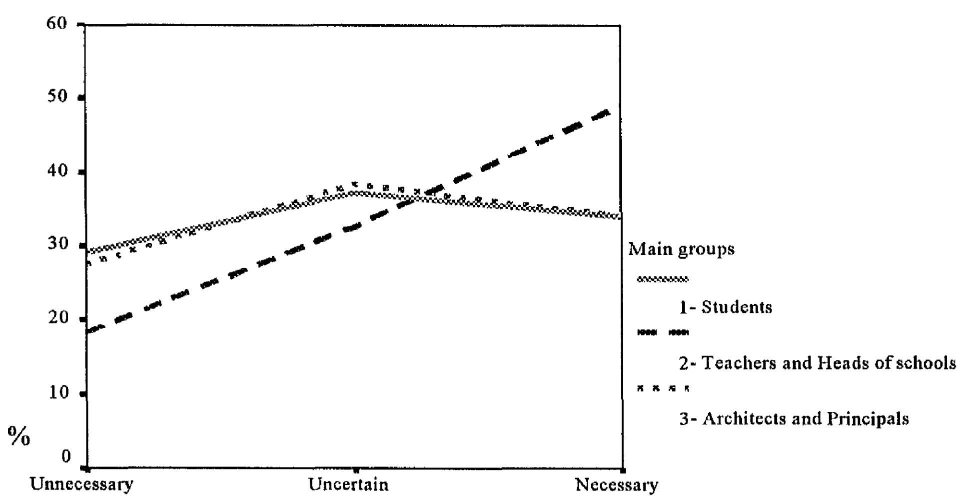

Fig 4-27: Attitudes concerning the necessity for teaching general knowledge in construction. Comparison between main groups.
N(1)= 673, N(2)= 242, N(3)= 455
Chi-square(1,3)= 0.343, NS. P=0.842. Chi-square(2,3)= 16.263, S. $p<0.01$.

Teachers and heads of schools produced the highest frequency of 'necessary' responses to this category, while students and practitioners produced the lowest. There is no significant difference between the attitudes of students and practitioners, even within groups. The frequency of 'uncertain' responses is also very high among all groups of respondents. Statistically, there is a significant difference between the attitudes of teachers and heads of schools compared with the other groups.

Basic knowledge (2)

Figure 4-28 illustrates the attitudes of the main groups of respondents concerning the necessity for the teaching of basic knowledge in construction. The majority of 'necessary' responses among the different groups indicates the belief in the necessity for teaching this category i.e. most respondents in all groups thought this was necessary.

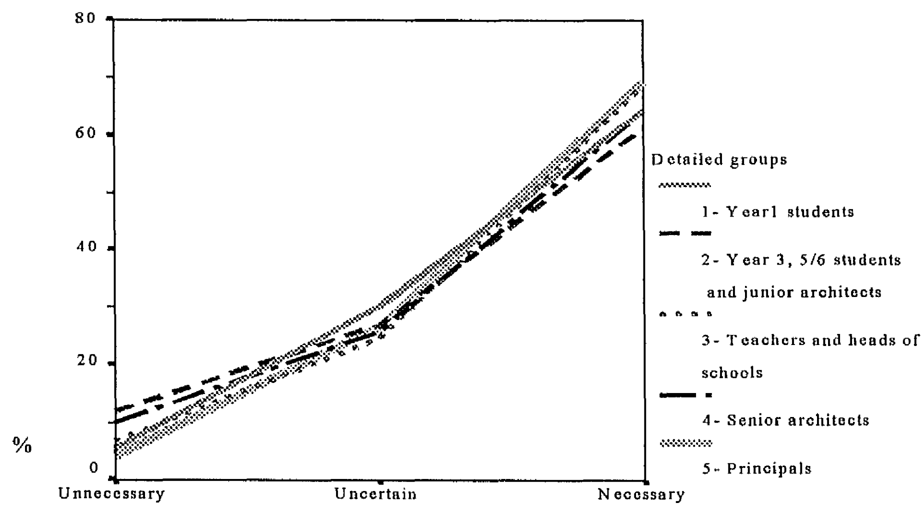

Fig 4-28: Attitudes concerning the necessity for teaching basic knowledge in construction. Comparison between main groups.
N(1)= 424, N(2)= 1346, N(3)= 565, N(4)= 362, N(5)= 496
Chi-square (4,5)= 12.051 S. $P<0.01$. Chi-square (year 5/6 students, teachers)= 12.014 S. $p<0.01$.
Chi-square (3,5)= 3.941 NS. $P=0.139$. Chi-square (1, year 5/6 students)= 15.181 S. $p<0.01$.

Teachers, heads of schools and principals produced the highest frequency of necessary responses, while third-year and final-year students and junior architects produced the lowest frequency of necessary responses.

Practical knowledge (3)

Figures 4-29 represents the attitudes of the main groups of respondents concerning the necessity for teaching practical knowledge in construction.

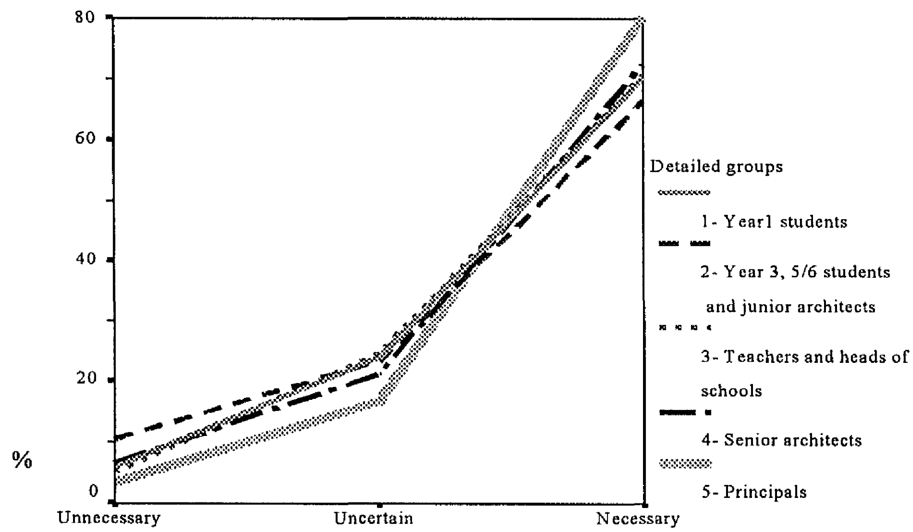

Fig 4-29: Attitudes concerning the necessity for teaching practical knowledge in construction. Comparison between detailed groups.
N(1)= 365, N(2)= 1152, N(3)= 485, N(4)= 311, N(5)= 423
Chi-square(2,5)= 33.149, S. P<0.01. Chi-square(3,5)= 11.167, S. P<0.01.
Chi-square(2,3)= 12.407, S. P<0.01. Chi-square(4,5)= 7.299, NS. P=0.026.

The majority of 'necessary' responses among the different groups demonstrates the belief in the necessity for the teaching of practical knowledge. However, teachers value this category of knowledge more than students and junior architects. Those who value this category the most are principals of the practices. Their attitudes show a significant difference from that of the teachers in this respect. Statistically, there is no significant difference between the attitudes of principals and senior architects.

Site knowledge (3s)

The attitudes of the different groups concerning the necessity for teaching site knowledge is also similar to the findings concerning basic and practical knowledge in construction. But the attitudes towards one of the items in this category is rather peculiar and is better considered separately. This item is "Site investigation and site analysis". Figure 4-30 shows the responses of the three main groups of respondents concerning the necessity for teaching this item.

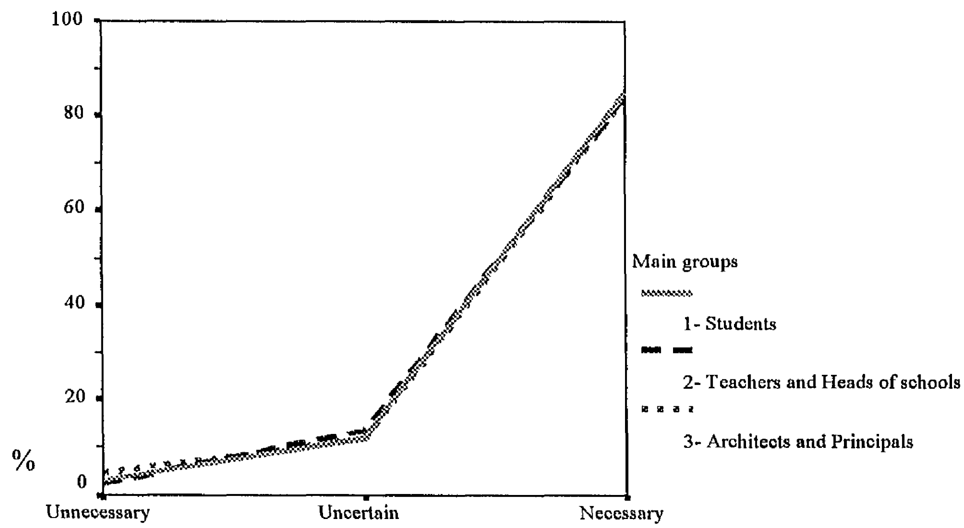

Fig 4-30: Attitudes concerning the necessity for teaching site knowledge in construction. Comparison between main groups.
N(1)= 225, N(2)= 81, N(3)= 153
Chi-square= 1.027, NS. p=0.906.

Almost all of the respondents have the same views about the teaching of site knowledge, (statistically, there is no significant difference between them). They all certainly agree that there is a need for the teaching of this knowledge (about 85%), and all of the heads of schools are in agreement with the necessity for teaching this item. In addition, the level of agreement and uncertainty among all groups of respondents is the same. This striking result was found for no other items or topics. It is interesting to note that this item (or any item like it) is not taught in all schools of architecture[34].

In order to be able, again, to compare the attitudes of different groups concerning different levels of practicality, we need to consider the method of 'mean of responses'. Figure 4-31 summarises the mean of responses about the necessity for teaching different levels of practicality in construction knowledge.

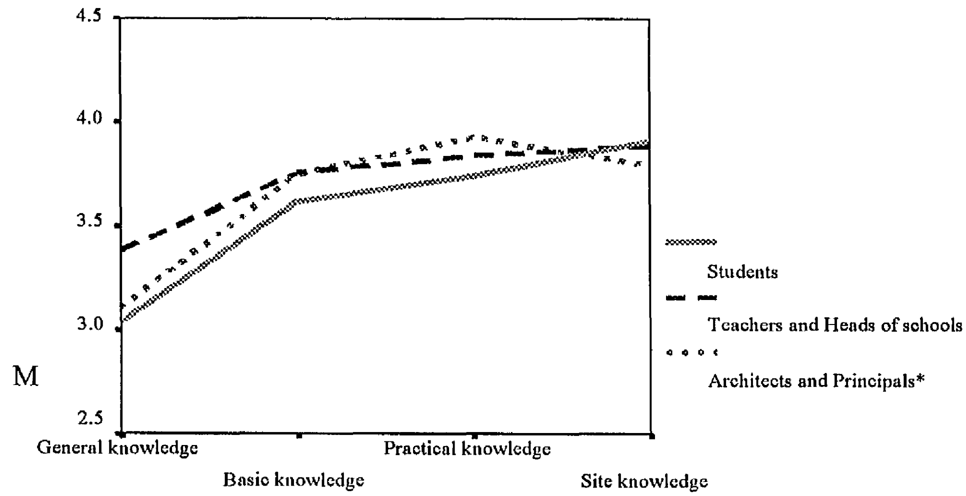

Fig 4-31: Attitudes concerning the necessity for teaching different levels of practicality in construction. Comparison between groups of respondents.
* Junior architects' responses are deducted and added to those of the students, due to their similarities.

The figure shows that there is not much difference between the attitudes of teachers and practitioners, the only significant difference between them being in the category of general knowledge, about which teachers show a higher mean of responses. The figure

[34] This is a 'medium esoteric' item, which means that it is not taught in all schools. See Table 4-7.

also shows that there is an increase in the mean of responses from general towards basic and practical knowledge.

Architectural practice

Table 4-6 shows nine items or topics of architectural practice selected under different levels of practicality (1,2 & 3).

No.	Code	Prc.*	Selected items or topics
1	P1H1	1	The structure of the construction industry .
2	P1M1	1	The historical development of the architectural profession .
3	P2H1	2	Office financial management.
4	P2H2	2	Marketing their (architects) services.
5	P2M1	2	Construction contract law .
6	P2M2	2	Social management skills.
7	P2W1	2	The architect's responsibilities and liabilities .
8	P3H1	3	Handling client relations.
9	P3M1	3	Evaluation of appropriate procurement methods .

Table 4-6: Selected items or topics in architectural practice. * Levels of practicality.

Figure 4-32 represents the respondents' attitudes concerning the teaching of different levels of practicality in architectural practice.

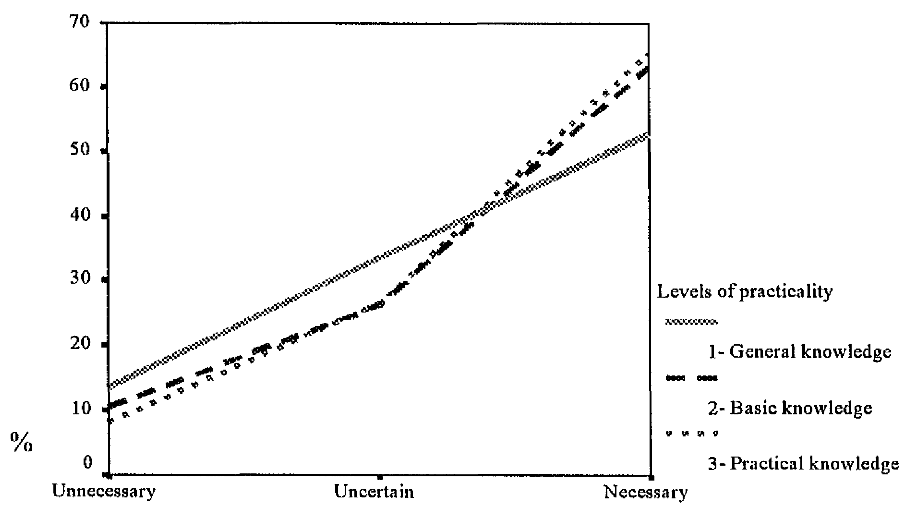

Fig 4-32: Attitudes concerning the necessity for teaching architectural practice. Comparison between different levels of practicality.
N(1)= 915, N(2)= 2289, N(3)= 913
Chi-square(1,2)= 29.951, S. P<0.01. Chi-square(2,3)= 4.118, NS. p=0.128.

Practical knowledge and basic knowledge received the highest frequency of 'necessary' answers (nearly 65% of answers in each category). But general knowledge (similar to construction) received the lowest frequency of 'necessary' answers (about 50%).

General knowledge (1)

Two items selected in the category of general knowledge of architectural practice provided very different responses, so they will be analysed separately. The first one is "the historical development of the architectural profession". Figure 4-33 shows the attitudes of respondents concerning the necessity for teaching this item[35].

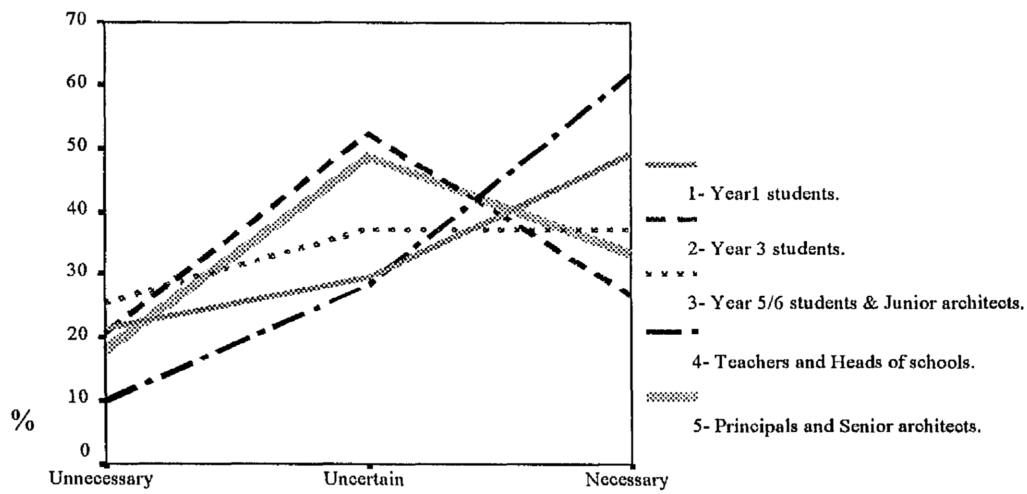

Fig 4-33: Attitudes concerning the necessity for teaching "the historical development of the architectural profession". Comparison between different groups.

N(1)= 224, N(2)= 80, N(3)= 153
Chi-square(4,5)= 15.946, S. $p<0.01$.
Chi-square(1,4)= 4.064, NS. $p=0.131$.

---

[35] As the responses of junior architects are similar to those of final-year students, both sets of responses are added together.

Principals and senior architects were uncertain about the necessity for teaching this item (nearly 50% of their responses expressed this attitude), which is quite different from teachers' attitudes, where 60% believed it to be necessary with only 20% being 'uncertain'.

The second item selected in this category is "the structure of the construction industry". The attitudes of all respondents concerning this item are similar and different from attitudes towards the previous item[36] (Fig 4-34). All groups of respondents show a strong belief in the necessity for teaching it and there is no significant difference between their attitudes in this respect.

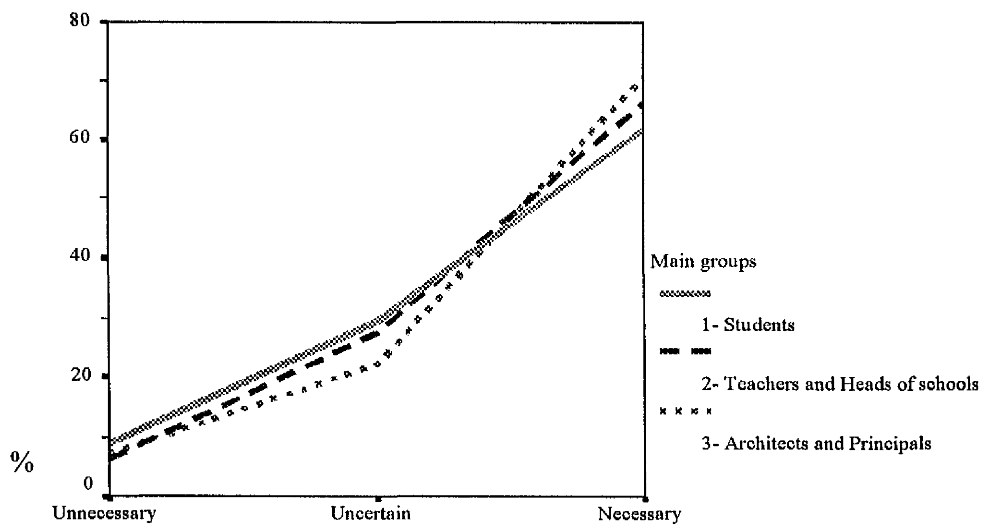

Fig 4-34: Attitudes concerning the necessity for teaching "the structure of construction industry". Comparison between main groups.
N(1)= 224, N(2)= 80, N(3)= 153
Chi-square= 3.615, NS. p=0.461.

[36] First-year students think that everything is necessary!

Figures 4-33 and 4-34 show a radical difference in attitude towards two items in the same category. Similar differences are found in some other categories though not as exaggerated as here (site knowledge in construction). This is an example of poor consistency between items in the same category.

Basic knowledge (2)

Figure 4-35 demonstrates the respondents' attitudes concerning the necessity for teaching basic knowledge in architectural practice.

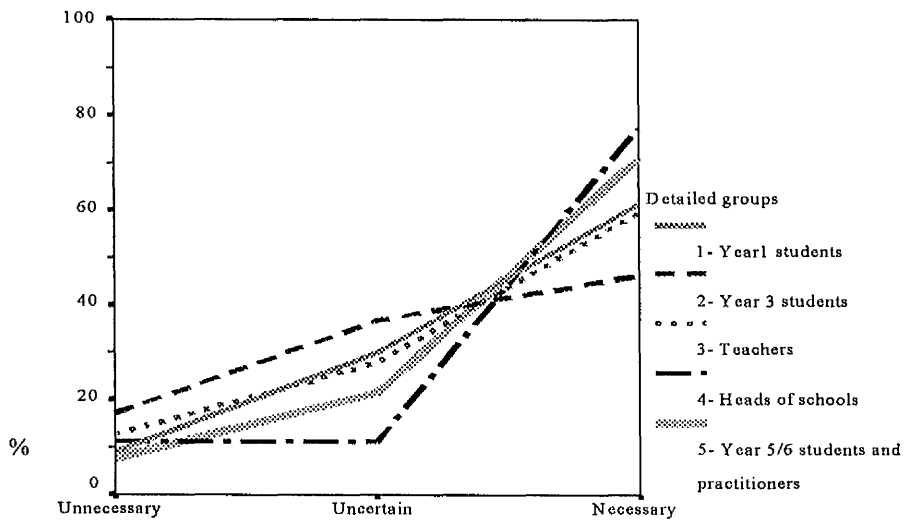

Fig 4-35: Attitudes concerning the necessity for teaching basic knowledge in architectural practice. Comparison between different groups.
N(1)= 304, N(2)= 414, N(3)= 369, N(4)= 35, N(5)= 1162
Chi-square (2,3)= 13.668, S. $P<0.01$. Chi-square (1,3)= 2.583, NS. $P=0.275$.
Chi-square (3,5)= 17.894, S. $P<0.01$.
Fisher's exact test (3,4) in (uncertain and necessary), NS. $P=0.275$

With the exception of teachers and third-year students, the rest of the respondents have similar attitudes here. They show a high frequency of 'necessary' responses concerning the teaching of this category (nearly 70% of their responses). Teachers are not so concerned as practitioners about basic knowledge in architectural practice. This is the only case among our three selected subjects about which teachers are not so concerned. Third-year students returned the highest frequency of 'uncertain' responses and also the lowest frequency of 'necessary' responses concerning basic knowledge in architectural practice. This is probably because they are more concerned about the other issues of knowledge at this stage in their studies, and knowledge of architectural practice has less importance for them.

Practical knowledge (3)

The attitudes of respondents concerning the necessity for teaching practical knowledge in architectural practice is similar to basic knowledge (Fig 4-36).

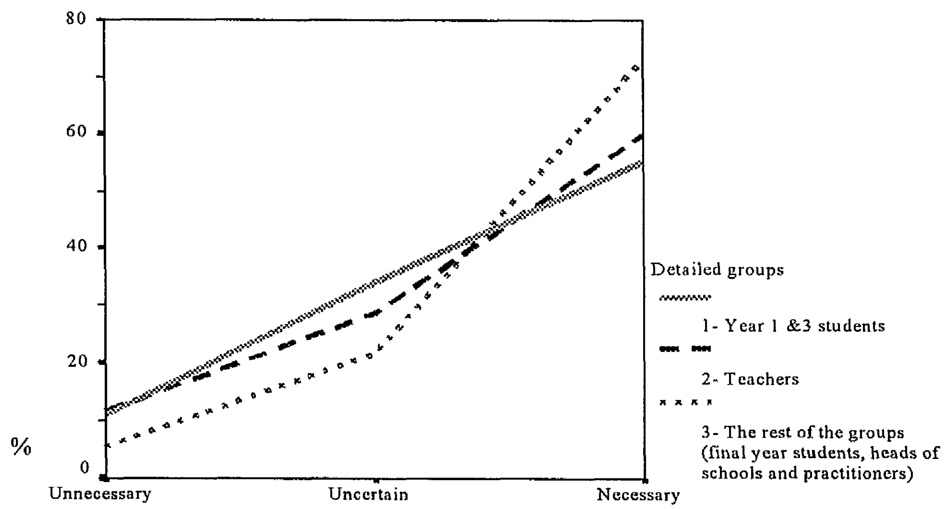

Fig 4-36: Attitudes concerning the necessity for teaching practical knowledge in architectural practice. Comparison between different groups.
N(1)= 286, N(2)= 147, N(3)= 478
Chi-square (1,2)= 1.275, NS. P=0.529.
Chi-square (2,3)= 11.301, S. p<0.01.

However, the frequency of 'necessary' responses is higher in this case. Just less than 5% of the responses of all in group (3) are 'unnecessary' (Fig 4-36). As we can see, teachers and third-year students are uncertain about the necessity for teaching practical knowledge in architectural practice (similar to their opinions about basic knowledge).

Figure 4-37 summarises the mean of responses of different groups concerning the necessity for teaching different levels of practicality in architectural practice. Quite interestingly, the mean responses of teachers concerning the necessity for teaching different practicality levels in architectural practice are very similar. Again, teachers have the highest mean of 'necessary' responses for general knowledge. But in basic and practical knowledge, practitioners have the highest mean of 'necessary' answers. Students' attitudes are more like teachers' than practitioners' in this respect.

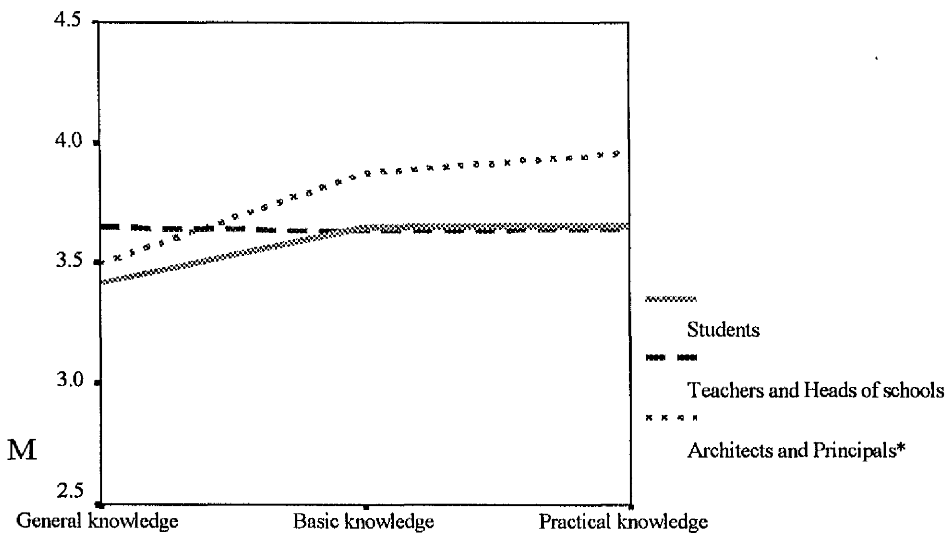

Fig 4-37: Attitudes concerning the necessity for teaching different levels of practicality in architetural practice. Comparison between groups of respondents.

* Junior architects' responses are deducted and added to those of students, due to their similarity.

Attitudes towards different 'esoteric levels'

As a reminder, an item or topic of knowledge is defined as 'highly esoteric' when it is seen in the course syllabuses of few schools, and is defined as 'low esoteric' when is seen in the course syllabuses of many schools.

No	Code	Eso	Selected items or topics
1	H1H1	1	Why we study architectural history and what is history?
2	H1H2	1	General cultural history.
3	H2H1	1	Architecture and politics.
4	H3H1	1	Understanding the cultural forces that shape buildings.
5	C1H1	1	Manufacturing process of bricks.
6	C2H1	1	Timber infestation.
7	C2H2	1	Properties of less-common building materials, such as plastics.
8	C2H3	1	Traditional construction methods.
9	C3H1	1	Building failures.
10	C3H2	1	Health and Safety issues.
11	P1H1	1	The structure of the construction industry.
12	P2H1	1	Office financial management.
13	P2H2	1	Marketing their services.
14	P3H1	1	Handling client relations.
15	H1M1	2	The work of some twentieth century engineers.
16	C1M1	2	The historical development of iron and steel.
17	C2M1	2	Construction of internal walls and partitions.
18	C2M2	2	Construction sequence.
19	C3M1	2	Fire protection with regard to internal finishes.
20	C3M2	2	Methods of estimating building costs.
21	C4M1	2	Site investigation and site analysis.
22	C4M2	2	Fabrication and assembly of steel frames.
23	P1M1	2	The historical development of the architectural profession.
24	P2M1	2	Construction contract law.
25	P2M2	2	Social management skills.
26	P3M1	2	Evaluation of appropriate procurement methods.
27	H2W1	3	Venturi, Rogers and Foster's idea of complexity and technology.
28	H2W2	3	The style of Baroque and French Rationalism.
29	H2W3	3	What Palladian architecture looks like.
30	H2W4	3	What Victorian architecture looks like.
31	H2W5	3	What a Frank Lloyd Wright Chicago house looks like.
32	C1W1	3	What is construction and why study it?
33	C2W1	3	Cladding systems .
34	C2W2	3	Properties of common building materials.
35	C3W1	3	Designing and detailing masonry walls .
36	C3W2	3	Designing and detailing joints at the junction of roofs and walls.
37	P2W1	3	The architect's responsibilities and liabilities.

Table 4-7: 'Esoteric levels' of selected items or topics.

Table 4-7 represents the 'esoteric levels' of selected items and topics in the questionnaire. Three levels are identified in this Table: 1,2 and 3. Level 1 is highly esoteric items or topics, level 2 is medium esoteric items or topics and level 3 is items or topics which are low esoteric. Table 4-8 is a summary of Table 4-6, and shows the number of selected items or topics in each 'esoteric level' and subject category.

	History of architecture	Construction and materials	Architectural practice	Total
High esoteric	4	6	4	14
Medium esoteric	1	7	4	12
Low esoteric	5	5	1	11
Total	10	18	9	37

Table 4-8: Number of questions selected at each 'esoteric level'.

The intention was to see whether there is any difference in attitudes concerning the necessity for the teaching of items or topics under different 'esoteric levels'.

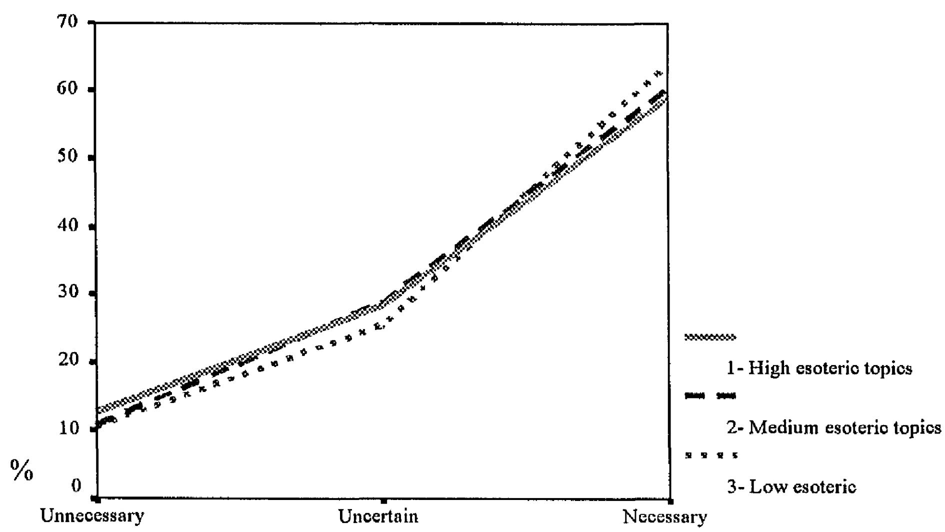

Fig 4-38: Attitudes concerning the necessity for teaching knowledge. Comparison between different esoteric levels.

N(1)=6405, N(2)=5498, N(3)=5008
Chi-square(2,3)= 17.064, S. $p<0.01$

Figure 4-38 shows the attitudes of all respondents concerning the necessity for teaching items or topics of knowledge of different 'esoteric levels'. The figure shows that the strength of belief about the necessity for teaching low esoteric items is higher than for the other categories, (just as one might expect). Differences between the responses to the some esoteric levels are statistically significant, although this is not obvious in the figure. For better expression of differences, the method of 'means of responses' is also considered in Figure 4-39.

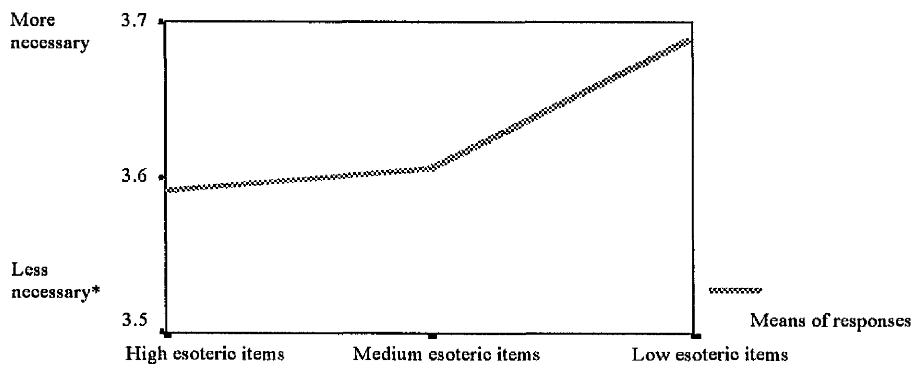

Fig 4-39: Comparing means of responses about the necessity for the teaching of items of different esoteric levels.

T test (high, medium), t= -0.855, NS. p=0.393.
T test (medium, low), t= -4.662, S. p<0.01.

* Means of five point scale responses (1,2,3,4 & 5).

The figure shows that statistically there is no significant difference between the attitudes concerning the necessity for the teaching of medium and high esoteric items, but that the difference between these and low esoteric items is statistically significant i.e. there is a stronger belief in the necessity for the teaching of low esoteric items. In another words, it may be said that the importance perceived by the teachers is also confirmed by the other respondents. The mean of the responses about high and medium esoteric items, however, is not very low (the mean score of the responses to these categories being almost 3.6). This shows that the respondents did not believe that the teaching of high and medium esoteric items is unnecessary.

There is not so much difference between the different groups of respondents in this respect. The only differing group are teachers, who have a greater belief in the necessity for teaching low esoteric items[37]. The mean of their responses concerning the necessity for teaching low esoteric items is about 3.90, in comparison with the average mean of all responses in Figure 4-39, which is about 3.70.

Comparing different subjects

Figure 4-40 compares the mean of responses concerning the necessity for teaching different subjects of three 'esoteric levels'.

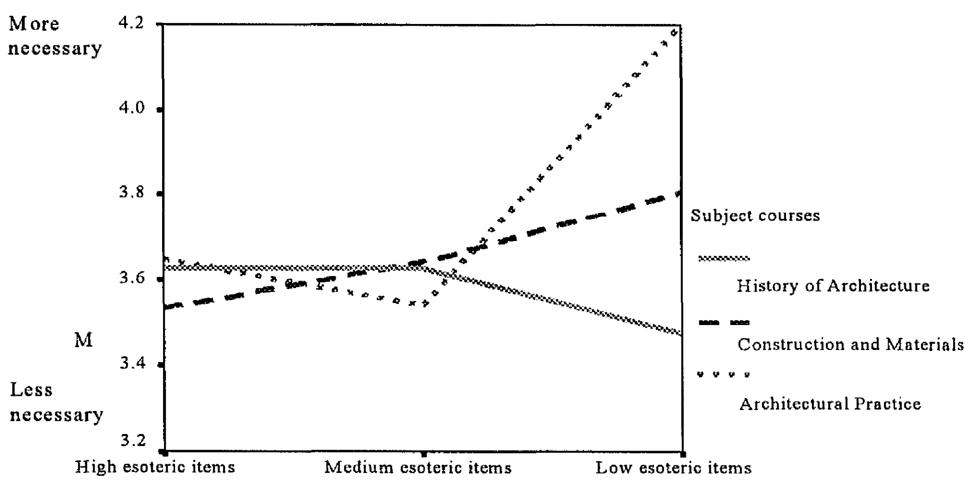

Fig 4-40: Comparing necessity for teaching subjects of different esoteric levels.

T test his (H,M)= 0.031, NS. P=0.975.
T test his (M,W)= 3.016, S. P<0.01.
T test con (H,M), F= 4.577, S. P<0.01
T test con (M,W)= 6.802, S. p<0.01.
T test arp (H,M) = 3.552, S. P<0.01
T test arp (M,W) = 14.234, S. p<0.01

[37] As might be predicted, they are unlikely to disregard their own syllabuses.

There are great differences in the mean of responses concerning medium and low esoteric items in different subjects. The mean of responses concerning low esoteric 'history' items shows a drop, while in contrast there is a large increase in low esoteric 'architectural practice' items. This could mean that those items which once were common and usual in 'history' are no longer of interest. On the other hand, the figure shows that there is a belief that it is important to teach the items or topics in 'construction' and 'architectural practice', which are taught in most of the schools. However, the differences between high to medium esoteric items do not show a particular pattern in the different subjects.

Statistically, in history, there is no significant difference between high and medium esoteric items. In construction, there is an increase in the belief about the importance of teaching medium esoteric items (in comparison with high esoteric items). But a strange thing happens in regard to architectural practice, where medium esoteric items show a lower importance than high esoteric items. This could mean that those items which are taught in few schools are more important than they are believed to be by teachers.

Some exceptions in all categories

There are some exceptions to the view that low esoteric items are more necessary and high esoteric items less necessary. These exceptions are of two kinds:

a) There are some items that are highly esoteric: i.e. are taught in only a few schools, but the mean of responses to these items is very high. These items are considered by respondents as 'very necessary' even though taught in just a few schools. These items are: 4) Understanding the cultural forces that shape buildings (H3H1). 9) Building failures (C3H1). 14) Handling client relations (P3h1). 21) Site investigation and site analysis (C4M1) [38].

The interesting thing is that most of these items are within the category of practical knowledge, leading to the conclusion that practical knowledge is not considered in schools as much as is seen to be necessary by respondents. This means that the extent to which these subjects are dealt with by the schools does not reflect the value placed on them by respondents.

b) There are items that are not esoteric but received a low mean of responses, which shows that some items are commonly taught in schools but respondents value them less. These items are: 27) Venturi, Rogers and Foster's idea of complexity and technology (H2W1) and 28) The style of Baroque and French Rationalism (H2W2). Both of these items are from the history syllabus and are considered to belong to the basic knowledge category (basic analytic knowledge). Items of basic descriptive history, in contrast received higher means of responses[39], which would seem to indicate that knowledge of styles and theories is of less interest to respondents than other sorts of history knowledge[40]. On the basis of the information above, it was found that there are items that are highly esoteric, but the means of responses concerning the necessity

[38] See Table 4-7 and Appendix 6, Table A-11.
[39] See Appendix 6, Table A-11.
[40] Obviously, the assumption is that the selected items are representative of the whole category: i.e. basic analytic knowledge.

for teaching them are high and there are items that are low esoteric and the means of responses concerning the necessity for teaching them are low. It is important to note here that items or topics of course syllabuses are selected according to the requirements which the teachers propose, within the limited time for presenting each course in school, as it is impossible to teach everything. So the question is, how do teachers decide which items are necessary and which are not?

Some individual items

This section will consider which items received the highest and which the lowest 'necessary' responses. The highest means of responses among most groups of respondents belong to the following items[41]:

37) The architect's responsibilities and liabilities (P2W1; total mean of 4.20[42]).
21) Site investigation and site analysis (C4M1; total mean of 4.11).
4) Understanding the cultural forces that shape buildings (H3H1; total mean of 4.06).

Item (37) received the highest mean of responses among final-year students, junior architects, senior architects and principals. This item also received the second-highest mean of scores among heads of schools. Quite interestingly, the highest mean of responses among heads of schools was accorded to item (21), "Site investigation and site analysis". This item also received the highest mean of scores among first-year students and almost the highest among third-year students.

[41] For a full list of means of responses to individual items, see Appendix 6, Table A-11.
[42] Means could be between minimum 1 to maximum 5.

But the highest mean of responses among teachers was received for item (4), "Understanding the cultural forces that shape buildings". This may indicate that teachers are more interested in historical and theoretical issues.

The lowest means of responses, among most groups of respondents, were received for the following items:

5) Manufacturing process of bricks (C1H1; total mean of 2.69).

28) The style of Baroque and French Rationalism (H2W2; total mean of 2.90).

16) The historical development of iron and steel (C1M1; total mean of 2.97).

The lowest mean of responses, among most of the groups of respondents was received for item (5), "Manufacturing process of bricks". This item scored the lowest mean among all groups of respondents except first-year students. The lowest mean of responses among first-year students was given to "Office financial management", which may indicate that first-year students are more interested in what they themselves need at the time of filling in the questionnaire and not what architectural graduates need.

Summary and comments

It was found that the attitudes of teachers are different both from those of students (third and final-year) and from those of practitioners, concerning the necessity for teaching knowledge in general. Actually, the greatest difference in attitude was that between teachers and third-year students and also between teachers and senior architects. Their attitudes showed differences about the necessity for teaching all three selected subjects. Teachers, more than students and senior architects, valued history, general and basic knowledge[43], while senior architects were more interested in the teaching of architectural practice and practical knowledge than teachers. A point to consider here is in relation to our definition of knowledge in education. Do teachers have in mind education for life rather than education for immediate needs? Their opinions actually seem to support this idea. More detailed investigation needs to be carried out to test this theory.

There were also differences between the attitudes of students in different years of their education, and also between practitioners of different status. For example, students in their third year did not value architectural practice as much as the other groups of students, while principals valued construction more than junior and senior architects.

---

[43] It is as well to note, again, that the perceived necessity for the teaching of selected items is likely to be indicative of the perceived importance of those subjects. Therefore a higher rate of 'necessary' responses to questions about a subject, the higher the belief in the importance of the teaching of that subject.

There were also some similarities between the responses of different groups. The attitudes of first-year students and heads of schools were very similar to each other, both believing that it is necessary to teach everything. The attitudes of teachers were also similar to those of heads of schools in this respect. In general, the attitudes of final-year students and junior architects were also very similar to each other. This will be discussed in greater detail below.

Subject courses

Of all groups of respondents, those who believed most strongly in the value of the teaching of history were teachers and heads of schools (Fig 4-7). Third-year and final-year students and senior architects did not believe in the importance of history as much as teachers, while first-year students believed that history is important (as did teachers and heads of schools).

There was a tendency for all responses to express a stronger belief in the necessity for the teaching of construction, in comparison to history. Heads of schools, teachers and principals of practices produced a higher frequency of 'necessary' responses than the other groups (Fig 4-10). However there were some differences between the different groups of respondents, in this respect. We found that principals (especially in medium-sized practices) more than senior architects believed in the importance of the teaching of construction. Third-year and final-year students also did not value construction (general and basic category) as much as teachers. Junior architects valued construction the least. There could be two reasons for this difference between the attitudes of junior architects and senior architects, although this is an assumption which only further research can prove. One reason could be the change in the nature of architectural practices. Nowadays, junior architects usually rely on technicians or manufacturers' data for detailing design. Perhaps it was not like this when senior architects were young. The other reason could be junior architects' lack of experience in understanding the value of construction in informing design, while senior architects obviously do so. There was also a great tendency among respondents to express their belief in the necessity for the teaching of architectural practice. Naturally practitioners showed the highest 'necessary' responses, even more than teachers and heads of schools in this respect (Fig 4-12). But there were differences in this area between senior architects and principals in this respect. Senior architects believed more in the importance of architectural practice than the principals of the practices (specially in small practices). Third-year students produced more 'uncertain' responses i.e. they were less concerned about this subject (Fig 4-13).

We found that in all subjects, those teachers who teach them believed more strongly than did the other groups in the necessity for the teaching of the subject (Figures 4-8, 4-11 & 4-15). Only in regard to history did those who did not teach any lecture course (e.g. studio instructors), also believe the same as history teachers[44]. One result which is interesting is the uncertainty of those teachers who did not teach a given subject. It might be asked whether this is a real attitude about the necessity for the teaching of a

[44] It is not an unexpected result that studio instructors are not interested in technical and practical issues as much as historical and theoretical ones.

subject, if so, suppose we ask about the necessity for the teaching of subjects or materials which are not now part of the schools' curriculum? The percentage of positive attitudes might be very small among teachers, which has implications for surveys in which the idea is to explore teachers' belief about the introduction of new subjects or topics in the curriculum.

We found that in medium-sized practices, principals value knowledge more than their senior architects (Figures 4-16, 4-17 & 4-18). This is in contrast to large practices where senior architects value knowledge more than their principals. One can only guess at the reasons behind these differences. Principals in large practices are probably more involved in the running of their practices than in individual projects, while those in medium size practices are much more involved in projects.

Levels of practicality

'Practical knowledge' received the highest frequency of 'necessary' responses in most cases (Figures 4-19, 4-26 & 4-32). Teachers produced the highest 'mean of responses' in practical knowledge of history, while practitioners have the highest mean of responses in practical knowledge of architectural practice. In construction and materials, both teachers and practitioners had the highest means of responses. Quite interestingly, site knowledge[45] (one of the aspects of practical construction knowledge) not only received the highest frequency of 'necessary' responses among all categories

---

[45] The exact item was 'site investigation and site analysis'.

(nearly 85% of all responses), but also received the highest level of agreement among all groups of respondents. This result was found for no other items or topics. It is important to note that this item is found in the course syllabuses of some schools but not most of them.

In contrast, 'general knowledge" in most subjects received the lowest frequency of 'necessary' responses (Figures 4-19, 4-26 & 4-32), but among all the groups, teachers and heads of schools produced the highest frequency of 'necessary' responses in this respect (Figures 4-20, 4-27 & 4-33).

General knowledge in history received a low frequency of 'necessary' responses. The lowest frequency of responses in this subject however belongs to "basic analytic knowledge" (Fig 4-19). In fact, we found that there are great differences of attitude about basic analytic and basic theoretical knowledge in history. The levels of 'uncertain' and 'unnecessary' responses were higher for basic analytical knowledge. This was even true among history teachers (Table 4-4). This means that even history teachers do not value this as much as other categories. The implication of this is that there is a concern that graduates should have a basic knowledge of forms rather than that they should have a clear understanding of the architectural theories that produced these forms, which is an idea which has also been appreciated by some previous historians such as Banister Fletcher (1961).

The attitude concerning the necessity for the teaching of 'basic knowledge', among all subjects in general, was rather close to the results for 'practical knowledge'. Respondents produced a high frequency of 'necessary' responses for this category, slightly lower than for "practical knowledge" (Figures 4-19, 4-26 & 4-32). Teachers and heads of schools more than other respondents valued basic knowledge, except in the case of architectural practice. Not unexpectedly, we found that in general, different groups of respondents understand the need for practical knowledge in all subject courses. What was not clear is whether or not they understand the need for the theoretical underpinnings of that knowledge material which does not appear to be as useful when it is taught to them. In fact, we found that these theoretical underpinnings are appreciated and wanted as well. This has some implications for our initial assumptions. Suggesting that a knowledge-based approach, in which subjects are taught independently of the studio, is likely to satisfy the demands of the students far more than a studio-based approach in which knowledge is supplied only in response to the needs of design. This is also confirmed by Salama's findings that studios are not likely to provide a suitable environment for the integration of knowledge[46]. If we wait for knowledge to be produced on demand then we have no option but to teach at the highest level of practicality because there is not enough time to go back to the theoretical underpinnings when under pressure to produce design work.

Esoteric levels

We found that low esoteric items received a higher frequency of 'necessary' responses than medium and high esoteric items. There was no significant difference between the attitudes of different groups of respondents in this respect. This shows a general

[46] See the discussion on page 108.

agreement about the necessity for the teaching of the items that are selected to be taught in most schools. It is important to note that as an exception, low esoteric items in history received different scores. They received less 'necessary' responses than medium and high esoteric history items. However, statistically, we found no significant difference between high and medium esoteric items. This means that high esoteric items are not seen to be unimportant, as they are now treated in schools.

3) Combination of 'adequacy' and 'necessity' responses

In this section we will consider together the responses about the adequacy of and the necessity for teaching certain subjects. This will be done in two different ways:

- Subtracting the responses to both sets of questions.
- Cross-tab analysis of responses to both sets of questions.

Subtracting the responses

In this method, the means of responses to questions about the necessity for teaching selected subjects will be subtracted from the responses to questions about the adequacy of teaching the same subjects. This should provide a rough guide to the areas of knowledge which need greater attention in schools, or we can simply say "have the schools got it right?". A similar method was also used by Salama (1997: 65). An example is provided below:

Let us assume that the responses of three respondents to two sets of questions are as follows:

Do you think architectural students need to be taught about history?

R_1: 5 (very necessary), R_2: 4 (necessary), R_3: 2 (unnecessary).

Do you think architectural graduates are taught enough about history?

R_1: 1 (very dissatisfied), R_2: 4 (satisfied), R_3: 5 (very satisfied).

Respondent one thinks it is very necessary to be taught about history, but is very dissatisfied about what is taught. Respondent two thinks that history is necessary, and is also satisfied about what is taught. Respondent three thinks history is unnecessary, but is very satisfied about what is taught. This could mean that respondent one expects more and thinks what is taught is not enough, while respondent two expects less and thinks what is taught is enough. Respondent three thinks history is absolutely useless and what is taught is more than enough (and maybe a waste of time). By subtracting their responses, in both sets of questions, we can achieve a measure for comparing their expectations and attitudes:

R_1: 5-1= 4, R_2: 4-4= 0, R_3: 2-5= -3

The higher the rate, the more is expected or the less the satisfaction about the performance of the schools. Respectively, this could mean that respondent one is satisfied with the performance of the schools, while respondent two is not. Respondent three is very dissatisfied about the performance of the schools.

This method of interpretation of data will be used both for comparing different subjects and also different groups of respondents.

Comparing different subjects

The results of subtracting the responses to the questions about the necessity for the teaching of subjects and the adequacy of the teaching of those subjects, are summarised in Table 4-9.

	History of architecture	**Construction and materials**	**Architectural practice**
Subtraction of Means	0.14	0.93	1.20

Table 4-9: Differences between what it is believed should be taught in schools and what it is believed schools have provided. T-test (construction and architectural practice)= -3.309, $p<0.01$

This table presents the difference between what is perceived to be necessary and what is actually taught in schools. The less the subtraction rate, the better is the performance of the schools or the less is expected of them.

Figures in the table clearly show that respondents are more satisfied about the performance of the schools in case of the teaching of the history of architecture or they expect less from the teaching of this subject. This is in contrast to the case of architectural practice. Respondents are dissatisfied about the performance of the schools in this respect, or they expect more. Construction and materials also shows weak performance by schools or higher expectations by respondents.

Groups of respondents

Figure 4-41 compares the views of different groups of respondents in this respect.

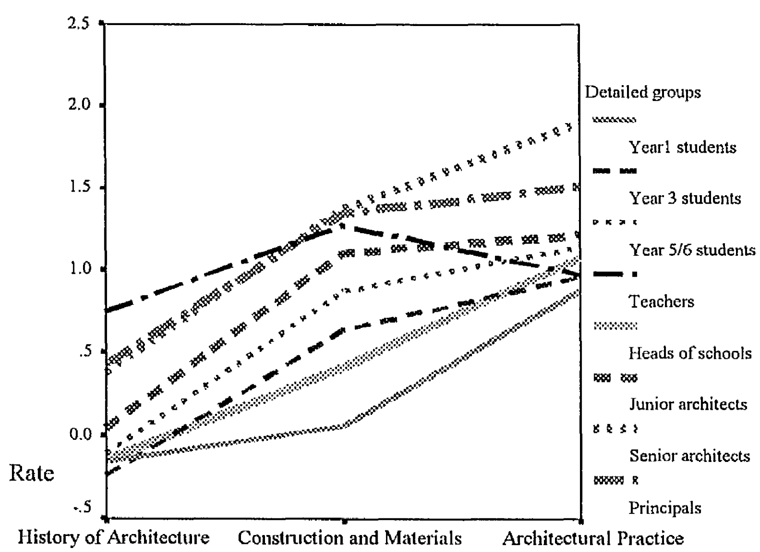

Fig 4-41: Differences between what people think should be taught in schools and what they think schools have provided. Comparison between different groups.

The most widely differing set of attitudes is provided by the teachers. Among all groups of respondents, teachers are the group most dissatisfied about the teaching of history. This means that they are either dissatisfied with the performance of the schools in this respect or expect superior content or greater volume of teaching of history of architecture. Conversely, they are among the most satisfied groups about the teaching of architectural practice. If we deduct teachers' attitudes, the rest of the groups could be arranged in an orderly fashion. The order from the least satisfied groups towards the most satisfied groups is as follows: senior architects, principals, junior architects, final-year students, third-year students, heads of schools and first-year students.

Cross-tab analysis of responses

The idea here is to discover if there is any correlation between the two series of responses. For example, in the case of the history of architecture, we found that the teachers were split into two groups: those who were satisfied about the adequacy of the history teaching and those who were not. By the cross-tab analysis of responses, we should discover if the attitudes of these two groups are similar or different concerning the necessity for the teaching of history. This means comparing the strength of their attitudes about the importance of teaching history, which can be done by the cross-tabulation analysis of the responses of each group of respondents to both series of questions. A detailed explanation of the methodology of this method was given in the previous chapter.

History of architecture

The results of the analysis show no significant difference concerning the importance of the teaching of history between those teachers who were satisfied and those who were dissatisfied about the adequacy of the teaching of history of architecture. This means that, whether or not teachers are satisfied about the adequacy of the teaching of history, their attitudes are similar concerning the importance of the teaching of this subject. This was also true for the principals of the practices. The responses of the senior architects however, show some differences. Their responses show that among those who are satisfied about the adequacy of history teaching, there is a higher percentage of 'unnecessary' responses about history items. This means that those senior architects who are satisfied about history teaching tend to think that less of this knowledge is needed. It could also mean that those who are dissatisfied think that more should be taught.

Construction and materials

The results of the cross-tab analysis in this subject shows that those teachers who believe that students (do not) need to be taught practical knowledge are more among those who are satisfied with the present teaching of construction and materials in schools, rather than those who are dissatisfied.

Architectural practice

Among those teachers and practitioners who are satisfied about the adequacy of the architectural practice teaching, there is a higher percentage of 'unnecessary' responses about the teaching of this subject. This means that (as with history) those who are satisfied tend to think that less is needed. In addition, those teachers who are satisfied about the teaching of architectural practice, are less convinced that students need to possess basic knowledge in this subject. In contrast, those teachers who are not satisfied about the adequacy of teaching architectural practice have a stronger belief that students need to possess basic knowledge in this subject. In contrast to the teachers, those practitioners who are satisfied about the adequacy of the teaching of architectural practice are less convinced that students need to possess general knowledge in this subject than those who are dissatisfied.

In general, what we may conclude about teachers' attitudes is that those who are satisfied (or complacent) about the teaching of construction and architectural practice expect students to possess less knowledge of this kind than those who are dissatisfied.

General summary

This general summary is based on what has already been discussed in previous summaries.

We can say that the attitudes of first-year students, shows what a young student expects from architecture, or how architecture looks from the standpoint of young outsiders. We found that first-year students are one of the most satisfied groups about what is taught in the schools (Fig 4-1). It is not actually surprising to find that students at an early stage of entry think the schools perform perfectly. When looking at their attitudes concerning the necessity for teaching certain subjects, it can be seen that first-year students gave almost the highest frequency of 'necessary' answers compared with other groups of students. They think they should learn everything. Maybe because of this attitude they feel that graduates have, or should have received, adequate knowledge. We can say that first-year students' attitudes are rather idealistic about architectural education, something that we might expect from someone newly entering a discipline.

As they spend more time in school, students gradually come to understand their needs and requirements better. Third-year students were less satisfied about the adequacy of the teaching of construction and materials than younger students, although they, less than first-year students, thought that architectural practice is necessary. It may be considered that their attitudes at this stage are influenced by the constraints and requirements for education at this level of study. For example, the issue of practising architecture and its problems is not as important for third-year students as the issue of construction and materials (which has more relevance to the design examinations they are facing). The important point about their attitudes is that they have been influenced by a combination of what they previously believed (at the beginning of their first year of study) and what they experienced during later years i.e. they have been conditioned by what their schools have offered them.

Final-year students have spent one year in practice, so their attitudes are a combination of what they have been taught, together with what is needed for practising architecture. In general, final-year students felt more dissatisfied about the performance of the schools than third-year students (Fig 4-1). We also found that there is not so much difference between the attitudes of final-year students and junior architects.

Teachers are responsible for educating students, so their attitudes can directly influence education. In general, we found that teachers were dissatisfied about the adequacy of the teaching in schools. Even for the teaching of history, only one third of the teachers expressed satisfaction. We also found that teachers are more concerned about general, basic and theoretical knowledge (mainly in subjects related to design activities), compared with other respondents. This shows that basic and theoretical background are more valued by teachers.

In contrast to teachers, heads of schools were most satisfied about the teaching in schools. However, we must realise that heads of schools feel responsible for the function of their schools and so may be unwilling to express dissatisfaction with any aspect of their own school. They also showed interest in the necessity for teaching all subjects.

Principals' attitudes are influenced by the professional requirements for architecture. We found that principals think that construction and architectural practice courses are more necessary and therefore valuable, than history of architecture (Fig 4-6). We also found that principals are among the groups most dissatisfied about the adequacy of teaching in schools (Fig 4-1).

Those who have the most contact with graduates in practices are senior architects[47]. It is probably true to say that they are more involved in architectural activities than principals. They also have more contact with recent graduates and are better able to assess the adequacy of their knowledge[48]. So in general, they should provide a better comparison of what is needed and what is taught. We found that senior architects are the group most dissatisfied about the performance of the schools (Fig 4-1), especially in the case of architectural practice. Their attitudes also show that architectural practice is regarded as being more important than the other two subjects (Fig 4-6).

---

[47] Except in case of sole practitioners. In this case again, principals have the least contact with the graduates, because of the size of their practices and the amount of work.
[48] Senior architects are probably closer than principals to their own education.

Chapter Five: CONCLUSION

This study has been concerned with the knowledge requirements for architects and has addressed the question of whether or not there is general agreement about these requirements.

Previous research has not been able to answer this question because surveys carried out in the past, which sought to define the knowledge that people thought essential, addressed different groups, posing different questions, so that no comparisons could be made. However, they did suggest a possible divergence of opinions. Similarly, it is impossible to know the extent to which individuals might be satisfied with the teaching being given in schools, because none of these surveys actually addressed the subjects which the researchers knew were presently being taught; none involved any syllabus analysis on which to base their surveys.

This study set out to answer these questions both in the construction of the questionnaire and by the wide range of respondent groups addressed. Of course there is an ultimate, and so far unstated agenda, which is the improvement of syllabuses within schools of architecture. The questionnaire was constructed on the basis of an analysis of the course syllabuses and a systematic procedure was devised for the selection of the items or topics. It addressed the need for the teaching of subjects and also the performance of schools with regard to knowledge acquisition. Respondents' groups were also selected from two environments: the schools and the practices, to enable differences between attitudes to be determined.

It was initially assumed that there would be clear differences in attitude between the two different respondent groups in their different environments: school and practice. I refer to the two groups as two classes of respondents. The greatest divergence or difference of attitudes between the two classes might have been expected with more agreement or consistency of attitudes within them. The simple reason for such an assumption is that there is a difference between the two environments. Teachers and students all move an academic world, enthusiastic about basic and theoretical issues and involved in education and learning activities, while practitioners are involved in practice activities and thus interested in practical issues. They are working with clients, other professionals and building authorities and are also concerned with costs and budgets. The results of this survey showed that there are differences between the attitudes, but the differences that were found were not always those that might have been expected. There were greater differences within educationalists, treated as a class, and within practitioners treated as another class, than had been anticipated.
For example, heads of schools, teachers and students each presented rather different perceptions about the requirements for knowledge. Heads of schools were likely to believe that everything is necessary and were also more satisfied about what is taught in schools. Teachers valued general, basic and theoretical issues more than the other groups of respondents and generally were not satisfied about what is taught in schools. Students also showed some differences in attitude in different years of their study.

Students in their third-year did not think architectural practice is as important as students in their final-year. Students in the first year valued history more than the other students. The attitudes of the final-year students showed more dissatisfaction about what is taught in schools than third-and first-year students. There were also differences between the attitudes of teachers and students. It was not a completely unexpected result to find differences between the attitudes of first-and final-year students and teachers, because first-year students have a lack of experience and final-year students are familiar with the requirements for knowledge in practice. But how about third-year students? They have spent about three years in school, and whatever they know is likely to have been influenced by their teachers. Quite unexpectedly, their attitudes show significant differences from those of the teachers both about what is taught and also about what is believed to be necessary to be taught. In fact, one of the greatest differences between any two groups was found between third-year students and their teachers.

Practitioners also presented some different perceptions within their class. Differences were specially great between junior architects and those who are experienced. In general, junior architects showed more satisfaction about what is taught in schools than senior architects and principals, and believed that construction is less important than history and architectural practice. Senior architects showed more interest in architectural practice, and principals showed more interest in construction. We also found that there were differences between the attitudes of senior architects and principals in different practice sizes. For example, we found that principals in medium-sized practices valued knowledge more than senior architects.

There were also some similarities between the attitudes of the groups, some of which were in different classes. The most similar attitudes were presented by final-year students and junior architects in practices and also by heads of schools and year one students. The first of these, which are from different classes, will have a common reason for the similarities shown. Final-year students have already had some experience of practice in their year out, which makes their attitudes similar to those of junior architects. But the similar views of heads of schools and first-year students, which are from the same class, must be for quite different reasons. First-year students have some ideal expectations of the discipline which they are entering, so expect everything to be fine; they also need to learn more. Heads of schools seem reluctant to criticise the operation of their own schools and also do not like to show disagreement about the necessity for teaching any kind of knowledge; they would like imagine everything to be fine and also would like students to learn more.

The important conclusion to be drawn from the discussions above is that it is possible to treat neither educationalists nor practitioners as a homogeneous class, in the selection of respondents for a survey. This shows that the results of work carried out by some earlier researchers has not been comprehensive enough in this respect.

A point should also be made about the way in which individuals responded to the questionnaire. Some differences can be explained by the quite different day-to-day needs of the different groups of respondents or their experience, such as the differences among students and practitioners. The implication is that these respondents answered questions on the basis of their own immediate needs or perceptions rather attempting a wider perspective in answering the questions. This was in spite of careful wording of the questionnaire; the words chosen being specifically related to the needs of architectural students and architectural graduates. This would seem to be an inevitable issue in surveys of this kind, in which the intention is to discover the respondents' opinions from their own points of view. This explanation, however, is not completely valid in the case of the differences between teachers and heads of schools. They are all providers and facilitators of knowledge, so should be familiar with the phrases used in the questionnaire and the contents of syllabuses. For this reason, a constant view was expected in their responses comparing the requirements for knowledge. Not only it was not similar between the two groups i.e. heads and teachers, but there were also clear differences among the teachers. This means that not only we can not regard heads of schools and teachers as the same, but also we can not treat all teachers as a single class.

It was assumed, additionally, that the most constant views would be received in respect of historical and theoretical issues, and the most controversial views would be those about technical and practical ones. This was based on our assumption discussed in earlier chapters, about technical and practical knowledge in schools, where it was noticed that the greatest discussion concerned these subjects. The results of this survey showed that more constant views were held about technical and practical issues than about historical ones. For example, almost all groups of respondents agreed about the inadequacy of the teaching of architectural practice in schools, they were all also agreed about the importance of this subject. Of course it is this agreement about the inadequacy of the teaching that has led to the debates about how best to teach these subjects. However there was uncertainty about the adequacy of the teaching of history among the different groups of respondents, and there were also differences between teachers and heads of schools, compared with the other respondents, about the importance of this subject.

Throughout this work, I have occasionally speculated about the reasons for some of the results obtained. Neither the sample sizes, nor the research methods allowed these speculations to be tested. They remain possible questions for small-scale studies that might be carried out in the future.

Further implications of research

With the help of this research, we can locate some points of difference or similarity between the different groups of respondents about the requirements for knowledge. For example, we found that history of architecture and basic theoretical issues are more valued by teachers than by other respondents, while architectural practice and practical issues are more valued by practitioners[1]. We found that site knowledge is valued by all groups of respondents as very important. These all show that subjects or categories of

[1] The differences are in the strength of importance indicated by each group of respondents.

knowledge are different from each other and can not be treated as the same. The implication of this is that a true picture about knowledge requirements in architecture will not be achieved merely by looking at a random selection of issues, but needs a well-considered selection of different subjects.

A second implication of this study is that because of different attitudes towards the requirements for knowledge, it would be difficult to find a syllabus that would generate immediate agreement between all the groups[2], and there are good reasons why it can not be used in that way. There would be a tendency to over-value all the items, so we would end up with an overloaded syllabus. The problem is also to distinguish immediately useful knowledge - practical from theoretical - which requires a longer term for reflection than would be given by answering the questionnaire. Moreover not every one is able to make such a judgement. For example, we could ask respondents to consider themselves as syllabus designers, but in most cases they would feel a lack of knowledge or experience of some subjects in order to do this. This means that not all groups of respondents would be able or would feel confident to make such a judgement, and we might need to reduce the number of our respondents to experienced teachers only or possibly heads of schools. The problem with this is that our research has shown that teachers have quite different views from practitioners and it is questionable whether they would be able to accommodate the views of the latter in their syllabus design. In other words, the results of such a survey would not differ so

---

[2] The differences detected have been discussed in a previous chapter.

much from what we have already obtained, because most groups of respondents would give their answers according to their own understanding and experience about the issue, and not on the basis of educational experience or research in this matter[3].

A third implication is that the attitudes of students and architects change over time, based either on their better understanding of their needs or their requirements at different times. There is growing dissatisfaction among students: first-year, third-year and final-year, towards junior architects and senior architects about the adequacy of knowledge that is taught in schools, even though all believe in much the same level of need[4]. What we have found is that the understanding of needs increases so that the level of satisfaction correspondingly decreases. In this case, we need to be careful when considering respondents' attitudes about the requirements for knowledge because this is surely affected by their needs.

A fourth issue concerns the performance of the schools. The measure of performance was based on what is required and what is received, and the aim was to see whether or not there is general agreement about this. The survey showed that most groups of respondents believe that schools do not provide adequate knowledge, especially in regard to technical and practical issues. Even in the reading of history, there was not total agreement. But the obvious question is: how much has to be taught so that

---

[3] More discussion about this matter will follow.
[4] Except in the case of practice knowledge, which the survey has shown to be demanded more by architects than students.

everyone would agree? And are their views reasonable? This is related to the issue discussed in the previous paragraph - not everything can be taught in schools, and so raises the question of how much might be shifted from schools to continuing education in practice. The questionnaire used actually made no attempt to address this question.

Limitations of research and possible developments

One of the limitations of this study was the number of subjects selected. I would have preferred to look at more subject courses, but in order to reduce the number of questions to manageable size, just three subjects were chosen. This was for two reasons. First, to limit the task of analysis of results and secondly to ensure more accurate results with a higher percentage of returns. One of the benefits of investigation into all subjects would be the opportunity to compare all technical and practical subjects with all theoretical and historical subjects. As a possible further study, one might work on other subject courses and compare the results with those which have been found in this research.

Alternatively, instead of work on more subjects, a single subject might be examined in greater detail. A benefit of such a detailed investigation would be the possibility of having more questions under different levels of practicality or even questions from the course syllabuses. For this, a smaller number of schools might be chosen and the items of their course syllabuses categorised by interviewing those teachers who teach the subjects or those who actually design the course syllabuses. This would also enable us to investigate the amounts of emphasis which teachers place on different levels of practicality in each subject.

Rather than a detailed investigation of items in a single subject, a particular level of practicality, but in different subject courses, might be examined. The intention would be to determine, for example, to what depth basic knowledge might be taken across a range of subjects.

Another limitation of this study, which has already been discussed in the introductory chapters of this thesis, was the lack of opportunity to categorise the items of knowledge based on the end-users. Unfortunately, owing to the lack of time, it was not possible to conduct such an investigation. Thus another possibility for further research would be to work on these categories, in order to separate out the kinds of knowledge needed only by architects and the kinds of knowledge that might be needed by other professionals, civil, building and structural engineers, for instance. This approach needs first a detailed investigation of course syllabuses, categorise the items according to the depth to which they go into the basic and theoretical background. This could again be done in collaboration with teachers who teach the courses or those who designed the syllabuses. It of course, to do so would need a clear understanding about the roles and responsibilities within the architectural profession. In conducting such a survey, we would also have the opportunity to understand individuals' expectations of the roles that the different professions should perform as part of the building team.

Some further suggestions

Addressing more directly the goal of improving course syllabuses and building as a result of the lessons derived from this research, further work might concentrate on defining necessary knowledge, omitting questions about the adequacy of teaching in schools. Two main groups of respondents would be chosen for such a survey: teachers and practitioners. Because I found differences among the groups in each class, teachers would need to be divided into those who teach particular subjects (in the survey) and those who do not. Junior architects, senior architects and principals would also need to be considered separately.

The starting point of such a survey would be an investigation into the architects' activities; those which are required and those which are thought to be required, as discussed above. Then the main idea would be to extract the relevant practical knowledge from these activities (of course this would not address those items of knowledge which have no practical value; it is believed that educated people ought to be aware of these). The next step would be to formulate a clear definition of the underlying basic and theoretical background knowledge. This is the crucial step, which also needs educational experience and may be carried out with the help of experienced teachers.

Another intention of such research would be to consider the reasons behind the responses, both the reasons for considering knowledge necessary and for considering it unnecessary. Practically, it may be necessary to change the methodology of survey from direct questions about the necessity for teaching certain items to a kind of comparison of selected of items. It might also be helpful to conduct the survey through an interview-questionnaire rather than a posted-questionnaire. There are considerable difficulties, however, in the design of such an experiment and the discussion about this goes beyond the scope of this conclusion.

In this study the point of focus was the material that is being taught in schools. Another approach could be to consider the methodology of teaching these subjects. The structure of such a survey would not differ so much from that already described. In this case, a subject might be chosen and different methodologies for teaching it considered. There is obviously a need for such an experiment, as may be seen from the findings here, concerning the teaching of history. The degree of satisfaction among students and teachers with different methods and their outcome could thus be ascertained.

Finally, it should be noted that such a questionnaire should be designed so that its objectives are clear. A more refined set of objectives would require a more refined set of questions.

BIBLIOGRAPHY

- Alexander, G. (1996) "Studying the Form", in *Building* 45, 8th Nov.1996, pp. 22-23.

- Allen, T. J. (1970) "Roles in Technical Communication Networks", in *Communicating Among Scientists and Engineers*, Nelson, C. E. and Pollock, D. K. Massachusetts.

- Backlund, P. and Abbott, R. (1990) *Understanding and using student ratings to improve your teaching*, Centre for Instructional Development and Research, University of Washington, Washington, USA.

- Bloom, B. S. (1956); *Taxonomy of Educational Objectives-The classification of educational goals*, Part I and Part II, Longmans, Green and Co. Ltd; London.

- Bradfield, V. J. (1983) *Information Sources in Architecture*, London.

- Bryman, A. & Cramer, D. (1977) *Quantitative data analysis with SPSS for Windows: A guide for social scientists*, Routledge, London.

- Buchanan, P. (1989) "What is Wrong With Architectural Education? Almost Everything", in *Architectural Review*, July 1989, pp. 24-26.

- Bullivant, D. (1959) "The Problem of Information before the Architectural Profession and the Building Industry", in *Architects' Journal*, 129 No. 3344.

- Burnette, C. H. (1979) "The architect's access to information: constraints on the architect's capacity to seek, obtain, translate and apply information", in *National Bureau of Standards*/GCR- 78/153.

- CIB, International Council for Building Research Studies and Documentation (1978) *Evaluation of information systems for the construction industry: Report from a subgroup of the CIB working commission W52*, (PUB. 47).

- Cole, R. and Cooper, I. (1988) "British Architects: Accommodating science and technical information", in *The Journal of Architectural and Planning research*, 5:2.

- Coleman, A. (1990) *Utopia on Trial*, Hilary Shipman, London.

- Crinson, M. and Lubbock, J. (1994) *Architecture: Art or Profession? Three hundred years of architectural education in Britain,* Manchester University Press, Manchester, UK.

- Cuff, D. (1991) *Architecture: The Story of Practice*, MIT Press, Massachusetts USA.

- Cuff, D. (1989) "The social art of design at the office and the academy", in *The Journal of Architectural and Planning Research*. 6:3.

- Denis Mills Associates (1988) *Building Defects: Architect's report and survey analysis*, Maidstone, Dennis Mills Associates, UK.

- Fletcher, Sir B. (1961) *A history of architecture on the comparative method*, Seventeenth ed., Revised by Cordingley, R. A., University of London, London.

- Gartshore, P. J. and Mayfield, I. A.(1988) *Admission Procedures in UK Schools of Architecture*, Design Information Research Unit, School of Architecture, Portsmouth Polytechnic, Portsmouth, UK.

- Gartshore, P. J. and Mayfield, I. A.(1989a) "Developing a view of information among students of architecture", in *The Journal of Architectural and Planning Research*, 6:3, pp. 216-226.

- Gartshore, P. J. and Mayfield, I. A.(1989b) "Practical Training", in *RIBA Journal*, Dec. 1989, pp. 42-46.

- Gartshore, P. J. and Mayfield, I. A.(1990) *The Teaching of Science and Technology in UK Schools of Architecture*, Design Information Research Unit, School of Architecture, Portsmouth Polytechnic, Portsmouth, UK.

- Gutman, R. (1988) *Architectural Practice: A Critical View*, Princeton Architectural Press, USA.

- Gwilt, J. (1876 edition, revised by Papworth, W.) *An encyclopaedia of architecture, historical, theoretical and practical*, Longmans, Green & Co., London.

- Hall, J. (1981) *On-line bibliographic databases*, 2nd ed., Aslib.

- HM Inspectors (1985) *Public Sector Education in Architecture*, Department of Education and Science, DIRU Internal Report, Portsmouth Polytechnic, UK.

- Kaye, B. (1960); *The Development of the Architectural Profession in Britain*, George Allen and Unwin LTD, London.

- Kernohan, D., Gray, J. and Daish, J. (1992) *User participation in building design and management: a generic approach to building evaluation*, Butterworth Architecture, London.

- Lera, S., Cooper, I. and Powell, J.A. (April, 1984) "Information and designers", in *Design Studies*, Volume 5, Number 2.

- Llewellyn Davies, R. (1957) "Deeper knowledge: better design", in *Architects' Journal*, Vol. 125 No 3247.

- Mackinder, M. and Marvin, H. (1982) *Design decision making in architectural practice*, Research paper 19, Institute of Advanced Architectural Studies, York, UK.

- Mackinder, M. (1980) *The selection and specification of building materials and components: a study in current practice and educational provision*, Institute of Advanced Architectural Studies, York, UK.

- Orbasli, A. and Worthington, J. (1995) *Architecture and town planning education in the Netherlands: A European comparison*, Institute of Advanced Architectural Studies, York, UK.

- Prak, N. L. (1984) *Architects: the noted and the ignored*, John Wiley & Sons Ltd. USA.

- Royal Institute of British Architects, (1995a) "This is your life", in *RIBA Journal*, August, pp. 6-11, RIBA Publications, UK.

- Royal Institute of British Architects, (1995b) *Directory of Practices*, RIBA Publications, UK.

- Royal Institute of British Architects, (1996) *Schools of Architecture; with courses recognised by the RIBA*, RIBA Publications, UK.

- Royal Institute of British Architects and Architects Registration Board (1997) *Procedures and Criteria for the Validation of Courses, Programmes and Examinations in Architecture, Part two: Criteria for Validation*, RIBA Pub., UK.

- Salama, A. (1997) *New trends in architectural education; Designing the design studio*, Anglo-Egyptian book-shop, Egypt.

- Sanoff, H. (1992) *Integrating programming, evaluation and participation in design: a theory Z approach*, Avebury, UK.

- Seidel, A. D. (1994) "The knowledge needs architects request", in *Banking on Design?* Proceedings of the Twenty-fifth Annual Conference of the Environmental Design Research Association, Environmental Design Research Association (EDRA) Oklahoma, USA.

- Siegel, S. & Castellan, N. J. (1988) *Nonparametric statistics for the behavioural sciences*, Second edition, McGraw-Hill, USA.

- Stevens, G. (1995) "Struggle in the Studio: A Bourdivin Look at Architectural Pedagogy", in *Journal of Architectural Education*, November 1995, 49/2, pp. 105-122.

- Symes, M. & Marmot, A. (1985) "The social context of design: a case problem approach", in *Journal of Architectural Education*, 38 (4).

- Symes, M., Eley, J. and Seidel, A. D. (1995) *Architects and their Practices: A Changing Profession* , Butterworth Architecture, Oxford, UK.

- Symes, M. (1997) *Summary of Discussion*, Unpublished report, Perspectives on Architectural Education, Institute of Advanced Architectural Studies, York, UK.

- Tzamir, Y. and Churchman, A. (1989) "An ethical perspective on knowledge in architectural education", in *The Journal of Architectural and Planning Research*, 6:3, pp. 227-239.

- Vincenti, W. G. (1990) *What Engineers Know and How They Know It*, The Johns Hopkins University Press, USA.

- Yeomans, D. T. (1988) "The introduction of the trussed roof rafter in Britain", *Structural Safety*, 5, 149-153, Amsterdam, Netherlands.

- Yeomans, D. T. & Neary, S. (1995) *Successful models for CPD: final report*, The School of Architecture, University of Manchester, UK.

APPENDICES

Appendix 1: Preliminary study.

Part one; Summary of observations and interviews in a medium-sized architectural practice[1].

This survey took place in a medium-sized architectural practice with 2 principals, 8 architects, 2 technicians and 1 year-out student. The investigation took five working days in summer 1996.

- The youngest technician with 15 months of experience was responsible for the library duties in the office. Usually designers themselves looked for the information they needed, but sometimes asked the librarian to do this. In these cases they usually asked for a particular product or a manufacturer's name. The librarian was also responsible for selecting the manufacturers' data which was recently received. He said that sometimes he needed to get help from experienced members of the design staff in this matter. Some of the catalogues received had already been ordered by designers, but some came without prior order. This technician also helped designers in searching through the catalogues when technical information was needed.

- When referring to information, designers picked up the catalogues almost straight away, without searching the lists by different manufacturers or different products. This means that they already knew what they were looking for; both in terms of the material and also the manufacturer. They were usually familiar with them for two reasons: 1) their own previous use or 2) their colleagues' previous use. Therefore selecting a manufacturer's data was mostly a pre-determined task.

[1] It was decided not to reveal the name of the practice.

- New manufacturers' data were usually selected in those cases where there were special requirements, for example in specifying products which were unknown. This kind of selection was based first on the manufacturers' name, secondly on the amount of information gathered from their catalogue, and thirdly the range and variety of the products which the manufacturers produce.

- It is important to note that the judgement about the selection of the information was affected by the quality of the presentation of the catalogue.

- The idea of searching was to find information: 1) as reliable as possible 2) as fast as possible and 3) as complete as possible. Time was the most important factor in accessibility of information.

- In practice, information is used in design activities. It is important to note that the collection of information is one stage and the transferring of this into design data is another stage. Saving time at this stage is possible by transferring information from other projects to new designs. It was observed that designers try to create similar objects, corners or patterns, in order to avoid searching for new kinds of information. On one occasion when a young designer decided to choose a new cladding (never previously used in the practice), he had to persuade the principals, and a meeting was held to assess the risk involved.

- If the information was gathered for solving a problem in previous projects it could also be used in new applications. The important thing is that it was the drawings which were used again in the new situations.

- The office had its own selection of materials. This means that the office usually used a pre-determined (or preferred) list of materials.

- In 6 out of 7 interviews none of the designers revealed that they had used any out-of-the ordinary materials in their last projects. One of the designers said: "I actually do not specify things which I have not specified before."

- It seems that a manufacturer who is known for a product may also be used for new combinations or other products.

- A sample of the product may be seen either when the manufacturer sends it himself or when it is requested by the client. On occasions it might also be requested by the architects.

- At the sketch design stage, designers usually did not search for information, merely looking at their previous known catalogues which they had probably used before. Therefore, before the detailing stage, materials are selected according to the previous knowledge of designers. At the detail design stage, designers looked at information based on the selection which they had already made.

- During the observation time, designers needed to look at information such as figures, numbers or detailed information which it was not possible to keep in mind. It is important to note that constant figures are probably exempt from this rule. Designers usually referred to their own remembered knowledge for constant figures or patterns, such as the maximum length of corridors in case of fire. This perhaps has some implications when announcing changes in the constant figures, because this change may be adopted too late.

- Information about cost is not usually found in the manufacturers' data. Although architects are sometimes able to find this information by telephoning the manufacturers, this is not comparable information which could justify their judgement in the selection of materials[2]. So it was rare to see them ask for this kind of information.

- During the observation period, building regulations approved documents were used six times. All of these occasions dealt with fire and escape.

---

[2] I also found that the price given to the architect may be different from the one given to the builder.

- During the observation time nobody used a British Standard. The last time some of the designers remembered using a British Standard was for fire issues.

- In traditional construction contracts, architects are responsible for selecting the products and also the techniques of construction, but in design and build contracts it is the contractors who do this. The principals of the practice revealed that now-a-days there is more tendency among clients to ask for the design and build contracts.

- It was found that certain decisions were fixed within the office. This means that it is the culture of the office which could provide an innovative environment and not the individual designers.

- Younger architects seemed to be more innovative than experienced architects.

- One architect who had some experience from his previous office brought his own concept or pattern of material selection which was also used in this new office.

Part two: Summary of observations and interviews in nine architectural practices.

This survey took place in eight architectural practices around Manchester and Stockport. Each investigation took about five hours, during two weeks in summer 1996. It is important to note that this investigation was considered as a preliminary study and conducted for greater understanding of the situation. The results collected in the context of the thesis are also supported by other researches.

	o.		Inf rmat ion S urces										
Pr	**Ar**	**Te**	**Rf**	**I**	**P**	**T**	**M**	**Rg**	**O**	**L**	**Ln**	**Qa**	**Comments**
1	2	1	7	18	2	7	N	N	1	N	N	A	- Building regulations were old & incomplete. - There was no individual index for manufacturers' data. - Manufacturers were usually familiar with big catalogues.
2	9	2	2	17	3	38	A	N	22	A	N	N	- This is a multi-disciplinary practice. - Barbour microfile and Barbour index (96). - Big and famous manufacturers much more interested. - They are trying to get certificate for QA. It is a competition in business, according to statements of one of the architects. He said that it talks about management and administration but does not talk about actual operation. - When you write your QA booklet, you write what you usually do. However it should be about what you should do. - Central Library. Some of staff believe that it will reduce the number of books in the practice, because all the books should be gathered in the Central Library (according to QA regulations) so they will not keep their own books in the practice. - There was a complete source of engineering information in the library.
3	3	1	11	2	6	7	N	N	2	A	N	A	- Library is located two storeys below the studio in a room with separate key. - QA talks about quality of the procedure, it does not talk about quality of the product.
4	1		4	5	2	23	A	A	36	N	N	N	- There was no BS code. - There were lots of other unrelated books. - Good technical library but with small handbooks.
5	1		5	1	0	5	N	A	2	N	N	N	- Building regulations were complete, but no other planning or BS. - Used small handy manufacturer's book (ASC). - Immediate information is important for them.

Continued on next page

	o.		Inf rmation		S urce								
Pr	**Ar**	**Te**	**Rf**	**I**	**P**	**T**	**M**	**Rg**	**O**	**L**	**Ln**	**Qa**	**Comments**
6	2	2	3	6	4	32	A	A	12	A	A	N	- Some manufacturers' data and Barbour near the desks. - RIBA library service was applied. A librarian came once a month to sort out just the manufacturers' data. - Barbour compendium with microfiche. - Studio was on ground floor, library on first floor.
7	13	2	8	12	3	16	A	A	9	A	A	N	- Architects kept their own books near their desks. - Manufacturers' data used through Barbour microfiche. - Building regulations are complete but 1991/1992. - It seems that architects with more experience keep more books and information near their desks. - One architect said experience from another country does not help. - There was a reference list for all the information available in the library. - Central library dealt with manufacturers' data only. Other books kept near the architects' desks.
8	2	2	-	-	-	-	A	A	-	A	N	N	- Big catalogues of famous manufacturers. - C1/SFB index for manufacturers' data. Also Barbour microfiche.

Table A-1: Summary of observations and interviews in nine architectural practices.

* All the figures in this table are provided roughly with 10%+/- mistake.

Pr. Practices who surveyed. It was decided not to list the names of the practices.
Ar. Number of architects in the practices.
Te. Number of technicians in the practices.
Rf. Number of reference and index books.
I. Number of illustrations and Portfolios.
P. Number of sets of periodicals.
T. Number of Text books.
M. The availability and quality of manufacturers' data. "A" refers to acceptable and "N" to non-acceptable.
Rg. The availability and quality of regulation leaflets and planning legislation. "A" refers to acceptable and "N" to non-acceptable.
O. Number of other articles.
L. The availability of central library. "A" refers to available and "N" to non-available.
Ln. The availability of librarian or RIBA catalogue service. "A" refers to available and "N" to non-available.
Qa. The availability of Quality Assurance certificate. "A" refers to available and "N" to non-available.

Appendix 2: List of Schools of Architecture[1]

	University	School	I[2]	S[3]	R[4]
1	University of Bath	School of Architecture and Civil Engineering	*	*	*
2	University of Brighton	School of Architecture and Interior Design			*
3	University of Cambridge	University of Cambridge			
4	University of Wales College of Cardiff	The Welsh School of Architecture	*	*	*
5	Heriot-Watt University (Edinburgh)	School of Architecture	*	*	*
6	The University of Edinburgh	Department of Architecture			
7	Mackintosh School of Architecture (Glasgow)	The Mackintosh School, Department of Architecture			
8	University of Liverpool	Liverpool School of Architecture and Building Engineering			*
9	Liverpool John Moores University	Centre for Architecture, School of the Built Environment			
10	Architectural Association	Architectural Association School of Architecture			
11	The Bartlett, University College London	The Bartlett School of Architecture	*	*	
12	Kingston University	School of Architecture			*
13	University of North London	School of Architecture and Interior Design			
14	University of Manchester	School of Architecture	*	*	*
15	University of Newcastle	Department of Architecture	*	*	
16	Oxford Brookes University	School of Architecture	*	*	*
17	University of Plymouth	Plymouth School of Architecture			*
18	University of Sheffield	School of Architecture	*	*	*
19	The University of Westminster	School of Architecture and Engineering	*	*	
20	The Robert Gordon University (Aberdeen)	Scott Sutherland School of Architecture	*	*	
21	The Queens University (Belfast)	Department of Architecture and Planning			

[1] See RIBA (1996).
[2] Sent course syllabuses.
[3] Sufficient information was provided in course syllabuses.
[4] Completed questionnaires received from these schools.

22	University of Central England-Birmingham	Birmingham School of Architecture			*
23	Kent Institute of Art and Design	Canterbury School of Architecture			
24	Faculty of Duncan of Jordanstone College (Dundee)	School of Architecture	*		
25	University of Strathclyde	Department of Architecture and Building Science			*
26	The University of Huddersfield	Department of Architecture			*
27	University of Lincolnshire and Humberside	Hull School of Architecture	*	*	
28	Leeds Metropolitan University	Faculty of Design and the Built Environment	*	*	*
29	De Montfort University (Leicester)	Department of Architecture	*	*	*
30	University of East London	School of Architecture	*		*
31	University of Greenwich (Dartford Campus)	School of Architecture and Landscape			
32	Royal College of Art (London)	School of Architecture and Interior Design	*		
33	South Bank University	Division of Architecture			
34	University of Nottingham	The Nottingham School of Architecture			*
35	University of Portsmouth	School of Architecture	*	*	*

Table A-2: A full list of those schools which participated in the survey and those which did not.

Appendix 3: Full list of items in course syllabuses

1) Construction and Materials

	Single items	Sc*	Y*	Pr*	To*	Es*
C	Natural and man-made materials and textures.	1	1	1	A1	W
C	The basic human need for shelter.	1	1	1	A1	W
C	What is construction? Why study it?	1	2	1	A1	W
C	Introduction to construction and materials.	4	1	1	A1	W
C	Where materials come from.	14	1	1	A1	W
C	The anatomy of a building: ground, floors, walls, roofs, doors and windows and stairs, building services.	14	2	1	A1	W
C	Thinking about materials.	15	1	1	A1	W
C	Material morphology.	15	2	1	A1	W
C	Materials and building form.	16	2	1	A1	W
C	Introduction to shelter as structure, detailed look at early domestic building techniques.	18	1	1	A1	W
C	Building analysis.	20	3	1	A1	W
C	State the functions of the main elements of the building.	27	1	1	A1	W
C	Why do we build? the building as environmental modifier and cultural expression.	28	1	1	A1	W
C	Introduction: construction, services & architecture.	15	2	1	A1,4	W
C	History of iron and steel, cast and wrought iron, early steel.	1	2	1	A2	M
C	History of concrete in architecture, 1890- present, European development, American development, Le Corbusier, Frank Lloyd Wright, Nervi,...	1	2	1	A2	M
C	New materials and technologies.	5	2	1	A2	M
C	New materials and building techniques.	14	3	1	A2	M
C	Iron and steel historical developments.	15	1	1	A2	M
C	Introduction to properties of metals and use in the building industry.	18	3	1	A2	M
C	History, development and manufacture of steel and properties and use of different types of steel.	18	3	1	A2	M
C	Manufactured products.	14	3	1	A3	H
C	Introduction to brick manufacturing process.	18	2	1	A3	H
C	Manufacture and properties of Portland cement and its use in the making of concrete.	18	3	1	A3	H
C	Introduction to the manufacture of glass; types of glass and their uses.	18	4	1	A3	H
C	Introduction to the manufacture of gypsum plaster and their uses.	18	4	1	A3	H
C	Introduction to module.	1	2	1	A4	H
C	Detailed introduction to technical literature.	5	2	1	A4	H

* **Sc**: Code of the school. See Appendix 2.
Y: The item is taught in this year.
Pr: Levels of practicality; i.e. 1= General knowledge, 2= Basic & theoretical knowledge, 3= Practical knowledge (S= site knowledge).
To: Topic to which the item belongs. See Appendix 4.
Es: 'Esoteric levels'; i.e. W= Low esoteric, M= Medium esoteric, H= High esoteric.

C	A review of the work of some twentieth century engineers and their influence on contemporary architecture.	5	3	1	A4	H
C	The work of eminent twentieth century engineers who have influenced the development of modern architecture.	5	3	1	A4	H
H	The status of the engineer from the end of the eighteenth century	5	3	1	A4	H
C	The technological demands of multi-storey buildings.	14	3	1	A4	H
C	Cladding materials and techniques.	1	1	2	B01	W
C	External walls in masonry and brick, bonding, insulation, coursing, dimensions, junctions.	1	1	2	B01	W
C	Eaves, gables and ridges.	1	1	2	B01	W
C	Flat roofs, parapets and eaves.	1	1	2	B01	W
C	Steel cladding. finishes, stainless steel, staircases and balustrades.	1	2	2	B01	W
C	Roof coverings for pitched roofs.	4	1	2	B01	W
C	Stone cladding and concrete finishes panels, sizes and modules, manufacture, transport and site assembly.	4	2	2	B01	W
C	Suspended ceilings, partitions and raised access floors: modular co-ordination and integration of building services.	4	3	2	B01	W
C	External walls.	5	1	2	B01	W
C	Flat roofs.	5	1	2	B01	W
C	Pitched roofs.	5	1	2	B01	W
C	Ground floors.	5	1	2	B01	W
C	Upper floors.	5	1	2	B01	W
C	Roofing choice of roof coverings and detailed study of forms available.	5	2	2	B01	W
C	Roofs.	5	2	2	B01	W
C	Introduction to aspects of cladding.	5	3	2	B01	W
C	Metal claddings ferrous and non-ferrous sheet or panel cladding using standard or customised systems.	5	3	2	B01	W
C	Stone cladding thin and thick cladding to steel/concrete frame buildings using unit and panel techniques fixed directly and indirectly.	5	3	2	B01	W
C	Cladding systems.	14	3	2	B01	W
C	Light cladding: walls, curtain walling.	15	3	2	B01	W
C	Heavy cladding: concrete, stone & brick.	15	3	2	B01	W
C	Light cladding: glass & glazing.	15	3	2	B01	W
C	Light cladding: roofs.	15	3	2	B01	W
C	Introduction of roof design. Construction of timber pitched and flat roofs.	18	2	2	B01	W
C	Construction of solid floors.	18	2	2	B01	W
C	Use, manufacture and elementary design of GRP and GRC panel for wall cladding.	18	3	2	B01	W
C	Introduction to use and elementary detailing practice of steel and aluminium sheet metal as wall cladding.	18	3	2	B01	W
C	Introduction to the use of metals to clad pitched roofs.	18	4	2	B01	W
C	Principles of flat roof design. Introduction of solutions to waterproofing techniques for flat roofs.	18	4	2	B01	W
C	Solutions to the problems of heat loss, condensation and thermal movement in flat roof design.	18	4	2	B01	W
C	Flat roofing principles, problems and development.	20	2	2	B01	W
C	Roofs: canopy for dwelling, expression of protection; water, light and shade; pitched and flat construction, condensation and insulation.	28	1	2	B01	W
C	Floors: platforms for dwelling, solid and suspended ground floors; timber, pre-cast and *insitu* concrete upper floors; robustness, flexibility and mass.	28	1	2	B01	W

C	Lightweight cladding and flat roofs.	28	2	2	B01	W
C	Moisture control: impervious materials.	28	2	2	B01	W
C	Water penetration and exposure.	28	2	2	B01	W
C	Cladding systems: heavy systems (in multi-storey buildings).	28	3	2	B01	W
C	Cladding: lightweight/rain-screen (in multi-storey buildings).	28	3	2	B01	W
C	External envelope: frame types in multi-storey buildings.	28	3	2	B01	W
C	Suspended ceiling/raised floors.	28	3	2	B01	W
C	External finishes (in multi-storey buildings).	28	3	2	B01	W
C	Cladding systems.	29	3	2	B01	W
C	Curtain walling and cladding systems.	29	3	2	B01	W
C	Roof decking.	29	3	2	B01	W
C	Superstructures, external walls, intermediate floors and internal partitions.	4	1	2	B01,02	W
C	An introduction to construction elements from the ground up to the roof, incorporating differing construction types, material properties and initial structural concepts and forms.	35	1	2	B01,02,03	W
C	Examination of patent glazing and curtain walling systems.	18	5	2	B01,02,04	W
C	Partitioning and wall finishes, conventional and proprietary internal partition systems using sheet material finishes, plaster & render finishes for internal and external walls.	5	2	2	B01,02,05	W
C	Structures & skins: principles of framed clad construction.	15	3	2	B01,03	W
C	Use of timber as a cladding material.	18	1	2	B01,03	W
C	Construction of brick cavity walls.	18	2	2	B01,03	W
C	Principles of retaining walls and basement construction.	18	4	2	B01,03	W
C	Walls solid cavity masonry, rain screen cladding, openings; thermal performance, security, threshold.	28	1	2	B01,03	W
C	Concrete floors.	1	1	2	B03	W
C	Wall openings, windows and doors, jambs, sills, heads, thresholds, sizes and frames, glazing.	1	1	2	B03	W
C	Timber construction.	1	1	2	B03	W
C	Foundations: strip, raft, piled foundations.	1	1	2	B03	W
C	Columns.	1	1	2	B03	W
C	Concrete: sizing; floor reinforcement, compression, pre-stressing, slabs, beams, columns.	1	2	2	B03	W
C	Steel; clear span building, connections.	1	2	2	B03	W
C	Non-structural uses of steel.	1	2	2	B03	W
C	Masonry: types, performance and use of bricks and blocks.	4	1	2	B03	W
C	Substructures foundation systems common to domestic construction.	4	1	2	B03	W
C	Domestic timber frame construction concepts, UK and overseas systems, and case studies.	4	2	2	B03	W
C	Ground investigations: special foundations, foundation systems for skeletal low-rise buildings.	4	2	2	B03	W
C	Domino construction introduction to skeletal building construction.	4	3	2	B03	W
C	Foundations.	5	1	2	B03	W
C	Basements.	5	1	2	B03	W
C	Concrete construction; study of forms of concrete construction, element connections, finishes and architecture detail, case studies and site practice.	5	2	2	B03	W
C	Concrete in multi-storey frame buildings.	5	3	2	B03	W
C	Mass construction, frame construction.	14	1	2	B03	W
C	Comparison of forms of construction: load bearing and framed clad.	15	2	2	B03	W

C	Principles of timber frame construction.	18	1	2	B03	W
C	Construction of openings in walls.	18	2	2	B03	W
C	Introduction to principles of construction of steel space frames and portal frames in timber, steel and concrete.	18	3	2	B03	W
C	Introduction to use and manufacture of timber frames for medium to wide span situation.	18	3	2	B03	W
C	Introduction to foundations used for medium to heavy loading; the relationship to soil types and structural form.	18	3	2	B03	W
C	Introduction to use of concrete in *insitu*, pre-cast and block work wall construction.	18	4	2	B03	W
C	Building systems concrete.	20	3	2	B03	W
C	Comparison of *insitu*, pre-cast and composite systems.	20	3	2	B03	W
C	Buildings systems steel.	20	3	2	B03	W
C	Reinforced masonry systems.	20	3	2	B03	W
C	Load bearing construction, choice of materials (Local distinctiveness, energy, transport).	28	1	2	B03	W
C	Basements: excavation and construction.	28	3	2	B03	W
C	Deep basement construction.	28	3	2	B03	W
C	Concrete, stone and stonework.	29	3	2	B03	W
C	Low-rise construction.	29	3	2	B03	W
C	Analysing construction techniques and structural systems with regard to their implications on the detailing of a building.	35	2	2	B03	W
C	Looking at the concepts of the essential of differing construction/structural typology, and the characteristics of their generic forms.	35	2	2	B03	W
C	Construction methods.	16	2	2	B03,08	W
C	An understanding of the application of prefabrication to the constructional process.	28	2	2	B03,08	W
C	Construction and structural types, erection and construction processes.	35	4	2	B03,08	W
C	Steel technology. Fabrication and erection.	1	2	2	B03, D1	W
C	Steel construction study of forms of steel construction, fabrication and erection procedures, protection and finishes, case studies and site practice.	5	2	2	B03, D1	W
C	Timber construction study of stud, post and beam, solid section and glulam construction, methods of fabrication, external finishes, case studies and site practice.	5	2	2	B03, D1	W
C	What is concrete? Composition, manufacture, hydration, cements and aggregates, reinforcement and properties.	1	2	2	B05	W
C	Advanced concrete technology, special materials, advanced techniques.	1	2	2	B05	W
C	Casting concrete.	1	2	2	B05	W
C	Concrete; cost/value, speed, buildability, flexibility, quality.	1	2	2	B05	W
C	Concrete; materials, form-work, reinforcement, construction joints, mixing, handling, curing, surface treatments.	1	2	2	B05	W
C	Concrete; *insitu* elements, weathering.	1	2	2	B05	W
C	Nature of steel.	1	2	2	B05	W
C	Materials; metal, glass, coatings and finishes, plastics and insulants/ Performance criteria.	1	3	2	B05	W
C	Timber: conversion and characteristics growth structure, industry sizes and performance characteristics.	4	2	2	B05	W
C	Timber classification, anatomy of timber, conversion, seasoning, moisture content, sizing and grading, properties, deterioration of timber, timber products.	5	1	2	B05	W

C	Brick manufacture and classifications, bonding properties, utilisation.	5	1	2	B05	W
C	Stone classification, quarrying, processing, properties, utilisation, cast stone.	5	1	2	B05	W
C	Metals manufacture and classification of ferrous and non-ferrous metals, fabrication methods, applied finishes, corrosion, utilisation.	5	1	2	B05	W
C	Introduction to pre-stressed concrete.	5	3	2	B05	W
C	Reinforced concrete and how it is made to perform efficiently.	5	3	2	B05	W
C	The properties of materials; timber, clay, stone, metal, plastic, glass, concrete.	14	1	2	B05	W
C	Concrete and concrete products.	15	1	2	B05	W
C	Timber and timber products.	15	1	2	B05	W
C	Brick and brickwork.	15	1	2	B05	W
C	Steel properties and implications.	15	1	2	B05	W
C	Common building materials and their physical properties.	16	2	2	B05	W
C	Introduction to various geomorphologic forms of stone and related properties for building purposes.	18	1	2	B05	W
C	Introduction to timber as a building material.	18	2	2	B05	W
C	Description of types and properties of bricks and the use in brick buildings	18	2	2	B05	W
C	Introduction to reinforced concrete.	20	3	2	B05	W
C	Pre-cast & *insitu* concrete.	20	3	2	B05	W
C	Properties of concrete.	20	3	2	B05	W
C	Concrete and mortar.	28	1	2	B05	W
C	Materials: properties and introduction/ Behaviour and performance criteria.	28	1	2	B05	W
C	Timber and bricks.	28	1	2	B05	W
C	Steel.	28	1	2	B05	W
C	Timber and timber products.	29	2	2	B05	W
C	Bricks and brickwork.	29	2	2	B05	W
C	Structural and sheet steel.	29	3	2	B05	W
C	Non-ferrous metals.	29	3	2	B05	W
C	Glass and glazing.	29	3	2	B05	W
C	Colouring and finishes, fast-build techniques.	1	2	2	B05,11	W
C	Internal walls and partitions, junctions and finishes.	1	1	2	B02	M
C	Suspended timber floors.	1	1	2	B02	M
C	Stairs and ramps.	1	1	2	B02	M
C	Solid fuel appliances, fuels and chimneys, design principles, construction and weathering.	4	1	2	B02	M
C	Second-fix carcassing and fitting out following plastering.	4	1	2	B02	M
C	First-fix carcassing and fitting out up to and including plastering.	4	1	2	B02	M
C	Multi-storey vertical access lifts and stairs.	4	2	2	B02	M
C	Interior architecture, impact of current performance criteria and approaches in major refurbishment projects.	4	3	2	B02	M
C	Vertical circulation and access performance criteria, systems, equipment, sizing, fire safety and building works in connection.	4	3	2	B02	M
C	Stairs.	5	2	2	B02	M
C	Doors.	5	2	2	B02	M
C	Windows.	5	2	2	B02	M
C	Internal elements: raised floors, suspended ceilings & partitions.	15	3	2	B02	M
C	Vertical circulation: lifts & escalators.	15	3	2	B02	M
C	Internal division: fixed/moveable partitions.	28	3	2	B02	M

C	Internal finishes; floor and wall (in multi-storey buildings).	28	3	2	B02	M
C	Plaster and plaster work.	29	3	2	B02	M
C	Principles of door and window design for timber and brick buildings.	18	2	2	B02,03	M
C	Construction sequence [process].	5	1	2	B08	M
C	The process of construction and the concept of buildability.	14	1	2	B08	M
C	Buildings as systems: the process of construction and the concept of buildability.	14	2	2	B08	M
C	How a contractor builds a building.	14	3	2	B08	M
C	Domino construction, shell, core, smart skins, roof performance/specification.	4	3	2	B04	H
C	Introduction to glazing systems.	18	4	2	B04	H
C	Glazed walls and roofs, curtain walling.	1	1	2	B04,02	H
C	Fibre reinforced materials using a matrix of glass/plastic fibre and cement, resin and gypsum.	5	3	2	B06	H
C	Introduction to the basic concept of polymer chemistry, Process of forming thermoplastic and thermoset polymers and their use as plastic artefacts in the building industry.	18	4	2	B06	H
C	Polymers and glass.	28	1	2	B06	H
C	Plastics: GRP and GRC construction.	20	2	2	B06,04	H
C	Introduction to problems which may occur in the use of timber and the methods of preventive treatment and preservation.	18	2	2	B07	H
C	Timber infestation.	20	3	2	B07	H
C	Means of degradation, corrosion, sulphate attack.	28	2	2	B07	H
C	Introduction to building materials defects.	28	2	2	B07	H
C	Traditional construction.	20	3	2	B09	H
C	Traditional construction of foundations, floors, walls and roofs, assembly and jointing, moisture exclusion and durability and weathering.	29	2	2	B09	H
C	Building conservation techniques SPAB guidelines.	4	2	2	B10	H
C	Conservation and rehabilitation.	20	3	2	B10	H
C	Insulation.	15	1	2	B11	H
C	Hard landscape: built features.	15	2	2	B11	H
C	Hard landscape: horizontal surfaces.	15	2	2	B11	H
C	Introduction to soft landscape.	15	2	2	B11	H
C	Trees, shrubs and ground cover.	15	2	2	B11	H
C	Integration of contraction, services & structure.	15	3	2	B11	H
C	Introduction to relationship of materials used to form openings in walls of superstructure.	18	2	2	B11	H
C	An appraisal of the factors determining the design of specific elements and components.	19	2	2	B11	H
C	Enclosing elements.	29	3	2	B11	H
C	Classification of enclosure systems.	29	3	2	B11	H
C	Detailed 3-dimensional studies of junctions.	1	1	3	C2	W
C	Concrete finishes and detailing, materials, casting, blocks, panels.	1	2	3	C2	W
C	Pre-cast concrete, scope, methods, design, joints/fixings.	1	2	3	C2	W
C	Design and analysis of steel.	1	2	3	C2	W
C	Materials; principles; joint and support design.	1	3	3	C2	W
C	Openings in walls; performance requirements for common forms of doors and windows.	4	1	3	C2	W
C	Ground floors: performance requirements for common forms of ground floors.	4	1	3	C2	W

C	Stairs and staircase design geometrical parameters, construction methods and safety.	4	1	3	C2	W
C	Lightweight cladding systems performance requirements, types and site assembly.	4	2	3	C2	W
C	Roof lights and dormer windows: performance requirements and weathering.	4	2	3	C2	W
C	Intersecting roofs and damp proofing valleys and hips.	4	2	3	C2	W
C	Brick cladding to steel frames: structural principles and connections.	4	2	3	C2	W
C	Cross-wall and calculated brickwork: structural principles and acoustic performance.	4	2	3	C2	W
C	Metal coverings to flat roofs types performance and site process.	4	2	3	C2	W
C	Structural glazing systems: performance requirements, types and site assembly.	4	2	3	C2	W
C	Timber flat roof construction types: performance and site process.	4	2	3	C2	W
C	Concrete cladding reinforced concrete cladding of storey and spandrel form using bolt or dowel fixings, top or bottom supported.	5	3	3	C2	W
C	Glass cladding curtain wall systems suspended assemblies in glass, structural glazing systems.	5	3	3	C2	W
C	User-requirements & window design.	15	1	3	C2	W
C	Heavy cladding: fixing.	15	3	3	C2	W
C	Design of masonry walls.	15	1	3	C2	W
C	Improving glazing: options and performance.	15	2	3	C2	W
C	Improving load-bearing walls: options and performance.	15	2	3	C2	W
C	Improving pitched roofs: options and performance.	15	2	3	C2	W
C	Building tolerances and interface.	16	3	3	C2	W
C	Methods of preventing water penetration at roof junctions.	18	2	3	C2	W
C	Methods of providing weather protection to roofs.	18	2	3	C2	W
C	Introduction to standard steel work sections and design of structures using these components.	18	3	3	C2	W
C	Examination of material used in waterproofing flat roofs.	18	4	3	C2	W
C	Introduction to design of openings in roofs to provide natural light.	18	4	3	C2	W
C	Principles of staircase design, elementary construction detailing of staircases.	18	5	3	C2	W
C	Principles of retaining wall and basement design.	18	5	3	C2	W
C	Methods of building in stone, fixing of stone facing to frame structures, factors which cause degradation and methods of preservation.	18	1	3	C2	W
C	Examination of design of concrete ground floors; introduction to design of upper concrete floors for short, medium and wide-span situations.	18	4	3	C2	W
C	Techniques of solving water penetration, structural fixings and heat loss problems for metal clad roofs.	18	4	3	C2	W
C	Introduction to brick/block construction used for high single storey structures, examination of diaphragm and fill wall construction.	18	4	3	C2	W
C	Concrete detailing and joints.	20	3	3	C2	W
C	Concrete finishes.	20	3	3	C2	W
C	Domestic scale construction in masonry and timber including materials, finishes and detailing of walls, solid and suspended floors including staircases, pitched and flat roof including eaves and chimneys.	20	1	3	C2	W
C	Domestic scale construction in masonry and timber including materials, finishes and detailing of damp courses and membranes, vapour barriers and insulation.	20	1	3	C2	W
C	Introduction to properties of glass and cladding/detailing techniques.	20	2	3	C2	W

C	Principles of production and detailing of prefabricated timber panel building systems.	20	2	3	C2	W
C	Elements design, dimensional tolerances.	28	2	3	C2	W
C	Movement: thermal expansion and contraction, joint design and sealant.	28	2	3	C2	W
C	Basement waterproofing systems.	28	3	3	C2	W
C	Concrete and concrete finishes.	29	2	3	C2	W
C	Joints and jointing.	29	3	3	C2	W
C	Design strategy (concrete); basic attributes, design for building, design of elements, design for construction.	1	2	3	C1	M
C	Delight in detail.	5	2	3	C1	M
C	How to detail, the individual detail, the detail as part of a whole, the expressive detail.	14	1	3	C1	M
C	Detail design: making building work.	15	2	3	C1	M
C	Use and placement of reinforcement in *insitu* and pre-cast construction.	18	3	3	C1	M
C	Draw detailed sections through the main elements.	27	1	3	C1	M
C	Ability to discuss and analyse detailed aspects of designs, and understanding of the relationship between the detailed design and the impact that construction details have on the evolution of the design process.	35	3	3	C1	M
C	An advanced understanding of integrated design and detailed assembly including junctions and fixings associated with structural connections.	35	4	3	C1	M
P	Cost benefit analysis, cost-in-use and life-cycle costing.	1	2	3	C3	M
P	Estimates of capital construction cost and cost analysis.	1	2	3	C3	M
P	Sources of cost information.	1	2	3	C3	M
P	Impact of design on cost and principles of cost control.	1	2	3	C3	M
P	The nature of cost planning and the preparation and use of viability studies.	1	2	3	C3	M
P	Economic consequences of design decisions	4	2	3	C3	M
P	Value and demand; funding and feasibility; design economics; building costs; life-cycle costs	4	2	3	C3	M
P	Factors determining cost levels	14	4	3	C3	M
P	Sources of cost information	14	4	3	C3	M
P	Provisional and prime cost sums	14	4	3	C3	M
P	Cost brief	14	4	3	C3	M
P	Cost planning	14	4	3	C3	M
P	Methods of estimating [cost]	14	4	3	C3	M
P	Budgets, building economics and cost control	15	2	3	C3	M
P	Recognise the factors of value and cost (long and short term) in decision making	15	1,2	3	C3	M
P	Design and cost exercise	15	2	3	C3	M
C	Building construction costs.	20	3	3	C3	M
C	Determine cost estimates for small-scale projects.	27	3	3	C3	M
P	Determine cost estimates for small-scale projects	27	2	3	C3	M
C	Timber construction; regulation requirements.	5	2	3	C4	M
C	Knowledge of technical issues addressed during the design and construction of buildings, with reference to prevailing regulations.	11	2	3	C4	M
C	An introduction to the Building Regulations and Codes of Practice.	14	3	3	C4	M
C	Building Regulations Pt B2,3,4,5: fire protection.	15	2	3	C4	M
C	Building Regulations Pt H: above-ground drainage and plumbing: function and invisibility.	15	2	3	C4	M

C	Building Regulations Pt H: underground drainage.	15	2	3	C4	M
C	Building Regulations and other standards, Building Regulations Pt M: design for disability.	15	2	3	C4	M
C	Building Regulations Pt B1: fire and means of escape.	15	2	3	C4	M
C	Building Regulations Pts K & M: changes in level: stairs and ramps.	15	2	3	C4	M
P	Planning and Building Regulations	16	2	3	C4	M
C	Examination of Part B of the Building Regulations (fire & means of escape).	18	5	3	C4	M
C	Introduction to staircase design to conform to Building Reg. requirements.	18	5	3	C4	M
C	Introduction to the British Building Regulations.	18	5	3	C4	M
P	Building Standards and Codes	20	2	3	C4	M
C	Codes of Practice and regulations for fire issues.	28	2	3	C4	M
P	Planning and Building Regulations	28	2	3	C4	M
P	Identify and respond to legislative parameters and issues of health and safety	15	1,2	3	C4, C7	M
C	Plasters and renders: material properties and construction techniques.	4	1	3	C5	M
P	Specification and co-ordinated project information	4	4	3	C5	M
C	Referencing to possible materials, structural and environmental systems and outlining the process of selection of the chosen items in the final design.	11	3	3	C5	M
P	Types of specification	14	4	3	C5	M
C	Properties, use of polymers as paints, adhesives and sealant in the building industry.	18	4	3	C5	M
C	Demonstrate an understanding of the process of selection and specification of internal finishes and components.	27	2	3	C5	M
C	Demonstrate an understanding of the process of selection and specification of materials and forms of construction for the substructure, superstructure and external envelope.	27	2	3	C5	M
C	Understand the process of selecting and specifying hard and soft landscaping and associated drainage.	27	2	3	C5	M
C	Design performance, environmental suitability, durability, compatibility and protective coatings of specific materials and assemblies.	35	4	3	C5	M
C	Fire protection of steel.	1	2	3	C6	M
C	Fire protection with regard to internal finishes.	4	3	3	C6	M
C	Safety in fire.	14	2	3	C6	M
C	Demonstrate an understanding of the theory of fire technology and means of escape.	27	2	3	C6	M
C	Fire: design and planning for control and escape; protection of structures.	28	2	3	C6	M
C	CDM regulations, site inspection and {QA role and requirements*[*]}.	4	3	3	C7, C4	H
C	Identify the main issues relating to health and safety and the effects on the environment.	27	1	3	C7	H
C	Identify the legislative requirements pertaining to safety and safe working practices.	27	2	3	C7	H
P	Bills of quantities and specification	14	4	3	C8	H
P	Trade workmanship and materials clauses	14	4	3	C8	H

[*] Not applicable

P	Design liability and briefing; introduction to procurement	4	2	3	C10	H
P	Programming	14	4	3	C10	H
P	Disability issues in design	16	2	3	C10	H
P	Self-build and participatory experiments in building	16	2	3	C10	H
C	Undertake a design project from a given (or agreed) brief and offer an acceptable solution which satisfactorily solves the following problems: spatial design and form, construction, environmental and structural requirements and fitness for purpose.	27	2	3	C10	H
P	Identify the principal legislative, technical and professional factors influencing the design strategy of a building project	27	2	3	C10	H
C	Internal and external components, standardisation.	35	4	3	C10	H
C	An understanding of realist design constraints and their impact on the concept and final built form.	35	4	3	C10	H
C	Steel frame assembly techniques fabrication, site assembly and joining techniques.	4	2	3S	D1	M
C	Concrete Constituent materials, mixing, placing, compacting, curing, *insitu* use, pre-cast use, weathering.	5	1	3S	D1	M
C	Ways of making reinforced concrete work harder.	5	3	3S	D1	M
C	Fabrication methods of timber, metal and concrete.	14	3	3S	D1	M
C	Introduction to concrete construction techniques as used on sites.	18	3	3S	D1	M
C	Production and properties of concrete; methods of testing concrete for use in construction.	18	3	3S	D1	M
C	Cement and aggregates.	29	2	3S	D1	M
C	Site establishment, external works drainage below ground, roads, paths, boundary walls and services.	4	1	3S	D2	M
C	Site investigation: setting up the site: practical exercise.	15	2	3S	D2	M
P	Site meetings	15	2	3S	D2	M
C	Siting and site design strategy, how micro-climates, view aspects, prevailing winds and thermal conditions affect the choice of settlements	18	1	3S	D2	M
C	Site analysis and appraisal techniques.	20	3	3S	D2	M
C	Initiate site analysis and research.	27	1	3S	D2	M
C	Carry out a site investigation and establish the soil conditions.	27	2	3S	D2	M
C	Building failures case studies, complex buildings appraisal, diagnosis and repair.	4	3	3	C9	H
C	Dealing with existing buildings.	14	3	3	C9	H
P	Dealing with building errors.	16	2	3	C9	H
C	Building failures.	20	3	3	C9	H
C	Existing building structural surveys and alterations.	20	3	3	C9	H
C	Land surveying, horizontal and vertical measurement of site to allow site plan to be plotted.	5	2	3S	D3	H
P	Surveying	16	2	3S	D3	H
C	Surveys.	20	3	3S	D3	H
P	Financial management on site	14	4	3S	D4	H
P	Health and Safety on site[1]	15	2	3S	D4	H
C	Examination of the function of an architect on site during the construction process.	18	5	3S	D4	H

[1] This item is specific to work on site.

C	Co-ordinated project information current information on office practice, project production drawings, specification bills of quantities and use of it.	4	3	3	C10	H
C	The principles and practices of producing production information.	14	2	3	C10	H
C	Architects' information for construction, drawing conventions, drawings specification, schedules, bills of quantity.	15	2	3	C10	H
C	The development and resolution of detailed design proposals.	16	2	3	C10	H
C	Communicate with appropriate drawings, CAD images, models, written and verbal presentations.	27	1	3	C10	H
C	A standard approach to specification and working drawings in common use throughout the construction industry.	35	3	3	C10	H
C	Identify the principal legislative, technical and professional factors influencing the design strategy of a building project.	27	3	3	C10	H
C	A broad introduction to the relationships between architectural design, the structural and constructional use of materials, the environmental control methods which are available to the architect, and the formal and tectonic consequences of their adoption.	19	1	?		
C	"State of the art" technologies and their impact on complex functional and performance requirements.	19	3	?		
C	Explanation of structural analysis and design.	20	2	?		
C	Qualitative & quantitative analysis.	20	3	?		
C	Explain the functions of the individual components.	27	1	?		
C	Describe the principles of the structure and construction appropriate to the given project.	27	1	?		
C	Identify and analyse the elements that link the process of design to the principles of building technology.	27	2	?		
C	Understand the requirements for the structural integrity and external envelope of buildings.	27	2	?		
C	Describe the components and organisational structures and their interrelationships.	27	3	?		
C	An ability to relate the results of simple calculations to the problem of determining built form, structural design and construction.	28	1	?		
C	The relationship [of] detailing and built form.	35	2	?		
C	Structural design of concrete elements.	1	2	NA		
C	Advantages of Steel, initial design approaches, structural systems.	1	2	NA		
C	Systems; structural gasket and panel, structural and silicone glazed, pressure plate and components.	1	3	NA		
C	Roof structures; roof forms in prefabricated and on site construction.	4	1	NA		
C	Roof structures.	5	1	NA		
C	The relative merits of conventional structural systems.	5	3	NA		
C	Condensation; the problem and remedy.	15	1	NA		
C	Heat flow control, resistance and U values.	15	1	NA		
C	Introduction to timber structures.	18	1	NA		
C	Introduction to foundation design.	18	2	NA		
C	Examination of frame structure design.	18	5	NA		
C	Structural movement, effects of moisture.	28	2	NA		
C	An ability to research, understand & present complex technical subject areas.	35	4	NA		

Table A-3: Full list of 'construction and materials' items extracted from course syllabus handbooks.

2) History of Architecture

	Single items	Sc*	Y*	Pr*	To*	Es*
H	Post-Moderns in Britain.	1	2	2d	B2	W
H	Urban theorists.	1	2	2d	B2	W
H	Venturi.	1	2	2d	B2	W
H	England; the Elizabethan Renaissance, tradition of renaissance thinking, the Globe Theatre, Court iconography, Poetry, the 'Triumphal Route' through London, the Stuart New Jerusalem and Second Rome, Wren, the new St. Pauls.	1	3	2d	B2	W
H	The Italian Renaissance, Serlio, Vitruvius, Alberti, background through treatise tradition.	1	3	2d	B2	W
H	Bath, The Woods, John Wood's texts as interpretation of Bath, Prior Park as example.	1	3	2d	B2	W
H	Art Nouveau and Arts and Crafts	4	1	2d	B2	W
H	Baroque	4	1	2d	B2	W
H	Gothic and Mediaeval secular (including the pointed arch)	4	1	2d	B2	W
H	Neo-Classicism and Romanticism across Europe	4	1	2d	B2	W
H	Neo-Palladianism in England	4	1	2d	B2	W
H	Renaissance	4	1	2d	B2	W
H	The classical heritage in the Middle Ages: Byzantine and Romanesque (arch and dome)	4	1	2d	B2	W
H	Greek and Roman antiquity (basic construction techniques; the establishment of the classical tradition; essential building types)	4	1	2d	B2	W
H	Baroque and Rococo	5	1	2d	B2	W
H	Gothic	5	1	2d	B2	W
H	Neo-classicism and the Picturesque	5	1	2d	B2	W
H	Nineteenth-century Revivalism to Art Nouveau	5	1	2d	B2	W
H	Renaissance	5	1	2d	B2	W
H	Greek architecture [old]	5	1	2d	B2	W
H	Roman architecture	5	1	2d	B2	W
H	Art Nouveau, Arts and Crafts and related movements in Europe and USA	5	2	2d	B2	W
H	British Imperial Baroque 1880 - 1920	5	2	2d	B2	W
H	Dissemination of the "Modern Movement" to UK and USA	5	2	2d	B2	W
H	Late Corbusier, Kahn and Aalto	5	2	2d	B2	W
H	Post-Modern classicism	5	2	2d	B2	W
H	Venturi and the beginnings of Post-Modernism	5	2	2d	B2	W

---

* Sc: Code of the school. See Appendix 2.
Y: The item is taught in this year.
Pr: Levels of practicality; i.e. 1= General knowledge, 2= Basic & theoretical knowledge (d= descriptive, a= analytic), 3= Practical knowledge.
To: Topic to which the item belongs. See Appendix 4.
Es: 'Esoteric levels'; i.e. W= Low esoteric, M= Medium esoteric, H= High esoteric.

H	Mackintosh and Gaudi: Late nineteenth or early twentieth century architects?	5	2	2d	B2	W
H	Revivalism, and Romanticism	5	2	2d	B2	W
H	The picturesque: urban planning	14	2	2d	B2	W
H	Modern architecture	14	1	2d	B2	W
H	English Palladianism	14	2	2d	B2	W
H	Greek revivalism in the 19th century	14	2	2d	B2	W
H	Romanticism and Gothic	14	2	2d	B2	W
H	Romanticism and Greek	14	2	2d	B2	W
H	Rome: the neo-classical crucible, first generation neo-classicists	14	2	2d	B2	W
H	Victorian architecture in Britain	14	2	2d	B2	W
H	Loos, Wright, Rietveld, Chareau, Asplund, Tatlin, Leonidov, Gropius, Scharoun, Le Corbusier, Mies van der Rohe, Aalto, Terragni, Scarpa, Moneo, Miralles, Stirling, Meier, Rossi, Eisenman, Tschumi.	14	3	2d	B2	W
H	Philip Webb	15	2	2d	B2	W
H	Prior, Baillie-Scott & Mackintosh	15	2	2d	B2	W
H	Ruskin, Morris & Pugin	15	2	2d	B2	W
H	Voysey & Lutyens: house & landscape	15	2	2d	B2	W
H	Greece [Architecture]	15	1	2d	B2	W
H	Rome [Architecture]	15	1	2d	B2	W
H	Baroque	15	1	2d	B2	W
H	Gothic	15	1	2d	B2	W
H	Palladianism and Georgian	15	1	2d	B2	W
H	Renaissance	15	1	2d	B2	W
H	Revivalism	15	1	2d	B2	W
H	Romanesque	15	1	2d	B2	W
H	Tudor and Jacobean	15	1	2d	B2	W
H	Early Modernism	15	1	2d	B2	W
H	Arts & Crafts in North America	15	2	2d	B2	W
H	Arts & Crafts on the continent	15	2	2d	B2	W
H	Norman Shaw: Old English & Queen Anne	15	2	2d	B2	W
H	Edwardian England: the later work of R Norman Shaw; and of J Belcher, J Joass, Mewes and Davis, J Burnet, Lancaster and Rickards, the early LCC, Smith and Brewer, Adams and Holden; the writings of Geoffrey Scott	18	1	2d	B2	W
H	Sir Edwin Luteyns: career and works: country houses, Cenotaph, Liverpool Cathedral, New Delhi	18	1	2d	B2	W
H	Frank Lloyd Wright: early Chicago houses from Oal Park to Robie House; Buffalo: Martin House and Larkin Building and Unity Church, Chicago	18	1	2d	B2	W
H	German industrial architecture, the Werkstatte and the Deutscher Werkbund; the work of H. Poelzig, Peter Behrens, Walter Gropius and H. Muthesius	18	1	2d	B2	W
H	France: 1625-1800: Francoice Mansart; Le Vau; works in the reign of Louis XIV; J. H. Mansart; changes in interior design; Gabriel; Soufflot; Ledoux and Boullee; the Revolution	18	2	2d	B2	W
H	Other locations 1400-1800: Russia, Rastrelli in St Petersburg: Mosques; Taj Mahal; Colonial architecture in North America	18	2	2d	B2	W

H	Central Europe: 1500-1800: Wooden Churches; the Dientzenhofers; Von Erlach and Hildebrandt in Vienna; Prandtauer; early 18th century work; church interiors; Neumann and Thumb	18	2	2d	B2	W
H	England 18th century: Neo-Palladianism; Campbell, Burlington and Kent; The Woods at Bath; Strawberry Hill; James Stuart, Robert Adam; the 'Picturesque'	18	2	2d	B2	W
H	England, the 16th century: influence on English architecture; materials used for building; castles and defence; characteristics of manor house design	18	2	2d	B2	W
H	England: 1600-1680: Conditions in the country; Inigo Jones; Webb and Pratt; the Civil War; Christopher Wren, early works and London Churches	18	2	2d	B2	W
H	England: 1680-1720: Christopher wren, later works; Talman; English Baroque; Vanburgh; Hawlsmoor, early 18th century churches; James Gibbs	18	2	2d	B2	W
H	France: 1500-1625: Chateaux in the Loire Vallry; Lescot; de l'Orme and Bullant; works in the reign of Henry IV; the development of Paris; the rise of French classicism; Lemercier	18	2	2d	B2	W
H	Italy, the 16th century (Cinquecento): Bramante, Peruzzi and da Sangallo the younger; Mannerism, Guilio Romano; Michelangelo; Vignola; Sansovino and Palladio in Venice	18	2	2d	B2	W
H	Italy, the 17th and 18th centuries: Baroque art; Bernini, Borromini and da Cortana; Longhena in Venice; Guarini; Juvarra	18	2	2d	B2	W
H	Italy; the 15th century (Quattrocento): Written works; the Orders; Florence; Brunelleschi; Alberti and da Sangallo; works in Rome	18	2	2d	B2	W
H	Spain and Portugal: 1500-1800: early history of the Iberian; the Plateresque; the Herreran style; church design in Portugal; Churrigueresque style in Spain	18	2	2d	B2	W
H	The Netherlands: 1500-1800: the Dutch canal house; Antwerp Town Hall; De Key in Haarlem 2nd De keyser in Amsterdam; Dutch painting in the 'Golden Age'; Van Campen; Marot and Viervant	18	2	2d	B2	W
H	Le Corbusier: early works up to 1920. architect, town planner, artist and polemical writer	18	2	2d	B2	W
H	English Architecture 1920-1960. Connell, Ward and Lucas, the influence of European immigrant architects and the post-war years, the New Towns and school building	18	2	2d	B2	W
H	Modernism and its origins, a consideration of changing attitudes to Architecture around the First World War, also as seen in music, literature, painting and politics	18	2	2d	B2	W
H	Architecture of iron: bridges, railway stations; conservatories; Joseph Paxton and the 'Crystal Palace'; the French contribution	18	4	2d	B2	W
H	End of century:' Sweetness and light': free style; Queen Anne revival; J J Stevenson, E. W. Godwin, Aesthetic Movement; Richard Norman Shaw	18	4	2d	B2	W
H	Regency architecture : c1800-1820, including the works of James Wyatt, John Soane, J Papworth, H. W. Inwood and G Basevi, John Nash and the development of Regent Street London	18	4	2d	B2	W
H	Modern architecture and allied thought in Europe and the United States by way of calling attention to exemplary buildings and texts	20	4	2d	B2	W
H	Origins and Meanings of the Ancient City	28	1	2d	B2	W
H	Architecture of Rome	28	1	2d	B2	W
H	Development of the Greek temple and the classical orders	28	1	2d	B2	W

H	Etruscan and Archaic Roman Architecture	28	1	2d	B2	W
H	Roman construction methods	28	1	2d	B2	W
H	The Mesopotamian city; Foundation of Architectural Representation	28	1	2d	B2	W
H	The Roman House	28	1	2d	B2	W
H	Rome and the Italian Romanesque	28	2	2d	B2	W
H	The Gothic Cathedral: A study of Charters, Amiens and Notre Dame	28	2	2d	B2	W
H	Romanesque architecture in France and England	28	2	2d	B2	W
H	The Baroque city and Palace; Versailles and Lecce	28	2	2d	B2	W
H	The imperial cities of Milan and Constantinopole: Imperium vs Sacerdotium	28	2	2d	B2	W
H	The Mannerist Villa	28	2	2d	B2	W
H	The medieval city: A study Symbolism and iconography	28	2	2d	B2	W
H	Boullee, Ledoux and Lequeu	28	2	2d	B2	W
H	Ravenna and Byzantium: Influence of Imperial Ceremonial on architecture and iconography	28	2	2d	B2	W
H	Renaissance courtly life; a study of the palace	28	2	2d	B2	W
H	Rococo and the aestheticisation of representation	28	2	2d	B2	W
H	Rome and the High Renaissance; architecture and historiography	28	2	2d	B2	W
H	The Concetto in Baroque representation	28	2	2d	B2	W
H	The ideal city and the concept of Theatre in Renaissance iconography	28	2	2d	B2	W
H	A basic understanding of the most important building types of the Victorian Era (Extended to c.1918) in the context of the stylistic/historical/religious forces which shaped and gave rise to them	35	2	2d	B2	W
H	Why study architectural history?	5	1	1	A1	H
H	What is history?	14	1	1	A1	H
H	Purposes and methodologies in architectural history	14	1	1	A1	H
H	What is history?	14	2	1	A1	H
H	'Basic literacy' in the key periods, styles, artists and artefacts of Western civilisation	35	1	1	A1	H
H	Essentials of 'basic literacy' in the key periods, styles, artists and artefacts of western civilisation	35	1	1	A1	H
H	18th and 19th century French history	1	3	1	A2	H
H	The rise of civilisation and the ascent of man	14	1	1	A2	H
H	Introduction to England in the 19th century: contrasts-'cruel habitations and heavenly mansions'; plan of the century	18	4	1	A2	H
H	Imperial Rome and the Ecumene	28	1	1	A2	H
H	Language and Myth, a study of Catal Huyuk	28	1	1	A2	H
H	The Eternal Present in Ancient Egypt	28	1	1	A2	H
H	Rediscovery of nature and antiquity in the Quattrocentro	28	2	1	A2	H
H	Prehistoric, Near eastern/Egyptian, Mediterranean, Central/North European, Asian, Chinese, American	28	1	1	A2	H
H	Crisis of humanism and the emergence of Mannerism	28	2	1	A2	H
H	Medieval Society: a study of the economic and social backgrounds	28	2	1	A2	H
H	The emergence of Christianity in late antiquity	28	2	1	A2	H
H	Constantine and Rome: Victory over Paganism and the new kingship	28	2	1	A2	H
H	Early Christian, Byzantine and Romanesque	5	1	2d	B1	H
H	Early Christian and Byzantine	15	1	2d	B1	H
H	Introduction to the Italian Renaissance: change of attitude in 'the Renaissance'; The gothic era in Italy; the re-birth of the arts; fresco paintings	18	2	2d	B1	H

H	The development of perspective theory	28	2	2d	B1	H
H	Classicism and democracy	5	2	2d	B3	H
H	Classicism and empire	5	2	2d	B3	H
H	Classicism and nationalism	5	2	2d	B3	H
H	Architecture and music	14	1	2d	B3	H
H	Architectural inscriptions	14	1	2d	B3	H
H	Cubism and the Void	28	3	2d	B3	H
H	Rationalism and the problem of abstraction	28	3	2d	B3	H
H	Romanticism and the cult of individualism	28	3	2d	B3	H
H	Surrealism; Myth and tradition in the Modern Age	28	3	2d	B3	H
H	The writing of architectural history [History of writing]	14	1	2d	B5	H
H	Historicism and technology before the Great War	14	2	2d	B5	H
H	Architecture in Scandinavia, Russia, Germany, Italy and America	18	2	2d	B5	H
H	The American city: the European tradition and the Grid iron	28	2	2d	B5	H
H	Chambers and primitive huts, 18th century and rational origins.	1	3	2a	B4	W
H	Building types as equivalent of biological species.	1	3	2a	B4	W
H	Categories of space as in served and servant spaces; the architecture of Louis Kahn.	1	3	2a	B4	W
H	Defined criteria and solutions for aspects of the environment, Christopher Alexander's "Pattern Language".	1	3	2a	B4	W
H	Lethaby, The Eagle Insurance building, Birmingham, Lethaby's theories.	1	3	2a	B4	W
H	Space and activity as unrelated phenomena; flexibility as a determinant, the architecture of Mies van der Rohe.	1	3	2a	B4	W
H	English usage of the Renaissance: Inigo Jones, Wren and Hawksmoor	4	1	2a	B4	W
H	Classicism and order	5	2	2a	B4	W
H	Classicism and rationalism	5	2	2a	B4	W
H	Constructivism and Expressionism	5	2	2a	B4	W
H	Definitions of Classicism - Classicism in Antiquity	5	2	2a	B4	W
H	Futurism and De Stijl	5	2	2a	B4	W
H	Le Corbusier and the Bauhaus	5	2	2a	B4	W
H	New Brutalism, the collapse of CIAM, and Team X	5	2	2a	B4	W
H	Nordic Classicism; 'Thirties reaction in Germany and USSR	5	2	2a	B4	W
H	Labrouste - the concept of architectural legibility	5	2	2a	B4	W
H	Late eighteenth century formalism: Soufflot to Durand	5	2	2a	B4	W
H	Le Duc and the Structural Rationalist tradition	5	2	2a	B4	W
H	The developing twentieth century position: consequence of architectural 'Truth'	5	2	2a	B4	W
H	The relationship between the nineteenth century and Post-Modernism	5	2	2a	B4	W
H	Investigating themes which have influenced c20th thought and architecture	11	2	2a	B4	W
H	Architecture and sculpture	14	1	2a	B4	W
H	Architecture and the pictorial arts	14	1	2a	B4	W
H	Form generation and the history of architecture	14	1	2a	B4	W
H	Illustration of how historical building materials , constructional methods and craftsmen and craftsmanship as well as socio-economic factors shape our environment by using vernacular architecture or "ordinary " buildings	14	1	2a	B4	W
H	Symbolic meanings in the history of architecture	14	1	2a	B4	W
H	The rise of abstraction before the Great War	14	2	2a	B4	W

H	Renaissance revival versus Pugin and ecclesiology	14	2	2a	B4	W
H	Revolutionary architects	14	2	2a	B4	W
H	Ruskin and High Victorian vocabulary	14	2	2a	B4	W
H	The Baroque and French Rationalism	14	2	2a	B4	W
H	The Ecole de Beaux Arts	14	2	2a	B4	W
H	The English free school	14	2	2a	B4	W
H	New technology, new space	14	2	2a	B4	W
H	Ashbee, Lethaby & the Craft Guilds	15	2	2a	B4	W
H	Complexity and technology: Venturi, Rogers and Foster	15	2	2a	B4	W
H	De-constructing the notion of form: Japan and the New York five	15	2	2a	B4	W
H	Forcing form, following function? Mies van der Rohe, Haring and Scharoun	15	2	2a	B4	W
H	Functionalism and flexibility: Gropius and Aalto	15	2	2a	B4	W
H	Idealism and ad hoc: Alto, Kahn, Eyck and Erskine	15	2	2a	B4	W
H	Looking forward, looking back: Van de Velde and Gaudi	15	2	2a	B4	W
H	Mastering the modern way: Le Corbusier and Wright	15	2	2a	B4	W
H	Modernity, the mystical and the monumental: Neutra, Schindler and Kahn	15	2	2a	B4	W
H	Objectivity versus the expression: Oud, Rietveld and Mendelsohn	15	2	2a	B4	W
H	Post-modernity versus the regional phenomena: Moore, Graves and Pietila	15	2	2a	B4	W
H	The Arts and Crafts movement: analysis of its sources and ideas: the work of E. S. Prior, Edgar Wood, C. H. Townsend, C. F. A. Voysey, C. R. Ashbee and W. R. Lethaby	18	1	2a	B4	W
H	America: the development of tall buildings in Chicago: the work of W. Le Baron Jenney, H. H. Richardson, Burnham and Root, Holabird and Roche, Lous Sullivan and Dankmar Adler	18	1	2a	B4	W
H	Art Nouveau: analysis of its sources and ideas: the work of V. Horta, H. Van de Velde, H. Guimard, A. Endell, C. R. Mackintosh and A. Gaudi	18	1	2a	B4	W
H	Europe: vernacular revivals, German Classicism, Beaux Arts in France, the condition of Vienna; the work of H. Berlage, A. Perret, O. Wagner, J. Olbrich, J. Hoffman, P. Behrens and A. Loos.	18	1	2a	B4	W
H	Expressionism: German Beginnings; 'Die brucke', the work of Bruno Taut, Paul Scheebart, Hans Poelzig and Erich Mendelsohn; Dutch Expressionism and the Amsterdam School, Vander Meij, Michael de Klerk and Piet Kramer	18	1	2a	B4	W
H	Italian Futurism: manifestos in art, poetry, literature, music; works of Marinetti, Carra, Russolo, Balla, Severini; architectural manifesto and work of Sant Elia and Chiattone	18	1	2a	B4	W
H	1960 onwards: New Brutalism, system building, the international style, Post-Modernism; Neo-Modernism	18	2	2a	B4	W
H	Frank Lloyd Wright and 'de Stijl'- The influence of the Wasmuth Volumes, Van Doesburg, Mondrian and Rietveld in the development of Neo-Plasticism	18	2	2a	B4	W
H	Le Corbusier: later works, from 1920: Salvation Army Hostel, Swiss Pavilion and moves towards vernacular influences (Marseilles, Ronchamps)	18	2	2a	B4	W
H	Mies van der Rohe and the growth of the International Style	18	2	2a	B4	W
H	Organic architecture and Expressionism: Mendelsohn, Scharoun, Haring, Taut, Wright, Aalto, De Klerk	18	2	2a	B4	W
H	The Bauhaus and Neue Sachlichkeit: Gropius, Meyer, Stam, Duiker	18	2	2a	B4	W

H	John Ruskin: biography; the written works, Modern Painters, Seven Lamps of Architecture; Stones of Venice; Unto this Last; Praeterita, his influence on architecture and society in the 19th century	18	4	2a	B4	W
H	The Gothic Revival: A W N Pugin; the Oxford Movement and the Cambridge Camden Society; William Butterfield, G. G. Scott, G. E. Street, Alfred Waterhouse and William Burges	18	4	2a	B4	W
H	The traditionalists: the continuation of the Classical Revival in the 19th century; Charles Barry, Elmes, Cockerell, Tite, Smirke, Burton, Hardwick etc.	18	4	2a	B4	W
H	A thematical study of architecture, drawing on a wide range of twentieth century buildings and the work of influential architects	19	1	2a	B4	W
H	The history of urban planning is evaluated with particular reference to density, grain and urban scale	19	2	2a	B4	W
H	Economic and social influences on architecture	19	2	2a	B4	W
H	Recognise key periods, names styles and concepts which form the basic language used to discuss architecture and design in the west	27	1	2a	B4	W
H	Summarise basic facts and concepts in the historical tradition and evolution of the disciplines of architecture and design	27	1	2a	B4	W
H	The Greek City: The relationship between architectural thought and Philosophy	28	1	2a	B4	W
H	Vitruvius and the Classical Language	28	1	2a	B4	W
H	Claude Perrault and the Crisis of the Classical tradition	28	2	2a	B4	W
H	Neo-classicism and the concept of origins	28	2	2a	B4	W
H	Piranesi, Fischer von Erlach and the Encyclopedic vision of architecture	28	2	2a	B4	W
H	The concept of transparency in Baroque architecture	28	2	2a	B4	W
H	Deconstruction and the question of reality	28	2	2a	B4	W
H	Fin-de-Siecle and Art Nouveau; The age of Neurosis and Narcissism	28	2	2a	B4	W
H	Le Corbusier and Alchemical Themes	28	2	2a	B4	W
H	Le Corbusier and the Phenomenology of Transparency	28	2	2a	B4	W
H	Technology and Historicism; the architecture of formalism	28	2	2a	B4	W
H	The Ecole des Beaux-Arts and Proto-Positivism	28	2	2a	B4	W
H	The industrial city and Utopia	28	2	2a	B4	W
H	The instrumentality of Architecture: the late Bauhaus and Russian Constructivism	28	2	2a	B4	W
H	The Modern City; a problem of Continuity	28	2	2a	B4	W
H	Crafts vs. technology and the Machine aesthetic	28	3	2a	B4	W
H	The growth and development of the English Town investigating the social, cultural and economic context which have gone form the urban conditions generically recognised as the English Town	35	2	2a	B4	W
H	An introductory survey of the key ideas, philosophies and sub-movements in art and history, comprising what is known as the Modern Movement, with particular emphasis on its seminal influence on 20th century architecture	35	2	2a	B4	W
H	Popper's hypothetico- deductive theory and its implications; model selection and model shifts.	1	3	3	C	H
H	The library as a building type, development of the library plan.	1	3	3	C	H
H	The museum as a building type, analysis of characteristics.	1	3	3	C	H
H	The difficulties in understanding the cultural forces that shape buildings and cities	11	1	3	C	H
H	Introducing ideas about form and incite students to look at architecture intelligently, critically and creatively	11	2	3	C	H

H	Practical function in the history of architecture	14	1	3	C	H
H	Uses and abuses of the history of architecture	14	1	3	C	H
H	The positions which purport to underpin artistic practice by using analytical aesthetics	19	2	3	C	H
H	Privatisation	1	2	?		
H	Urban reconstruction.	1	2	?		
H	The beginnings of architecture	5	1	?		
H	Crypto-classicism	5	2	?		
H	Pelicans in the Wilderness	14	2	?		
H	Mid-twentieth century	15	1	?		
H	Recent architecture	15	1	?		
H	Introduction: case study, Egypt	15	1	?		
H	Introduction: socio-technological background	15	2	?		
H	Concept of Ecstasis and the Cult Sanctuary in Ancient Greece	28	1	?		
H	The Graeco/Roman tradition of Founding Cities	28	1	?		
H	The Palace Age in Crete and Mycenae	28	1	?		
H	Abbot Suger and the symbolic of Divine Light	28	2	?		
H	Charlemagne and the Classical Renaissance	28	2	?		
H	Hermits and Monasticism	28	2	?		
H	English Gothic and the emergence of an indigenous style	28	2	?		

Table A-4: Full list of 'history of architecture' items extracted from course syllabus handbooks.

3) Architectural practice

	Single items	Sc*	Y*	Pr*	To*	Es*
P	Professionalism and negligence	4	2	1	A1	M
H	The rise of the British architectural profession	14	2	1	A1	M
P	Professionalism	15	2	1	A1	M
P	The emergence of managerialism and its rise to contemporary quasi-professional status	16	1	1	A1	M
P	The nature and history of professionalism as the basis for architectural practice	16	1	1	A1	M
P	The historical development of the architectural profession	16	2	1	A1	M
P	The role of the architect in society from a psychological standpoint	16	2	1	A1	M
H	The role of the architect, throughout history	19	2	1	A5	H
P	A brief history of building legislation, the building regulations and approved [2]documents	14	4	1	A2	H
P	Means of building production	4	2	1	A3	H
P	Structure, operation and political economy of the building industry	4	2	1	A3	H
P	The structure of the construction industry	16	2	1	A3	H
P	State how the construction industry is placed within the general economy of the country	27	2	1	A3	H
C	State how the construction industry is placed within the general economy of the country.	27	3	1	B2	H
P	The structure of central and local administration	14	4	1	A4	H
P	Research into architectural psychology	16	2	1	A4	H
P	Meaning of development, permitted development	14	4	2	B10	H
P	Structure plans and local plans	14	4	2	B10	H
P	Development control	15	2	2	B10	H
P	The planning system	15	2	2	B10	H
P	Town and Country Planning	20	2	2	B10	H
P	Aspects of building demand: Brief formulation, facilities management, feasibility studies	4	4	2	B11	H
P	Act with a concern for and sensitive response to the natural and built environment	15	1,2	2	B11	H
P	Critically evaluate issues of energy, embodied energy and energy conservation in the shaping of a project	15	1,2	2	B11	H
P	Understand qualitatively the inter-relationship between making, material and design intention within the process of construction	15	1,2	2	B11	H
P	Make decisions, within an ethical framework, in response to client and user needs and the built and natural environment	15	1,2	2	B11	H
P	"Green" issues in architecture	16	2	2	B11	H

* **Sc**: Code of the school. See Appendix 2.
Y: The item is taught in this year.
Pr: Levels of practicality; i.e. 1= General knowledge, 2= Basic & theoretical knowledge, 3= Practical knowledge.
To: Topic to which the item belongs. See Appendix 4.
Es: 'Esoteric levels'; i.e. W= Low esoteric, M= Medium esoteric, H= High esoteric.
[2] This item is considered as an item of history.

P	The architect's responsibility and liability, in law, for the adverse effects of decisions and actions that may ultimately be proven to have been made wrongfully.	1	3	3	B6,B7	W
P	Contracts of appointment, codes of conduct, fees, consultants, collateral warranties, registration acts.	1	2	3	B7	W
P	Organisation of construction sites- the roles of architect, engineer, contractor, project manager.	1	2	3	B7	W
P	Delivery of the service	4	4	3	B7	W
P	The architect's appointment and the shorter forms of construction contract	4	4	3	B7	W
P	The architect's responsibilities in the design process	4	2	3	B7	W
P	Introduction to JCT 80, IFC 84 and minor works agreement	14	4	3	B7	W
P	Liability and professional indemnity	14	4	3	B7	W
P	Specification as a contract document	14	4	3	B7	W
P	Types of contract	14	4	3	B7	W
P	Code of conduct	14	4	3	B7	W
P	Office and contract administration	15	2	3	B4	W
P	The appointment of architects and consultants	16	2	3	B7	W
P	Architect's responsibility and fees	20	2	3	B7	W
P	The profession (Understand the standards and expectations of professional practice)	27	2	3	B7	W
P	Practical exercise in job getting, confirming the appointment, planning the work, pricing for fees, dealing with warranties and appointing other consultants.	1	2	3	B7,B3	W
P	Areas of work for the architect, types of client, the strategic view of the profession.	1	2	3	B7,B3	W
P	Roles and responsibilities of architecture and QS	14	4	3	B7,B8	W
P	The building team	15	2	3	B7,B8	W
P	The importance of construction sequence, time, critical paths.	1	2	2	C1	M
P	Control of time, resources and money.	1	3	2	C1	M
P	Decision-making and project control	16	1	2	C1	M
P	Techniques of project planning	16	1	2	C1	M
P	Running a project (Become familiar with the procedures and practices involved in running a project)	27	2	2	C1	M
P	Understanding of quality, cost and time	35	1,2, 2	2	C1	M
P	Project management; design economics and management; cost planning; value management	4	4	2	C1,C2	M
P	Looking at sources of work, the appointment process, management and design process, role playing, the client/architect relationships.	1	2	2	C1,B3	M
P	Cost reporting procedures and preparation of final accounts.	1	2	2	C2	M
P	The theory and concepts of project management	16	1	2	C2,C3, C4,C5	M
P	Practice management (Appreciate the scope of work involved in running a practice)	27	2	2	C2,C3	M
P	Paper controls; regulations, local plans, regional plans, feasibility studies, traffic/environmental impact studies	5	2	2	C2,B6	M
P	The RIBA job book, planning ahead, pricing the job, tendering procedures for the architect, communication in the office, feedback and development.	1	2	2	C3,C7	M
P	Procurement	20	2	2	C4	M
P	Evaluate appropriate procurement methods	27	2	2	C4	M
C	Evaluate appropriate procurement methods.	27	3	2	C2	H
P	Procurement of construction work tendering design and build, project management.	1	2	2	C4,C5	M
P	RIBA plan of work and the building process	15	2	2	C4,C7	M

P	Procurement methods; standards forms of contract; contract administration: safety, indemnity and insurance: disputes and settlements	4	4	2	C4,B7	M
P	RIBA plan of work	14	4	2	C7	M
P	The architectural profession (RIBA plan of work)	20	2	2	C7	M
P	The RIBA plan of work	29	1,2,2	2	C7	M
P	RIBA plan of work stages and related legal and ethical obligations and responsibilities of architect to client, the profession, other members of the design team and to society	35	1,2,2	2	C7,B6,B7	M
P	Develop an understanding of the organisational management in architectural practice such as: office procedures, organisational management and post-contract activities in architectural practices, RIBA Job book (plan of work) communication methods.	28	2	3	B2,B3,B7,B8	M
P	Procedures and techniques in architectural practice	4	4	3	B4	M
P	Office structure and working techniques	14	4	3	B4	M
P	General practice organisation	15	2	3	B4	M
P	The working environment [of practice]	15	2	3	B4	M
P	Office and contract administration	15	2	3	B4	W
P	Forms of practice	16	2	3	B4	M
C	Introduction to architectural working practice.	18	5	3	B4	M
P	Develop an awareness of office practice and procedures	29	1,2,2	3	B4	M
P	Legal controls affecting development and design	4	2	3	B6	M
P	Land law, including boundaries, easements, property and premises; the law of tort, in particular nuisance; building and development control legislation	4	2	3	B6	M
P	Construction contract law	4	4	3	B6	M
P	Current legal issues of importance to the profession	4	4	3	B6	M
P	Law of agency and the architect's appointment	14	4	3	B6	M
P	Laws of tort and contract	14	4	3	B6	M
P	Basic legal principles, criminal law, civil law, law of contract, law of property, in particular law relating to land and buildings, rights of owners, the legal profession	20	2	3	B6	M
P	Demonstrate an understanding of contract law	27	2	3	B6	M
C	Demonstrate an understanding of contract law.	27	3	3	B6	M
P	Contractors and subcontractors.	1	2	3	B8	M
P	The participants in the project.	1	3	3	B8	M
P	The players in the game; clients, financiers, developers, planners amenity groups, builders, contractors, building control officers, safety people	5	2	3	B8	M
P	Corporate management.	1	3	3	B1	M
P	Management control.	1	3	3	B1	M
P	Context of management; architects' culture	4	4	3	B1	M
P	Aspects of management: self management, interpersonal relations, working in teams, business management	4	4	3	B1	M
P	Communication and meetings	14	4	3	B1	M
P	Communications	15	2	3	B1	M
P	Design team working	15	2	3	B1	M
P	Contribute to the planning and co-ordination of a Group's work	15	1,2	3	B1	M
P	Establish a good rapport with others and work effectively with them to meet an object	15	1,2	3	B1	M
P	Recognise and respect the attitudes, actions and beliefs of the other members of the group	15	1,2	3	B1	M
P	Document and achieve requirements within a programme both as an individual and within a group	15	1,2	3	B1	M
P	Managing yourself and others	15	2	3	B1	M

P	Manage personal time effectively and handle a range of activities simultaneously	15	1,2	3	B1	M
P	Set achievable targets within a long-term strategy	15	1,2	3	B1	M
P	Methods of communication	16	2	3	B1	M
P	Realities of project teamwork and leadership	16	1	3	B1	M
P	Develop an understanding of the management of the value of "Human resource management" (H.R.M) in the practice of architecture such as: managing individuals in organisation, managing groups in organisation and leadership.	28	2	3	B1	M
P	Develop personal and social management skills such as: motivation, time management, project management and "change" management.	28	2	3	B1	M
P	Understanding of management processes	35	1,2, 2	3	B1	M
P	Tendering documentation	14	4	2	C3	H
P	Tendering procedure	14	4	2	C3	H
P	Client relations (Understand the need to satisfy the client demands through effective communications at all stages)	27	2	2	C5	H
P	Planning consent, planning fees and appeals and related legislation	14	4	2	C6	H
P	Explain the procedures to be followed for compliance with planning and building control regulations	27	2	2	C6	H
C	Explain the procedures to be followed for compliance with planning and building control regulations.	27	3	2	C6	H
P	Research methods, report writing and communication	4	4	2	C8	H
P	Certificates and instructions	15	2	2	C8	H
P	Financial management	16	2	3	B2	H
P	Marketing.	1	2	3	B3	H
P	The business system and the market, project and enterprise.	1	3	3	B3	H
P	Client alternatives	20	2	3	B3	H
P	Quality and assurance and marketing	14	4	3	B5,B3	H
P	The form and nature of contractual and non-contractual relations in construction	4	4	3	B11	H
P	Energising creativity and productivity	14	4	3	B11	H
P	Post-contract procedures	14	4	3	B11	H
P	Performance bonds	14	4	3	B11	H
P	Preliminaries	14	4	3	B11	H
P	Roles of building and design teams	20	2	3	B11	H
P	Describe the components and organisational structures and their relationships	27	2	3	B11	H
P	Understanding of the context in which architects work	29	1,2, 2	3	B11	H
P	Methods of seeking architectural employment	16	2	3	B9	H
P	Writing CVs	16	2	3	B9	H
P	Making a job application and attending an interview	29	1,2, 2	3	B9	H
P	Team building.	1	3	?		
P	Efficiency of design	14	4	?		
P	Prioritise targets	15	1,2	?		
P	Experience the process by which designs are implemented	29	1,2, 2	?		
P	Semiology and architecture	16	2	NA		

Table A-5: Full list of 'architectural practice' items extracted from course syllabus handbooks.

Appendix 4: Summary of topics in course syllabuses

1)Construction and Materials

Pr*	To*	Description of topics	1@	4	5	11	14	15	16	18	19	20	27	28	29	35	T+	ST+	E
1	A1	**Introduction to building, construction and materials**	3	1	0	0	2	3	1	1	0	1	1	1	0	0	14	**9**	**L**
1	A2	**History and development of main building materials**	2	0	1	0	1	1	0	2	0	0	0	0	0	0	7	**5**	**M**
1	A3	**Manufacturing of building materials**	0	0	0	0	1	0	0	4	0	0	0	0	0	0	5	**2**	**H**
1	A4	**Others**	1	0	4	0	1	1	0	0	0	0	0	0	0	0	7	**4**	**H**
2	B1	**Construction of exterior elements**	5	4	11	0	1	5	0	11	0	1	0	11	3	1	53	**10**	**L**
2	B2	**Construction of interior elements**	4	7	4	0	0	2	0	2	0	0	0	2	1	1	23	**8**	**M**
2	B3	**Common constructional systems**	9	5	6	0	1	2	1	9	0	4	0	4	2	4	47	**11**	**L**
2	B4	**Complex constructional systems**	1	1	0	0	0	0	0	2	0	1	0	0	0	0	5	**4**	**H**
2	B5	**Properties of common building materials**	9	1	7	0	1	4	1	3	0	3	0	4	5	0	38	**10**	**L**
2	B6	**Properties of uncommon building materials**	0	0	1	0	0	0	0	1	0	1	0	1	0	0	4	**4**	**H**
2	B7	**Material problems**	0	0	0	0	0	0	0	1	0	1	0	2	0	0	4	**3**	**H**
2	B8	**Process of construction**	0	0	1	0	3	0	1	0	0	0	0	1	0	1	7	**5**	**M**
2	B9	**Traditional construction**	0	0	0	0	0	0	0	0	0	1	0	0	1	0	2	**2**	**H**
2	B10	**Building conservation**	0	1	0	0	0	0	0	0	0	1	0	0	0	0	2	**2**	**H**
2	B11	**Others**	1	0	0	0	0	6	0	1	1	0	0	0	2	0	11	**5**	**M**
3	C1	**General introduction to detailing**	1	0	1	0	1	1	0	1	0	0	1	0	0	2	8	**7**	**M**
3	C2	**Designing and detailing building elements**	5	11	2	0	0	6	1	11	0	6	0	3	2	0	47	**9**	**L**
3	C3	**Cost estimates (planning, exercise)**	5	2	0	0	6	3	0	0	0	1	2	0	0	0	19	**6**	**M**
3	C4	**Regulation requirements**	0	1	1	1	1	7	1	3	0	1	0	2	0	0	18	**9**	**L**
3	C5	**Specification**	0	2	0	1	1	0	0	1	0	0	3	0	0	1	9	**6**	**M**
3	C6	**Fire protection**	1	1	0	0	1	0	0	0	0	0	1	1	0	0	5	**5**	**M**
3	C7	**Health and safety issues**	0	1	0	0	0	1	0	0	0	0	2	0	0	0	4	**3**	**H**
3	C8	**Bills of quantities**	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2	**1**	**H**
3	C9	**Existing building and failures**	0	1	0	0	1	0	0	0	0	2	0	0	0	0	4	**3**	**H**
3	C10	**Others**	0	2	0	0	2	2	2	0	0	0	4	0	0	3	16	**6**	**M**
3s	D1	**Elements and materials in site**	1	1	4	0	1	0	0	2	0	0	0	0	1	0	10	**6**	**M**
3s	D2	**Site analysis and establishment**	0	1	0	0	0	1	0	1	0	1	2	0	0	0	6	**5**	**M**
3s	D3	**Surveying**	0	0	1	0	0	0	0	0	0	1	0	0	0	0	2	**2**	**H**
3s	D4	**Others**	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	**1**	**H**

Table A-6: A list of topics in construction syllabuses together with the number of times they have been seen in the handbooks of different schools.

---

* **Pr**: Levels of practicality; i.e. 1= General knowledge, 2= Basic & theoretical knowledge, 3= Practical knowledge (S= site knowledge).

To: Topic to which the item belongs.

@ Numbers indicate the code of the school. See Appendix 2.

+ **T**: Total number of items the topic is seen in course syllabuses.

ST: Total number of schools in which the topic is seen in their course syllabuses.

E: Esoteric levels of topics i.e. H= High esoteric, M= Medium esoteric, L= Low esoteric.

2) History of Architecture

Pr	**To**	**Description of topics**	**1@**	**4**	**5**	**11**	**14**	**15**	**16**	**18**	**19**	**20**	**27**	**28**	**29**	**35**	**T+**	**ST+**	**E**
1	A1	**Introductory**	0	0	1	0	3	0	0	0	0	0	0	0	0	2	6	**3**	**H**
1	A2	**Pure history**	1	0	0	0	1	0	0	1	0	0	0	9	0	0	12	**4**	**H**
2d	B1	**History of art**	0	0	1	0	0	1	0	1	0	0	0	1	0	0	4	**4**	**H**
2d	B2	**History of architecture**	6	8	15	0	9	17	0	23	0	1	0	21	0	1	101	**9**	**L**
2d	B3	**Abstract issues**	0	0	3	0	2	0	0	0	0	0	0	4	0	0	9	**3**	**H**
2a	B4	**Architectural theories and styles**	6	1	13	1	13	11	0	15	3	0	2	16	0	2	83	**11**	**L**
2	B5	**Others**	0	0	0	0	2	0	0	1	0	0	0	1	0	0	4	**3**	**H**
3	C	**Practical function of history of architecture**	3	0	0	2	2	0	0	0	1	0	0	0	0	0	8	**4**	**H**

Table A-7: A list of topics in history syllabuses together with the number of times they have been seen in the handbooks of different schools.

---

* **Pr**: Levels of practicality i.e. 1= General knowledge, 2= Basic & theoretical knowledge, 3= Practical knowledge (S= site knowledge).

To: Topic to which the item belongs.

@ Numbers indicate the code of the school. See Appendix 2.

\+ **T**: Total number of times the topic is seen in course syllabuses.

ST: Total number of schools in which the topic is seen in their course syllabuses.

E: Esoteric levels of topics i.e. H= High esoteric, M= Medium esoteric, L= Low esoteric.

3) Architectural Practice

Pr	To*	Description of topics	1@	4	5	11	14	15	16	18	19	20	27	28	29	35	T+	ST	E
1	A1	**History of professionalism and architectural practice**	0	1	0	0	1	1	4	0	1	0	0	0	0	0	8	**5**	**M**
1	A2	**History of building regulations**	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	**1**	**H**
1	A3	**Introduction to production and building industry**	0	2	0	0	0	0	1	0	0	0	2	0	0	0	5	**3**	**H**
1	A4	**Others**	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	**1**	**H**
2	B1	**Team work, managing yourself, leadership and managing others**	2	2	0	0	1	9	2	0	0	0	0	2	0	1	19	**7**	**M**
2	B2	**Financial Management**	0	0	0	0	0	0	1	0	0	0	0	1	0	0	2	**2**	**H**
2	B3	**Marketing**	5	0	0	0	1	0	0	0	0	1	0	1	0	0	8	**4**	**H**
2	B4	**Forms of practice and office organisation**	0	1	0	0	1	3	1	1	0	0	0	0	1	0	8	**6**	**M**
2	B5	**Quality Assurance**	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	**1**	**H**
2	B6	**Legal principles**	1	4	1	0	2	0	0	0	0	1	2	0	0	1	12	**7**	**M**
2	B7	**Architects' responsibility, appointment, contract & services**	5	4	0	0	6	1	1	0	0	1	1	1	0	1	21	**9**	**L**
2	B8	**Others' responsibilities**	2	0	1	0	1	1	0	0	0	0	0	1	0	0	6	**5**	**M**
2	B9	**Architectural employment**	0	0	0	0	0	0	2	0	0	0	0	0	1	0	3	**2**	**H**
2	B10	**Planning & development system**	0	0	0	0	2	2	0	0	0	1	0	0	0	0	5	**3**	**H**
2	B11	**Others**	0	1	0	0	4	2	1	0	0	1	1	0	1	0	11	**7**	**M**
3	C1	**Project planning and control**	3	1	0	0	0	0	2	0	0	0	1	0	0	1	8	**5**	**M**
3	C2	**Cost planning and control**	1	1	1	0	0	0	1	0	0	0	1	0	0	0	5	**5**	**M**
3	C3	**Tendering**	1	0	0	0	2	0	1	0	0	0	1	0	0	0	5	**4**	**H**
3	C4	**Procurement (building process)**	1	1	0	0	0	1	1	0	0	1	2	0	0	0	7	**6**	**M**
3	C5	**Client relations**	1	0	0	0	0	0	1	0	0	0	1	0	0	0	3	**3**	**H**
3	C6	**Compliance with planning and building regulations**	0	0	0	0	1	0	0	0	0	0	2	0	0	0	3	**2**	**H**
3	C7	**RIBA (plan of work)**	1	0	0	0	1	1	0	0	0	1	0	0	1	1	6	**6**	**M**
3	C8	**Others**	0	1	0	0	0	1	0	0	0	0	0	0	0	0	2	**2**	**H**

Table A-8: A list of topics in architectural practice syllabuses together with the number of times they have been seen in the handbooks of different schools.

* **Pr**: Levels of practicality i.e. 1= General knowledge, 2= Basic & theoretical knowledge, 3= Practical knowledge (S= site knowledge).

To: Topic to which the item belongs.

@ Numbers indicate the code of the school. See Appendix 2.

\+ **T**: Total number of times the topic is seen in course syllabuses.

ST: Total number of schools in which the topic is seen in their course syllabuses.

E: Esoteric levels of topics i.e. H= High esoteric, M= Medium esoteric, L= Low esoteric.

Appendix 5: A sample of the questionnaire

UNIVERSITY OF MANCHESTER
Postgraduate Department

SCHOOL OF ARCHITECTURE
Oxford Road
Manchester M13 9PL
Tel: 0161 275 6921/6934
Fax: 0161 275 6935

Dear Architect,

As part of my research in the School of Architecture, I am conducting a survey on attitudes to the knowledge requirements for architects. The survey seeks to compare different views about what knowledge should be taught in schools of architecture.

I am aware you are a busy professional and it is a liberty on my part to ask you to complete this unsolicited questionnaire. However it should take about 10 minutes and your responses will be valuable. Please answer the questions according to your own opinions. Your answers will be confidential and only summary results will be used.

Your patience and participation are much appreciated.

Yours faithfully,

A. Alai, Ph.D. student

Part I: I would like to have some information about yourself. Please fill or circle the appropriate boxes.

1. Age:	(20-30) (30-40) (40-50) (50-60) (60+)
2. Sex:	(M) (F)
3. How long since you graduated?	( ) years
4. Where did you study architecture?	....
5. Do you also teach in a school of architecture?	(Yes) (No)
6. How big is the firm you are working for?	(1-2) (3-5) (6-14) (15-30) (30+) architects
7. What was your previous activity?	....

Part II: I am interested to know your ideas about the general level of architectural teaching in three areas at present. Please circle the appropriate number to indicate your answer according to the following scale:

[1] STRONGLY DISAGREE   [2] DISAGREE   [3] NEITHER AGREE NOR DISAGREE   [4] AGREE   [5] STRONGLY AGREE

Architectural graduates are taught enough about:

H	1. History of Architecture.	[1] [2] [3] [4] [5]
C	2. Construction and materials.	[1] [2] [3] [4] [5]
P	3. Architectural practice.	[1] [2] [3] [4] [5]

(Please turn over...)

Knowledge Requirements in Architecture: A Survey of Attitudes

Part III: I would like to know your ideas about the kinds of knowledge which architectural students need to be taught in schools. Please circle the appropriate number to indicate your answer according to the following scale:

[1] STRONGLY DISAGREE [2] DISAGREE [3] NEITHER AGREE NOR DISAGREE [4] AGREE [5] STRONGLY AGREE

Code[1]		Architectural students need to be taught about:	
C2W1	1.	Cladding systems .	[1] [2] [3] [4] [5]
P1H1	2.	The structure of the construction industry .	[1] [2] [3] [4] [5]
H2W1a	3.	Venturi, Rogers and Foster's idea of complexity and technology.	[1] [2] [3] [4] [5]
C3W1	4.	Designing and detailing masonry walls .	[1] [2] [3] [4] [5]
P3M1	5.	Evaluation of appropriate procurement methods .	[1] [2] [3] [4] [5]
H3H1	6.	Understanding the cultural forces that shape buildings.	[1] [2] [3] [4] [5]
C1M1	7.	The historical developments of iron and steel.	[1] [2] [3] [4] [5]
C3M1	8.	Fire protection with regard to internal finishes .	[1] [2] [3] [4] [5]
C2H1	9.	Timber infestation.	[1] [2] [3] [4] [5]
H1M1	10.	The work of some twentieth century engineers .	[1] [2] [3] [4] [5]
P1M1	11.	The historical development of the architectural profession .	[1] [2] [3] [4] [5]
C1W1	12.	What is construction and why study it?	[1] [2] [3] [4] [5]
P2H1	13.	Office financial management.	[1] [2] [3] [4] [5]
H2W2a	14.	The style of Baroque and French Rationalism.	[1] [2] [3] [4] [5]
C2M1	15.	Construction of internal walls and partitions.	[1] [2] [3] [4] [5]
P3H1	16.	Handling client relations.	[1] [2] [3] [4] [5]
H1H1	17.	Why we study architectural history and what is history.	[1] [2] [3] [4] [5]
C3M2	18.	Methods of estimating building cost .	[1] [2] [3] [4] [5]
C3H1	19.	Building failures.	[1] [2] [3] [4] [5]
C3H2	20.	Health and Safety issues.	[1] [2] [3] [4] [5]
P2W1	21.	The architect's responsibilities and liabilities .	[1] [2] [3] [4] [5]
C2W2	22.	Properties of common building materials.	[1] [2] [3] [4] [5]
C2H2	23.	Properties of less-common building materials, such as plastics .	[1] [2] [3] [4] [5]
C3M3s	24.	Site investigation and site analysis.	[1] [2] [3] [4] [5]
P2M1	25.	Construction contract law .	[1] [2] [3] [4] [5]
C3M4s	26.	Fabrication and assembly of steel frames.	[1] [2] [3] [4] [5]
H1H2	27.	General cultural history.	[1] [2] [3] [4] [5]
C2M2	28.	Construction sequence.	[1] [2] [3] [4] [5]
P2M2	29.	Social management skills.	[1] [2] [3] [4] [5]
C2H3	30.	Traditional construction methods.	[1] [2] [3] [4] [5]
H2H1a	31.	Architecture and politics.	[1] [2] [3] [4] [5]
C1H1	32.	Manufacturing process of bricks.	[1] [2] [3] [4] [5]
P2H2	33.	Marketing their services.	[1] [2] [3] [4] [5]
C3W2	34.	Designing and detailing joints at the junction of roofs and walls.	[1] [2] [3] [4] [5]
		Architectural students need to be shown what:	
H2W3d	35.	Palladian architecture looks like.	[1] [2] [3] [4] [5]
H2W4d	36.	Victorian architecture looks like.	[1] [2] [3] [4] [5]
H2W5d	37.	A Frank Lloyd Wright Chicago house looks like.	[1] [2] [3] [4] [5]

Thank you again for your trouble.

If you would like to have a summary of the results please write your name and address below.

....

[1] This column was hidden from respondents.

Appendix 6: Summary of responses

1) Means of responses to the adequacy of teaching subjects. Means of responses separated by subjects and different groups of respondents are represented in Table A-9.

No.	Year 1	Year 3	Year 5/6	Teachers	Heads	Junior A.	Senior A.	Principals	Total
History	3.74	3.72	3.54	3.10	4.00	3.53	3.15	3.00	3.41
Construction	3.59	2.98	2.69	2.47	3.29	2.37	2.25	2.39	2.72
Architectural practice	2.80	2.41	2.55	2.67	2.71	2.53	1.96	2.23	2.46
Total	3.38	3.04	2.93	2.75	3.33	2.81	2.45	2.54	

Table A-9: Means of responses to the adequacy of teaching selected subjects.

2) Means of responses to the necessity for teaching certain subjects. Means of responses separated by subjects and different groups of respondents are presented in Table A-10.

No.	Year 1	Year 3	Year 5/6	Teachers	Heads	Junior A.	Senior A.	Principals	Total
History	3.59	3.49	3.43	3.82	3.86	3.59	3.50	3.43	3.55
Construction	3.66	3.62	3.56	3.74	3.70	3.48	3.62	3.77	3.65
Architectural practice	3.68	3.38	3.70	3.62	3.79	3.76	3.89	3.75	3.66
Total	3.64	3.52	3.56	3.73	3.77	3.58	3.66	3.67	

Table A-10: Means of responses to the necessity for teaching selected subjects.

3) Means of responses to the necessity for teaching selected items. Means of responses separated by subjects and different groups of respondents are presented in Table A-11.

No.	Code	Year 1	Year 3	Year 5/6	Teachers	Heads	Junior A.	Senior A.	Principals	Total
1	c2w1	3.61	3.54	3.49	3.59	3.86	3.37	3.48	3.52	3.53
2	p1h1	3.85	3.51	3.59	3.66	3.86	3.73	4.06	3.65	3.70
3	h2w1a	3.39	3.37	3.09	3.36	3.57	3.23	3.12	3.09	3.24
4	c3w1	3.52	3.66	3.41	3.84	4.00	3.63	3.86	4.03	3.71
5	p3m1	3.38	3.29	3.65	3.62	3.86	4.03	3.98	3.80	3.63
6	h3h1	4.03	4.11	4.03	4.31	4.29	4.00	3.94	3.90	4.06
7	c1m1	3.61	2.90	2.90	3.24	3.29	2.73	3.00	3.07	2.97
8	c3m1	3.85	3.54	3.50	3.54	3.71	3.07	3.54	3.86	3.58
9	c2h1	3.39	3.16	3.06	3.07	3.14	2.86	3.08	3.42	3.15
10	h1m1	3.52	3.56	3.68	3.66	3.71	3.60	3.67	3.52	3.63
11	p1m1	3.38	3.13	3.11	3.62	3.57	3.10	3.23	3.13	3.26
12	c1w1	4.03	3.59	3.65	4.12	3.67	3.60	3.47	3.64	3.70
13	p2h1	2.77	3.10	3.57	3.36	3.14	3.59	3.67	3.63	3.43
14	h2w2a	3.70	2.93	2.80	3.20	3.29	3.03	2.83	2.56	2.90
15	c2m1	3.25	3.67	3.53	3.74	3.71	3.43	3.53	3.82	3.66
16	p3h1	3.70	3.58	3.84	3.62	3.86	3.76	4.13	3.97	3.83
17	h1h1	3.38	3.46	3.61	4.11	3.71	3.69	3.52	3.65	3.66
18	c3m2	3.69	3.51	3.65	3.64	3.43	3.67	3.67	3.70	3.64
19	c3h1	3.28	3.90	3.99	3.97	3.71	4.00	4.04	4.13	4.00
20	c3h2	2.95	3.66	3.80	3.86	3.86	3.47	3.94	4.07	3.85
21	p2w1	3.74	3.89	4.16	4.12	4.00	4.33	4.41	4.46	4.20
22	c2w2	4.05	3.91	3.85	4.19	4.00	3.93	4.02	4.18	4.01
23	c2h2	3.69	3.59	3.60	3.77	3.43	3.47	3.46	3.76	3.64
24	c3m3s	4.11	4.20	4.04	4.14	4.57	3.83	4.13	4.08	4.11
25	p2m1	3.61	3.34	4.03	3.66	3.86	4.03	4.12	4.08	3.80
26	c3m4s	3.69	3.80	3.73	3.59	3.71	3.63	3.38	3.55	3.64
27	h1h2	3.33	3.39	3.45	3.89	3.71	3.40	3.12	3.17	3.41
28	c2m2	3.85	3.83	3.69	3.96	3.86	3.97	4.02	3.97	3.88
29	p2m2	3.70	3.22	3.60	3.50	3.86	3.23	3.50	3.37	3.46
30	c2h3	3.75	3.76	3.64	3.97	4.00	3.83	3.98	4.09	3.85
31	h2h1a	3.49	3.28	3.47	3.62	3.43	3.38	3.21	3.03	3.36
32	c1h1	2.87	2.65	2.56	2.84	2.71	2.30	2.62	2.79	2.69
33	p2h2	3.64	3.33	3.71	3.42	4.14	4.03	3.90	3.65	3.63
34	c3w2	3.77	4.22	4.04	4.22	4.00	3.87	3.98	4.19	4.07
35	h2w3d	3.72	3.55	3.33	3.97	4.29	3.76	3.88	3.75	3.70
36	h2w4d	3.77	3.53	3.31	4.00	4.29	3.75	3.88	3.77	3.70
37	h2w5d	3.89	3.69	3.58	4.03	4.29	4.03	3.87	3.84	3.82

Table A-11: Means of responses to the necessity for teaching selected items.

Appendix 7: Statistical differences

1) Responses to the 'adequacy' questions

Table A-12 represents the statistical differences concerning each two groups of respondents about the adequacy of teaching certain subjects. It also locates the points of difference.

GR*	Chi-square	P	S@	Location of difference $\alpha<0.05$
1&2	7.485	0.025	S	construction
1&3	16.489	0.000	S	construction
1&4	31.575	0.000	S	history and construction
1&5	1781.5**	0.548	NS	-
1&6	12.8	0.002	S	construction
1&7	50.334	0.000	S	history, construction and arch. practice
1&8	49.682	0.000	S	history, construction and arch. practice
2&3	3.323	0.19	?	construction (k^2= 13.104, p=0.001)
2&4	10.697	0.005	S	history and construction
2&5	2086.5**	0.1	NS	-
2&6	2.392	0.302	?	construction (k^2= 9.568, p=0.008)
2&7	27.097	0.000	S	history, construction and arch. practice
2&8	24.065	0.000	S	history, construction and arch. practice
3&4	5.927	0.52	?	history (k^2= 9.887, p=0.007)
3&5	1888**	0.04	?	in total
3&6	1.381	0.501	NS	-
3&7	13.764	0.001	S	history, construction and arch. practice
3&8	13.56	0.001	S	history and construction
4&5	1491.5**	0.004	S	history and construction
4&6	0.839	0.657	?	history (k^2= 6.592, p=0.037)
4&7	7.72	0.02	S	architectural practice
4&8	3.154	0.207	?	architectural practice(k^2= 7.141, p=0.028)
5&6	665**	0.024	S	construction
5&7	953.5**	0.000	S	history and construction
5&8	1253.5**	0.000	S	history and construction
6&7	7.881	0.019	S	architectural practice
6&8	4.949	0.084	?	history (k^2= 10.371, p=0.006)
7&8	2.431	0.297	NS	-

Table A-12: Calculation of statistical differences between responses of different groups of respondents about the adequacy of teaching selected subjects.

* **GR-** 1: year one students, 2: year three students, 3: year 5/6 students, 4: teachers. 5: heads of schools, 6: junior architects, 7: senior architects, 8: principals.

** Mann-Whitney test is applied. @ S. Significant, NS. Not significant, ?. depends on the particular conditions.

The Chi-square test is chosen here, to find differences between the responses. For the calculation of the chi-square all the responses were considered. In some cases when the number of responses was insufficient to apply the chi-square, the Mann-Whitney test was used instead. It may be seen that in some cases, such as: 2&3 or 3&4, although the Chi-square test does not show significant difference between the attitudes of the two groups of respondents, there are some differences in individual subjects. On the other hand, in some cases such as: 3&5, the Chi-square shows significant difference between the attitudes of the two groups of respondents, but no difference could be found in individual subjects. All these cases are marked by '?' in the Table.

2) Responses to the 'necessity' questions

Table A-13 represents the differences detected between each two groups of respondents concerning the 'necessity' responses.

R	Location of difference (subjects)	Location of difference (levels of practicality)
1&2	History/ Architectural practice	Basic construction/ Arch. practice
1&3	History/ Construction	Descriptive history/ General arch. practice
1&4	-	General construction
1&5	-	-
1&6	Construction	Basic construction
1&7	Architectural practice	Basic and practical arch. practice
1&8	History	Analytic history/ Practical construction
2&3	Architectural practice	Basic and practical arch. practice
2&4	History/ Construction/ Arch. practice	Descriptive history/ General construction/ General & basic arch. practice
2&5	History/ Architectural practice	Descriptive history/ Basic arch. practice
2&6	Architectural practice	Basic and practical arch. practice
2&7	Architectural practice	Descriptive history/ Basic and practical arch. practice
2&8	Construction/ Architectural practice	Analytic history/ Basic & practical construction/ Arch. practice
3&4	History/ Construction	General & basic construction/ Descriptive history/ General arch. practice
3&5	History/ Construction	Descriptive history
3&6	-	-
3&7	History/ Architectural practice	Descriptive history
3&8	Construction	Descriptive history & analytic history/ Basic & practical construction
4&5	-	-
4&6	Construction	General, basic & practical construction/ Descriptive history
4&7	History/ Construction/ Arch. practice	Gen. & analytic history/ Gen. construction/ Basic & prac. arch. practice
4&8	History	Gen. & analytic history/ Practical. construction/ Basic arch. practice
5&6	Construction	-
5&7	History	-
5&8	History	Descriptive and analytic history
6&7	-	Descriptive history
6&8	Construction	Analytic history/ Basic & practical construction
7&8	Construction/ Architectural practice	Basic construction

Table A-13: Differences between different groups of respondents concerning the necessity for teaching selected subjects. Differences are based on statistical analysis at significant level of less than 0.01.

Table A-14 represents the statistical differences between each two groups of respondents concerning the 'necessity' responses. Points of difference are also located by examining individual items in the questionnaire. See Table 4-7 for a list of items.

GR*	Chi-square	P	S	Location of difference $a<0.05$
1&2	31.053	0.000	S	h2w1a, c2w1, c3h2, c3w2, p2h2, p1m1, p2m2, p3h1
1&3	30.787	0.000	S	h1h2, h2w1a, h2w3d, h2w4d, c3w1, p2m1, p3m1
1&4	5.64	0.064	?	h1h1, h1h2, c1m1, c1w1, c3m1, c3w1, p2h2, p3h1
1&5	17.087	0.000	?	Found no difference in 37 individual items (by Mann-Whitney or Fisher's exact test)
1&6	18.354	0.000	S	c1h1, c3w1, c3h2, c3m1, p3m1, p2m1
1&7	2.52	0.284	?	h2w1a, c2w1, c3m4s, p2h2, p2m1, p3m1
1&8	2.369	0.306	?	h2h1a, h2w1a, h2w2a, c1m1, c3w1, p1m1, p2m1, p2m2
2&3	14.091	0.001	S	c2m1, p2h1, p2h2, p2m1, p2m2, p3m1
2&4	61.658	0.000	S	h1h1, h1h2, h2w4d, h2w5d, c1m1, c1w1, p1m1, p2m1, p3m1
2&5	34.388	0.000	S	Differences in just p2h2 and p3m1 (by Mann-Whitney or fisher's exact test)
2&6	9.953	0.007	S	c3m1, c3w2, p2h1, p2h2, p2m1, p3m1
2&7	23.547	0.000	S	h2w5d, c3h2, c3m4s, p3m1, p1h1, p2h1, p2h2, p2m1, p2m2, p2w1
2&8	38.076	0.000	S	h1h1, h2w2a, c1m1, c2w1, c3h1, c3h2, c3m1, c3m4s, c3w1, p2h1, p2h2, p2m1, p2w1, p3h1, p3m1
3&4	43.898	0.000	S	h1h2, h2w3d, h2w4d, h2w5d, c1w1, c2m1, c3w1, p1m1
3&5	22.786	0.000	S	Differences in h2w4d, h2w3d and c3m3s (by Mann-Whitney or Fisher's exact test)
3&6	0.233	0.89	NS	h1h2
3&7	15.251	0.000	S	h1h2, h2w3d, h2w4d, h2w5d, c2h3, c3m4s, c3w1, p1h1, p3m1
3&8	26.12	0.000	S	h1h2, h2h1a, h2w2a, h2w3d, h2w4d, c2h1, c2m1, c2w1, c2w2, c3h2, c3m1, c3w1, p2m2
4&5	10.159	0.006	S	Differences in just p2h2 (by Mann-Whitney or Fisher's exact test)
4&6	24.189	0.000	S	h1h2, h2w3d, c1h1, c1m1, c2m1, c3m1, p2h2
4&7	5.089	0.079	?	h1h1, h1h2, h2h1a, h2w2a, c1w1, p1m1, p2h2, p2m1, p3m1
4&8	2.533	0.282	?	h1h1, h1h2, h2h1a, h2w2a, c1w1, c3m1, p1m1, p2m1 (no difference between solo prc. and others)
5&6	18.747	0.000	S	Differences in just c3m3s (by Mann-Whitney or fisher's exact test)
5&7	14.98	0.001	S	Differences in h2w2, p2h1 and p2w1 (by Mann-Whitney or fisher's exact test)
5&8	13.533	0.001	S	Differences in just h2w2a (by Mann-Whitney or Fisher's exact test)
6&7	8.791	0.012	S	h2w2a, h2w3d, h2w4d, c3h2
6&8	14.118	0.001	S	h2w2a, c1h1, c2h1, c2m1, c2w1, c3h2, c3m1
7&8	0.616	0.735	?	h1h1, c2h1, c2w1, c3m1, p3m1 (there are differences between sole prctitioners and other principals)

Table A-14: Calculation of statistical differences between responses of different groups of respondents concerning the necessity for teaching selected subjects. 37 questions are involved in this analysis.

* **GR-** 1: year one students, 2: year three students, 3: year 5/6 students, 4: teachers. 5: heads of schools, 6: junior architects, 7: senior architects, 8: principals.

@ S. Significant, NS. Not significant, ?. depends on the particular conditions.

The Chi-square test is chosen here, to find differences between the responses. For the calculation of the Chi-square, all the responses were considered. In some cases, where the number of responses was insufficient, the Mann-Whitney or Fisher's exact test was used instead of the Chi-square.

We can see that in some cases, such as: 1&4 or 1&7 although the chi-square does not show significant difference between the attitudes of the two groups of respondents, there are some differences in individual items. On the other hand, in some cases such as: 1&5 or 4&5, the Chi-square shows significant difference between the attitudes of two groups of respondents, but no or just a few differences are found in individual subjects.

Appendix 8: Distribution of responses (normal curve)

1) Responses to the 'adequacy' questions

	Mean	Median	Mode	Standard Deviation	Sum	Percent of cases within one standard deviation
Year 1 students	3.38	4	4	1.07	618	82.5%
Year 3 students	3.04	3	4	1.06	756	87.5%
Year 5/6 students	2.93	3	2	1.17	702	81.2%
Teachers	2.74	3	2	1.10	601	82.3%
Heads of schools	3.35	4	4	0.97	70	95.2%
Junior architects	2.81	3	2	1.12	253	82.3%
Senior architects	2.45	2	2	1.10	390	88.1%
Principals	2.54	2	2	1.14	526	94.2%

Table A-15: Statistical measures for responses to the questions about the adequacy of knowledge.

In a normal distribution, a minimum of 68.26 per cent of cases will be within one standard deviation of the mean. The Table shows that all responses are within one standard deviation of the mean.

2) Responses to the 'necessity' questions

	Mean	Median	Mode	Standard Deviation	Sum	Percent of cases within one standard deviation
Year 1 students	3.64	4	4	0.87	8179	76.2%
Year 3 students	3.52	4	4	0.96	10780	72.1%
Year 5/6 students	3.56	4	4	0.99	10516	85.8%
Teachers	3.73	4	4	0.93	10195	91.2%
Heads of schools	3.77	4	4	0.73	972	83.8%
Junior architects	3.58	4	4	0.99	3924	85%
Senior architects	3.66	4	4	0.92	6990	87.4%
Principals	3.67	4	4	0.92	9617	88.7%

Table A-16: Statistical measures for responses to the questions about the necessity for knowledge.

In a normal distribution, a minimum of 68.26 per cent of cases will be within one standard deviation of the mean. The Table shows that all responses are within one standard deviation of the mean.