COURSE DESIGN AND STUDENT EPISTEMOLOGY

by

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In partial fulfilment of the requirements for the degree of
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This research began with a concern about the possible effects upon student epistemology of the fragmentation of knowledge within the education system. This fragmentation was seen to be a consequence of increasing specialisation both between and within the arts-science divide.

Employing a naturalistic methodology - observations, interviews and case studies - research was conducted in four departments of Higher Education; two arts and two science departments. Through a process of progressively focusing upon emergent issues, the study evolved through three phases, culminating in a model of the factors influencing student epistemology.

Four types of student epistemology were identified, ranging along a continuum from fragmented to relative perceptions of knowledge. The research subsequently illuminated two main factors which were seen to influence the incidence of the different types of student epistemology.

The primary factor concerned the kinds of knowledge presented to students. Four modes of knowledge were identified in course structures - Analytical Knowledge, Own Work (Personal Knowledge), Historical Knowledge and Philosophical Knowledge. Where all four elements were present they were found to contribute a dynamic thrust to what was, in other departments, a more static model of knowledge.

The second factor concerned the ways in which knowledge is transmitted and learned. A student-centred, discussion-based teaching style was found to facilitate students' active reconstructions of their views of knowledge.

Where both factors were present students were found to have developed epistemologies based upon the relative nature of knowledge.

The thesis suggests that student epistemology is less related to specialisation per se than to factors of course design and teaching method within both arts and science departments.
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CHAPTER ONE

INTRODUCTION

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CHAPTER I: INTRODUCTION

1.1 Initial research interest

Experience of teaching in the Primary sector led me to question assumptions about disciplinary labels, or 'subjects' in the education system. In particular, the curricular labels 'art' and 'science' attached to lessons on the school timetable are commonly assumed to represent fundamentally different areas of knowledge, yet what actually took place in the classroom under these two labels seemed to possess remarkable similarities.

I made several observations. In both 'subjects' a curiosity for environmental objects led, firstly, to discussion, involving the generation of hypotheses, on to closer observation and analysis (using microscopes, paint, clay, scissors, for example) and resulted in individual pieces of work which demonstrated both logical and aesthetic elements. Thus, the objects for attention, the method of working and the end products showed few immediately observable differences.

Whilst appreciating that this may be explained in part by the level of sophistication of the six-year-old and by the fact that there is a common pool of available
resources when all activities take place in the same space, I did not feel this to be a wholly adequate explanation. Furthermore, the pupils themselves were as yet unaware of the conventional labels, and so the ready transference of knowledge between different 'subjects' was unproblematical, seeming to promote ways of thinking which might be termed holistic.

As the child moves on through the education system, however, activities become progressively compartmentalised, both in curricular organisation and geographically, with, perhaps inevitably, a parallel effect upon pupils' minds. At Secondary level, even though the new National Curriculum will reduce the opportunities for premature specialisation, a choice of emphasis between arts and sciences is usually required at the age of fourteen years, is reinforced in the Sixth form and is characterised at Tertiary level by the awarding of degrees broadly in either arts or sciences, obliging the student to specialise at first between and then within the two areas of knowledge.

Whilst the explicit purposes of these divisions - that they are useful, even necessary in an age which demands specialist expertise - may be readily seen, I was struck by the contrast between the freedom of interdisciplinary exploration possible in the Primary sector
and the seeming rigidity of disciplinary boundaries at Secondary and Tertiary levels. More particularly, I suspected that the implicit effect of this structure, this gradual process of the fragmentation of knowledge, might be to encourage a more general fragmentalised habit of thinking, or worldview.

I, therefore, came to this present research project with the broad intention of investigating the extent of and effects of the fragmentation of knowledge within the education system.

1.2 Structure of the thesis

Having found little published empirical research on the fragmentation of knowledge within the education system, I concluded that it might not, as yet, be a commonly perceived problem. I, therefore, conducted an initial literature survey with the intention of establishing a context, or basis for the main study. This was in three parts. Beginning with a review of the literature on the perceived epistemological consequences of the fragmentation of knowledge in the wider culture, I then narrowed down the search to deal with what is perhaps the most accepted example of fragmentation in our culture (and my own starting-point) – the arts-science divide. Finally, I reviewed the literature on
the fragmentation of knowledge within the education system.

Later chapters have reviews of literature embedded into them, which reflects the fact that literary sources were consulted as the study evolved and the focus of attention become more specific.

Chapter 3 discusses and justifies the methodological choices made and presents the research questions to be addressed in the main study.

Chapter 4 describes the pilot study undertaken for the purposes of determining the most appropriate type and size of sample, the refining of research 'tools' and the early exploration of issues to be probed in interviews.

Chapter 5 describes the first phase of the main study. The theme of the fragmentation of knowledge is investigated through the medium of interviews with students in four departments of Higher Education - two arts and two sciences. Four types of student epistemology are identified, along a continuum from 'fragmented' to 'relative'. Model I is formulated.
Chapter 6 represents a second variation on the main theme of fragmentation in which factors of learning, teaching and departmental ethos are seen as an important influence upon the development of student epistemologies. Model II is formulated.

Chapter 7 describes the third and final variation on the theme of fragmentation. Four modes of knowledge presented to students in course structures are identified as the most fundamental factors influencing student epistemologies. Model III is formulated. The main study is then concluded and a final model - Model IV - is formulated.

Chapters 8 and 9 describe two sub-courses identified in the main study as having an important influence on the development of student epistemologies. They are observed and participants interviewed, in order to provide supplementary data on their content, presentation and significance to students.

Chapter 10 represents a recapitulation of the main theme of the fragmentation of knowledge and its effects upon student epistemologies. Research questions are discussed in the light of findings.
In Chapter 11 implications of the research project are discussed for practice and for educational research.
## CHAPTER TWO

**INITIAL LITERATURE SURVEY**

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CHAPTER 2: INITIAL LITERATURE SURVEY

2.1 Introduction

The previous chapter described the background to my research and outlined the area of concern in which I proposed to work. At this point the decision was taken to work in the tertiary sector, since it is here where the effects of the gradual fragmentation of knowledge might best be observed. This could be summarised by the following broad question:

Does the progressive division of knowledge into separate compartments, and the requirement by the education system that the student at the level of Higher Education should specialise in one area of knowledge only, have the effect of promoting a fragmented view of knowledge?

In order to address such a question it would first be necessary to conduct a critical literature survey of existing work in this area. This I undertook during the early stages of my research. My intention throughout was twofold: to lend formal support to my belief that this is an important area in which to conduct research if a narrow worldview, as a by-product of educating the specialist, is to be avoided; and to
establish a framework, or point of departure. The resulting literature survey is in three sections. Beginning with the broader problem of the fragmentation of knowledge seen in the wider culture, I then narrowed down my search to address the specific example of the Arts/Science divide and, thence, to a consideration of the literature on the fragmentation of knowledge in the education system. In this way, I sought to demonstrate that the problem of fragmentation represents a wide phenomenon which might usefully be addressed within the education system. The three sections comprise:

- 2.2 General problem of the fragmentation of knowledge
- 2.3 The arts/science divide
- 2.4 Fragmentation of knowledge within the education system

The chapter concludes with a summary (2.5)

2.2 General problem of the fragmentation of knowledge

That knowledge has been divided up for the purposes of selective attention would, I think, be generally agreed. That these divisions may have become so long-standing and so rigid that man has lost sight of the whole may not be so readily agreed. Bohm (1980) suggests possible epistemological consequences:
In essence, the process of division is a way of thinking about things that is convenient.....

However, when this mode of thought is applied more broadly to man's notion of himself and the whole world in which he lives (i.e. to his self-world view), then man ceases to regard the resulting divisions as merely useful or convenient... man acts in such a way as to try to break himself and the world up, so that all seems to correspond to his way of thinking. Man thus obtains an apparent proof of the correctness of his fragmentary self-world view (Bohm, 1980.3)

(Bohm's emphasis)

Bohm believes that this way of life has led to the creation of an "overall environment" that is neither physically nor mentally healthy for those who have to live in it, that it is responsible for what he terms "the growing series of extremely urgent crises" that is confronting us today, such as pollution and world-wide economic and political disorder.

Whilst Bohm outlines the effects of fragmentation, others look for the cause. A variety of explanations have been put forward. Brent (1978) states that the process of division can be traced back to the division of labour, when we moved from a pre-industrial
to an industrial society, or from 'mechanical' to 'organic' solidarity (Durkheim's analysis 1965), which, Brent says:

... transformed the central value system too, since there arose a plurality of different value systems in different professional and occupational norms and values, different kinds of language (such as technical and professional vocabularies) .... Under organic solidarity, then, there is a threat of the breakdown of the social order in the absence of identical patterns of behaviour and moral rules that regulate the behaviour of the group as a whole (as opposed to the behaviour of sub-groups), so that people generally do not know what they can expect of one another (Brent, 1978.172)

Polanyi (1958) cites the ideal of scientific detachment, which falsifies our whole outlook beyond the domain of science. He believes:

The urge to make knowledge impersonal in our culture has split fact from value, science from humanity (Polanyi, 1958.vii)
A third explanation may be found in the work of Cassirer (1950), who blames the demise of philosophy as an all-encompassing discipline. He writes:

The era of the great constructive programs, in which philosophy might hope to systematize and organize all knowledge, is past and gone. But the demand for synthesis and synopsis, for survey and comprehensive view, continues as before, and only by this sort of systematic review can a true historical understanding of the individual developments of knowledge be obtained. (Cassirer, 1950.19)

Concern about fragmentation has been expressed over the years by many (Collingwood 1940, Waismann 1968, Weiss 1969, Waddington 1970). The above three quotations, however, demonstrate that the phenomenon has been recognised as a problem in a variety of fields: here, sociology, science and philosophy. But a closer examination may yield the observation that, even whilst addressing the problem of the fragmentation of knowledge, fragmentation may be seen to be at work. The sociologist looks to sociology for his analysis of the problem, the scientist to science and the philosopher to philosophy. Cassirer himself warns (1958):
Each of these formulations of the question [theory of knowledge], connected with a different discipline, contains important and fertile problems. But everyone pretends to speak not only for his own department of knowledge but for the whole of science, which he believes himself to represent and to embody in an exemplary fashion (Cassirer, 1950.7)

Whilst some solutions to the above problem have been suggested: for example, a new culture-wide predisposition which might allow the replacement of the prevailing deterministic orthodoxy (Waismann 1968); an inquiry into the role of language structure (Bohm 1980, Murdoch 1953, Kelly 1969), there appears to be neither a consensus of opinion regarding how such ideas might be implemented, nor - perhaps more importantly - an established inter-disciplinary tribunal for such discussion. In such a forum a common epistemological basis might be established from which to move beyond discussion of cause and effect towards the discovery of interrelationships and the possible development of mutually agreed strategies for change.

In the present climate, a contribution from educational research, far from representing yet another analysis of the problem from an isolated area, might be
seen as a step towards such a forum. My basis for such an argument is as follows:

a) It is in an educational setting where approaches to knowledge — which may later become unquestioned assumptions — are largely formed.

b) It is in an educational setting where we are first required to choose between what are sometimes seen as mutually exclusive versions of reality.

For the above reasons, the education system might be viewed as the most appropriate arena for change.

2.3 The arts-science divide

The arts-science divide may be seen to represent the most outstanding example of the fragmentation of knowledge in our culture. I propose to examine assumptions regarding the mutual incompatibility of these two principal areas of knowledge by reviewing both literature on the divide itself and that of theorists from within the philosophies of science and of art.

Far from being a 'natural' or inevitable division, the arts and sciences have not always been
viewed as exclusive areas of knowledge. Rosenberg (1983) dates the split from the rise of science's authority and the rationalism of the Enlightenment, when the rift first properly appeared between science and the humanities, the lines of whose divisions still dominate the classification of human intellectual activities (Rosenberg, 1983.15)

Others have contributed their analyses (among them, Snow 1964, Harrison 1972, Goodman 1976, Koestler 1976, Kuhn 1977, Harre 1981). Mesarovic and Henning (1963) summarise the situation as follows:

It is usually accepted that the creative processes in art and in science are essentially different and have very little in common. They are even pictured frequently as being mutually antithetical and the vast differences in the end products are offered as evidence (Mesarovic and Henning, 1963.164)

Pollack, too, (1983) stresses this point. He says:

Once the products of scientific and artistic activity have taken their place as distinct
elements in science or art, any similarities may be quite faint - shadows extinguished by the bright lights of cultural categorisation (Pollack, 1983.xiii)

But he goes on:

... but as we track them back through the hands and minds of their makers within the historical context of their creation, the common denominators begin to appear (Pollack, 1983.xiii)

One of these common denominators, Pollack suggests, may lie in the similarity of their deep structures. Harre (1981) presented a paper at the Edinburgh acts-science symposium whose published proceedings were edited by Pollack (above). Harre's contribution, entitled 'Is there a Zeitgeist?' drew arts-science correlations:

a) In shared content (phenomena chosen for attention)

b) In similarity of style (modes of attention)

c) In culture-wide predispositions and assumptions about the nature of the world and of mind.
Others, however, point to the differences between the two areas. Bruner (1964) states that although both art and science use the method of "the construction and exploitation of the category of possibility" (P. 62) they are nevertheless very different in essence. He gives definitions of both areas to illustrate his point:

The hallmark of the way of knowing called science is that the intent of the scientist is to create rational structures and general laws that, in the mathematical sense, predict the observations one would be forced to make if one were without the general laws. i.e. science increases the unity of our experience of nature (Bruner, 1964.74)

and:

Art as a form of knowing does not and cannot strive for such a form of unification .... The elegant rationality of science and the metaphoric non-rationality of art operate with deeply different grammars; perhaps they even represent a profound complementarity (Bruner, 1964.74)

Kuhn (1977) says that we have only just begun to discover "the benefits of seeing science and art as one"
and warns that an exclusive emphasis upon the parallels between science and art...

... obscures a vital difference. Whatever the term "aesthetic" may mean, the artist's goal is the production of aesthetic objects; technical puzzles are what he must resolve in order to produce such objects. For the scientist, on the other hand, the solved technical puzzle is the goal and the aesthetic is the tool for its attainment. Whether in the realm of products or of activities, what are ends for the artist are means of the scientist, and vice versa (Kuhn, 1977..343)

Philosophies of art and of science

It may be seen from the above survey that here, as in the discussion on fragmentation in the previous section, there appears to be no consensus. It may be useful at this point, therefore, to re-direct attention, away from those who have theorised about the divide towards more primary sources - theorists within the two separate areas - to see if parallels can be drawn. I shall look at three key areas:
a) the subjective - objective problem
b) representation
c) cause and effect

These were chosen because they have become the subject of debate in both areas

a) The subjective-objective problem

It would, I believe, be generally agreed that the sciences are seen to be objective by those who see science as the only true method of knowledge, achieving absolutely impersonal knowledge. As such, it is incompatible with the arts, which are viewed as subjective. An examination of this assumption may, however, raise doubts about such a conception.

Within the field of abstract art, two distinct movements may be seen. One, which Read (1959) terms an "art of determined relations" has the ideal of clarity, formality and precision: the other, which Read terms an "art of internal necessity" reaches towards expressiveness, vitality and flux. These two principles correspond to an objective and a subjective theory of abstract art.
The painter who was to develop to its logical extreme the objective concept of abstraction was Mondrian (1872-1944). His basic philosophy of art was to reveal the underlying structure of the Universe, which he believed to be independent of the objects which happened to be before his eyes - a philosophy which might be said to define Classicism in terms of twentieth century art (Read 1959). Mondrian gradually reduced everything to a geometrical pattern of crossing horizontal and vertical lines, which he saw as essential structure revealed, not created - a 'window' on absolute reality.

Kandinsky (1866-1944), on the other hand, epitomised the subjective theory of abstract art. His work concerned a progressive emancipation of art from any external reality. He was involved in using plastic forms as a system of symbolisation whose function is to give outward expression to an internal necessity. (Read 1959, Kandinsky 1912).

In the sciences, meanwhile, it was being suggested that a strictly objective description of nature might no longer be adequate. In physics, two separate developments, that of relativity and quantum mechanics, shattered the classical concepts of absolute space and time and elementary solid particles. In both
cases (Waismann 1968) the assumption that we can study natural phenomena without referring to ourselves was challenged, with the recognition of the part played by the observer, thus questioning the Cartesian position and admitting a subjective element into science. There is still strong resistance to this alternative conception (Feyerabend 1975). The 1968 Alpbach Symposium, entitled 'Beyond Reductionism' (Koestler and Smythies 1969) suggested that our present society is far more receptive to rationalistic—mechanistic philosophies than to others, simply because it views them as more "scientific" and that this is based on a misunderstanding of the nature of science itself.

I have suggested, albeit briefly, that doubt has been cast both on assumptions concerning the nature of art and of science and on their relationships to the terms 'subjective' and 'objective', which may not, after all, be mutually exclusive ways of thinking and acting. The relationship of art and science to each other, then, may merit further investigation.

b) Representation

The concept of representation plays an important role in conceptual change (Harrison 1973) in both the arts and sciences. Here I include examples of two
aspects of representation as they have appeared in the literature of each area. The first example seeks to show that common phenomena for representation may claim the separate attention of both art and science: the second example that discussion of the problem of how such phenomena are represented has followed parallel lines.

The Western tradition of sculpture (Chipp, 1968), from Egypt, through Greece and Rome, the Middle Ages and the Renaissance, rested entirely on the concept of the monolith. Thus, the idea of sculpture inherited by the twentieth century sculptor was a centripetal one, or sculpture tied to its own centre. Ferber (1958) suggests that 'an adherence to the closed forms of biological life' was first broken by the Cubists and that this opened up a new conception which marked a radical divergence from the old. Art could now concern itself with the concept of extension. Writing about his own work, Ferber (1958) described it as concerning 'the relationship of solids and spaces which define each other'. He states:

... This sculpture of extension does not begin with the idea of removing the found surface in order to charge the revealed one with meaning. Nor does it move out from a core to a
preconceived surface ..... instead of enclosing a
volume, its shape allows the free use of spaces
as essential parts of the sculpture (Ferber,
1958.554)

The above phenomenon in the field of sculpture
may be seen to have links with changes in the scientific
Discoveries in the realm of sub-atomic physics have
prompted the need (Waismann 1968) to drastically revise
the notion of particles in the classical sense, and
continuous existence in space, or, as Waismann terms it,
"the attributes of thinghood". Seemingly echoing
Ferber's words (above) across the arts-science divide,
Harre (1972) suggests that a modern metaphysician might
investigate how our thing-concepts are related to our
space-concepts.

My second example of representation, as treated
in art and in science, concerns an aspect of which there
is a growing awareness. I refer to the claim that the
process depends upon an elaborate background of mental
habits, assumptions that have to be learned, even if
they have been learnt so readily that we are not aware
of having done so. Harre (1970) says that, in
science...
both models and symbols depend upon a convention or set of conventions by which they become vehicles for thought about a certain subject matter (Harre, 1970.37)

Of painting, Wolfflin remarked (Wolfflin 1932, in Gombrich 1971) that all pictures owe more to other pictures than they do to nature—a point which Gombrich believes to be still insufficiently understood. He rejects the belief in the 'innocent eye' which sees the world afresh, asserting rather that:

the conventional vocabulary of basic forms is still indispensable to the artist as a starting point, as a focus of organization (Gombrich, 1971.9)

Implicit in both the above quotations is a rejection of naive realism (postulating a 1:1 relationship between theory and reality) and empiricism (which assumes knowledge to be directly derived from sensory experience) and an awareness that they are both 'theory-laden' (Popper 1966).

In the above discussion of representation I have sought to demonstrate, firstly, that there may be parallels between the practices of art and science —
between what the artist pictures and the scientist models; secondly, that parallels may be found between the perceptions of underlying theory in each area, as they attempt to define the process of representation.

c) Causality

Harre (1972) said that we must try to make clear just what concepts are being employed in any given intellectual enterprise and that, whatever may be the major direction of influence at any time:

the explicit identification of the structure and components of one's conceptual system release one from bondage to it (Harre, 1972.17)

It was in the above spirit that artists in many fields in the 1960s reacted against what they saw as the weight of unquestioned assumptions influencing thought and actions. More specifically, they reacted against what they, too, saw as bondage - to the tradition of goal-oriented art. There was an upsurge of experimentation into what Meyer (Bergonzi 1968) terms 'anti-teleological' art. It sought not only to expose the influence of traditions, theories and systems, but to sever all ties with the past. The method of ensuring that they established no 'syntactical - grammatical'
relationships was to employ the systematic use of chance. Thus, composers such as Stockhausen and Cage sought to destroy musical syntax by avoiding tonal relationships, repetitions and regular rhythmic patterns; painters such as Rothko and Mathieu avoided symmetry, perspective and the presence of recognisable objects or patterns (which tended, they thought, to structure visual experience, creating goals and points of focus); and writers such as Beckett and Robbe-Grillet avoided the elements of syntactical organisation - plot, character and conventions of grammar. They denied the reality of relationships and the relevance of purpose, believing that only individual sensations and not the connections between them were real. For this reason, Meyer gave them the name 'radical empiricists', saying further that:

the assertion that predictions and goals depend not upon an order existing in nature, but upon the accumulated habits and preconceptions of man ... rest upon a less explicit, but even more fundamental denial: a denial of the reality of cause and effect (Meyer, 1968.56).

In the field of contemporary physics, particularly in quantum mechanics, where events are not fully determined or predictable but only probable, the
concept of cause and effect has also become problematical. Many philosophers of science have addressed the problem (Nagel 1970, Toulmin 1972, Harre 1970 and 1972, Feyerabend 1975). Waismann (1968) discusses the issue exhaustively in the chapter entitled 'The Decline and Fall of Causality'. An electron, he writes, is not objectifiable in a manner independent of the way it is observed. Any observation is made at the expense of "breaking the connection between the past and the future", owing to the uncontrollable disturbance it creates. This circumstance, the unavoidable interference with the run of events, together with its unsurveyability, introduces an element of uncertainty into any possible observation and "thus blocks the way to a causal analysis".

Whitehead's definition (1927), that "causal efficacy is the hand of the settled past in the formation of the present" is undergoing critical scrutiny. Here, I have suggested that the concept of cause and effect is a contemporary problem currently being addressed, in different ways, on both sides of the arts-science divide independently.

In this section on the arts-science divide I have aimed to question certain assumptions concerning the mutual incompatibility of the two areas of knowledge.
Exclusive emphasis on their differences could, perhaps, give way to a search for common denominators, for the reason that Rosenberg (1983) gives:

This divided outlook is uncertain ground on which to build a unified account of both methods of knowledge, providing instead views and theories that tend to appeal exclusively either to those who look to science as the only true method of knowledge or to those drawn to the arts, seldom furnishing a standpoint from which to recognize the similarities as well as the differences of both together (Rosenberg, 1983.3)

The previous section concluded that research into the fragmentation of knowledge might appropriately be carried out within the education system. The present section must conclude, I believe, that any such research must be conducted across the disciplinary boundaries, most particularly the boundary between art and science.

2.4 Fragmentation of knowledge within the education system

This section takes the concerns outlined in the two preceding literature surveys - the general problem of the fragmentation of knowledge and the arts-science divide - and reviews how they have been addressed in
educational literature. My concern in this section is to survey literature dealing either explicitly or implicitly with the fragmentation of knowledge in the education system. Literature emphasising other aspects, such as theories of learning and teaching, though related to the topic, is surveyed in later chapters.

2.41 surveys theoretical literature

2.42 surveys empirical contributions

2.41 Theoretical literature

The historical background to specialisation is given by King and Brownell (1966), who describe how the disciplines separated off from each other in the nineteenth century, thus bringing about the loss of the concept of the unity of knowledge with philosophy overriding all the disciplines. They analyse the problem of the unity of knowledge for school curricula posed by what they see as the two major characteristics of the modern world of knowledge - the autonomy of the disciplines and the pluralism of the modern world. Concern about the effects of what may be seen as the fragmentation of knowledge for the education system has been expressed for at least the last fifty years. Collingwood (1924) observed that an individual's
absorption in any given form of experience necessarily commits him to the opinion that no other form is valid, that his is the only one adequate to the 'comprehension of reality'. McKeon (1937) advocated what he termed a 'general education', which would culminate in the graduate emerging:

with a knowledge of how problems, whether of life or of science or of art, have been treated, and with some insight therefore into how problems may be treated; and, joined to that knowledge, he should possess an ability to understand positions other than his own ... (McKeon, 1937.377)

More contemporary theorists, in the last ten years, have analysed the relationships between subjects (Postman and Weingartner 1971, Young 1971, Esland 1971). Esland (1971) discusses the rigidity of the concept of a 'subject', which he believes to have become reified:

If knowledge is dereified it is, then, a much more negotiable commodity between teacher and pupil ... There is no reason to suppose that these will remain within the 'boundaries' of what are now heuristically labelled as 'subjects'. New configurations of knowledge are likely to emerge from the combinations of questions which
arise in the learning situation ... the boundaries are only human constructs and can, therefore, be broken (Esland, 1971.96)

Discussion of the relationships between subjects in the curriculum might be seen to have links with the discussion of the relationship between objects and the spaces between them which have taken place in the arts and sciences (above). It might, therefore, be seen as part of a culture-wide reorientation - away from an absolutistic towards a more relativistic view of knowledge. This dereified view of knowledge in the education system, however, has met with resistance. This might possibly be explained by the existence of a perceived threat to a 'core construct' held by many teachers that 'the world as they see it is the world as it is' (Pope and Gilbert 1984); that the acceptance of the notion that knowledge is fundamentally relative might cause anxiety in a person used to being regarded as the final expert.

The advantages of a view of knowledge based on relativity, however, continue to be stressed by educational theorists. King and Brownell (1966) state:

Integration and unity of knowledge are achieved by the inquirer as he surpasses boundaries of
divisions of knowledge by means of generalised intellectual skills (King and Brownell, 1966.41)

Hirst (1974) says that we need a new organisation of the curriculum if we are to begin to develop the qualities of mind we now recognise as important, such as the ability to make connections, or to think in an integrated way when faced with a wide variety of issues. He writes:

A subject-structured curriculum restricts pupils in their thinking, artificialises and limits both the process of learning and their approach to life that results. In fact it hinders the development of an integrated point of view on life which is one of the achievements of a mature adult that education seeks (Hirst, 1974.134)

How such a change might be achieved is by no means clear in the literature. Whilst agreeing that it is desirable, even necessary, both Bohm (1980) and Schwab (1964) believe that there is no easy solution. Attempts at the integration of knowledge through the introduction of interdisciplinary work have, according to Bohm (1980) 'ultimately served mainly to add further separate fragments'. Schwab (1964) offered a caveat. Even the integration of previously separate bodies of
knowledge by new and unifying conceptions, he believed, 'should not blind us' to the possibility that some of the differences we recognise among phenomena may be genuine; some differentiation of disciplines may be perennial:

There really may be joints in nature ... Science, ethics and aesthetics may indeed represent three widely variant objects of inquiry. The doctrine of the unity of science, which insists on a unification of all knowledge, is either a dogma or a hope, but not a fact (Schwab, 1964.10).

Others, too, recognise the complexity of the problem of implementation in face of the status quo. Bernstein's analysis (1975) states that the curriculum is inappropriate, that we need to move from a mechanical to an organic model, but that a conflict exists between two social structures. The first, he says, is predicated upon the rule 'Things must be kept apart' and the second upon the inverse of that rule, which attempts to change it, and is 'Things must be put together'. The extent of the conflict between the two depends upon how much is to be put together. King and Brownell (1966) see the difficulty as a conflict between 'the two major characteristics of the contemporary world of knowledge: the autonomy of the disciplines of modern knowledge and
the pluralism of the world of knowledge'. Sawada and Caley (1985) cite the strength of a Newtonian, deterministic influence on the education system.

Positive suggestions for facilitating a view of knowledge based on relativity, which might be implemented in the classroom, have been put forward. Whilst not expressed in common terms, they may perhaps be seen to be moving in a broadly similar direction.

Having warned against over-compensation (above), Schwab (1964) says that we must make explicit the underlying conceptual structures of each discipline:

For the teacher:

to know what structures underlie a given body of knowledge is to know what problems we shall face in imparting this knowledge (Schwab, 1964.13)

for the student:

to understand that the knowledge we possess is not mere literal, factual truth, but a kind of truth that is true in a more complex sense... together with the reasons for the appropriateness
of these concepts and some hint of their limitations (Schwab, 1964.13)

Pope (1982), applying the work of Kelly (1955) to education, maintains that pupils in schools should be exposed to a range of conceptions held by the teacher and their peers. This interchange of ideas, she believes, can facilitate communication and offer a further range of experience within which pupils may reconstruct their models (Pope, 1982)

Snow (1964) warned about what he called the 'two cultures', believing it to be a matter of urgency that we should close the gap between literary intellectuals and scientists

Pollack (1981), reviewing the arts-science workshop attended by distinguished academics, expressed the hope that:

as a long-term objective ... it may find its way into the course structure of universities and other centres of higher education to help break the rigid polarisation between the so-called 'two cultures' (Pollack, 1981.xi)
Broudy (1981) also advocates formal courses, though of a more general nature. The particular rationale for liberal studies, he writes, rests in a conception of the uses of knowledge - replicative, applicative, interpretive and associative - of which the latter two are central to building a sense of what Broudy terms 'warranted commitment'. He states that perspective and context are the functional residues of general education, that once the details of disciplines studied explicitly in school are forgotten, they function tacitly in later life as 'frames or lenses or stencils of interpretation, both of fact and value'. For this reason, Broudy believes:

... a convincing case can be made for the functionality of formal course work in the associative and interpretive uses of knowledge, even though the content of the formal courses cannot be recalled on cue (Broudy, 1981.137)

The above review of educational literature from a theoretical perspective has, I believe, served to show both that there exists considerable interest in a more relative view of knowledge in educational circles, and that the gap between theory and practice may be narrowing. It remains, however, to survey empirical work conducted in this area.
My search for published empirical work on the fragmentation of knowledge in the education system has revealed a concentration of work on the arts-science divide. Apart from an early (1960) report to the Gulbenkian Foundation, based on a survey, the work emanates from research conducted by Hudson during the late 1960s. This work was carried out before the theoretical perspectives reviewed above. For this reason and because it concerns itself more with personality types than with the structures of knowledge, it cannot be seen as an extension or application of those theoretical perspectives. Hudson's later work does argue for cross-fertilisation between the arts and sciences, but is not empirically based, which is my concern here. I have, therefore, limited my review to a fairly concise description of the type of work undertaken with its significant findings, which provided a useful starting-point for early data-collection.

In 1958 Oxford University Department of Education investigated the possibility of a revision of the English sixth-form curriculum, which would end the division into arts-science sides. The method used was to conduct a survey. Questionnaires were returned from 2822 pupils about to enter the sixth-form and 245 first-
year university undergraduates, in order to provide a picture of attitudes and practices across the country. A study was then made of 15 representative school timetables. The research team then revised these timetables in order to allow an arts-science mix of 'A' level subjects. The subsequent report (Gulbenkian Foundation, 1960) suggested that such a revision would be both educationally desirable and possible, given the necessary nation-wide interest.

Hudson (1966, 1968) carried out tests for cognitive bias amongst English schoolboys prior to specialisation. He advanced the view that arts-science differences amongst schoolboys are related to more general personality differences. Hudson contrasted performances on open-ended tests - requiring creative answers - with performances on the traditional type of intelligence test - requiring one correct answer. Using Guilford's 1956) terminology of 'convergers' and 'divergers' Hudson suggests that arts-choosers tend to be divergent thinkers and science-choosers convergent thinkers. Hudson's later work (1968) did allow the possibility of extrinsic factors, such as stereotyping in pupils' minds and parental influence, but upheld his thesis that cognitive bias is firmly established before specialisation takes place. The probable effect of specialisation, then, would be to consolidate these in-
built differences. Others working in the same area have tended to support Hudson's findings (Terman 1954, McClelland 1962, Getzels and Jackson 1962, Povey 1970). There are those, however, who have replicated Hudson's work, yet disagree with his analysis.

McKay and Cameron (1969) carried out work intended to discover whether the relationship found in Hudson's (1966) sample of English schoolboys between arts-science specialisation and convergent-divergent bias would be found in a sample of Scottish undergraduates who had not been exposed to the same degree of specialisation in their previous schooling. Their findings indicated that where students had elected to specialise in their first year, Hudson's analysis was upheld, but that where non-specialist students are compared, the relationship between arts-science specialisation and cognitive bias is not found. This would tend to suggest that specialisation may be a cause rather than an effect of cognitive bias.

Butcher (1969) also suggested that the degree of specialisation in the upper forms of English schools may be the cause of distinctive modes of thought identified by Hudson, and suggested that Hudson's work should be replicated in other types of school and other ability groups.
Lloyd-Bostock (1979) maintained that research relating cognitive style to arts-science choice was limited to the upper ability range and had neglected unspecialised pupils, particularly girls. Her research, therefore, set out to investigate how far the relationship found by Hudson would hold true for 'unspecializing, mainly comprehensive, third-year pupils (aged 13-14) of both sexes, across a wider ability range'. She found that:

Analyses using convergent-divergent bias scores indicated that these confounded two sources of variance (verbal-non-verbal mode and open-closed-endedness) and the notion of convergence-divergence as a dimension contrasting preference for open-ended versus closed-ended tests was not supported. (Lloyd Bostock, 1979)

The above review of empirical work suggests firstly - as the previous section concluded - that work across the arts-science boundary will be a necessary precondition of research into the fragmentation of knowledge in the education system: secondly, that work to date has consisted of quantitative studies. Missing from the literature is empirical work of a qualitative nature which would seek to elicit and evaluate the
perceptions of those people - teachers and students - actively engaged in the learning - teaching process.

The survey of theoretical perspectives has highlighted the concerns around which such a qualitative study might focus.

2.5 Summary

This initial literature survey set out to serve two main purposes:

a) to lend formal support to my belief that this is an important area in which to conduct research.

It has served to demonstrate that there is growing concern about the fragmentation of knowledge - amongst theorists of knowledge, of science, of art and of education.

b) to establish a framework, or point of departure.

The literature survey as a whole has clarified the issues which I wish to address. The survey of empirical work has identified a gap in the literature and, thus, provided a point of departure.
Each separate section of the literature survey has contributed progressively towards the essential decision-making process:

2.2 General problem of the fragmentation of knowledge

This section confirmed the need for work on the fragmentation of knowledge within the education system.

2.3 The arts-science divide

This section demonstrated the importance of conducting research across disciplinary boundaries, specifically the arts-science divide.

2.4 Fragmentation of knowledge within the education system

This section exposed the need for qualitative research in this area.
CHAPTER THREE

METHODOLOGY

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3.1 Introduction

The previous chapter surveyed literature on the fragmentation of knowledge from three perspectives - epistemology, the arts and sciences and education, both theoretical and empirical. Whilst a substantial body of theorists in all three areas were shown to be addressing the problem of fragmentation, the literature on empirical educational research in this area was found to be limited. The quantitative methodologies employed, though suitable for the research aims - the placing of arts and science students on a convergent-divergent scale - were designed neither to identify individual perceptions of the nature of knowledge, nor to investigate how those perceptions are influenced by the education system. The research does, however, raise questions and expose the need for further empirical work in this area. The next step, I argued, is to conduct research aimed at discovering whether meaningful relationships can be identified between student epistemology and the whole learning milieu; moreover, that such questions should be asked of those actively engaged in the learning-teaching process - students and their teachers.
The present chapter describes and justifies a methodology designed to provide answers to such questions. I begin by clarifying the nature of the research problem, discuss the philosophical implications underlying the subsequently chosen methodology and then specify the research methods employed. The sections comprise:

3.2 Nature of the research problem
3.3 Philosophy of the methodological approach
3.4 Research methods
3.5 Summary

3.2 Nature of the research problem

Since the nature of an area of enquiry will affect decisions about research design and methodology, it is important to begin by clarifying that nature. It may be seen as consisting, in any research, of two related aspects:

a) type of questions asked
b) type of answers sought

In this present research project they are as follows:
a) Questions will seek to obtain data which will facilitate the identification of different types of individual student epistemology, suggest how these differences might be related to factors of disciplinary or more common educational concern and discover to what extent and in what ways the question of student epistemology is currently addressed in departments of Higher Education.

The type of questions asked, therefore, will be 'open' and data sought qualitative.

b) Data obtained will be analysed and interpreted to provide a model or models of the relationships between student epistemology and the educational milieu which will be both meaningful and of use to practitioners within and across disciplinary areas.

The type of answers sought, therefore, will be interpretive and applicable.
3.3 Philosophy of the methodological approach

3.31 Research paradigms

Once the nature of the research problem has been clarified it will be necessary to match it to a suitable methodology. This process involves earlier and more fundamental considerations than those guiding such pragmatic decisions as choice and size of sample, or methods of data-collection and analysis. As Rist (1977) points out:

When discussing research methodologies, we are, in the final analysis, speaking of an interrelated set of assumptions about the social world which are philosophical, ideological and epistemological. They encompass more than simply data-gathering techniques. (Rist, 1977)

A research methodology may be seen as belonging to, or emanating from what has been called variously a 'paradigm' (Kuhn 1970), a 'particular conceptual structure' (Schwab 1964), or an "axiom system" (Guba and Lincoln 1982). [I shall use the term 'paradigm', which Kuhn (1970) defines as a 'theoretical framework', or a way of perceiving and understanding the world, through which problems are formulated, data collected and
results interpreted by an intellectual community]. The nature of the paradigm in which the methodology is embedded needs to be made explicit by the researcher if the thesis itself is to demonstrate internal validity. In this way the epistemological question of what is to count as knowledge is addressed. Smith (1983) points out:

If researchers do not discuss this question, they are forfeiting any participation in determining the basis for the authority of their knowledge (Smith, 1983:12,13)

It is equally important if the researcher aims to contribute towards methodological development in his or her discipline - here, educational research - as well as to offer answers to questions. The methodology used may then be seen as a conceptual tool of enquiry - self-consciously chosen, deployed and, finally, evaluated.

The question of paradigmatic commitment (in areas where it is recognised as existing) can be fiercely debated. In current social science research, whilst a degree of flexibility in methodological design is accommodated, there exists a prevailing expectation, whether implicit or explicit, that research in the social sciences should derive from one traditional
paradigm. However, there is a growing feeling among some researchers that it might not prove appropriate for all areas of enquiry. An alternative paradigm for education research is beginning to emerge. The researcher's position in such debate will reflect his/her own implicit philosophical orientation, which has also influenced the selection of the research problem to be addressed.

The traditional research paradigm in the social sciences is taken from the physical sciences. Its approach is essentially reductionist. It involves the analysis of complex social situations into component parts, the controlled variation of single variables leading to a better understanding of each separate part and, finally, the reassembly of the parts into the original whole with increased understanding (Elton and Laurillard 1979). It relies on the concept of cause and effect and thus focuses upon isolated events, which are treated quantitatively. Rist (1977) states:

Quantitative research is the dominant methodology in educational research. It is more widely published, taught, accepted and rewarded in educational circles than any other approach. In the extreme, quantitative research is
characterised as equivalent to 'The Scientific Method'. (Rist, 1977.42)

But the reductionist approach is increasingly questioned in the natural sciences themselves, where it is found to be, not inappropriate, but not always appropriate. Weiss (1969) maintains that the method of the reconstruction of phenomena from an analysis of their properties has been unproblematic where phenomena display a high degree of stability, at the macro-level. But when scientists attempt to study the integrality of a living system, involving the micro-level also, the method of 'analytic atomisation' is found to be untenable, since some processes exhibit indeterminacy. Here, a more holistic approach is needed. Bakan, (1967) discusses another criticism of 'scientific method' for science; its 'closed' approach.

He writes:

Consider the ideal of the "well-designed experiment". The usual meaning of "well-designed" is that the outcomes of the experiment have been completely anticipated, and that one will not allow the experience of conducting the experiment to lead one to consider alternatives
outside of the ones already thought of beforehand. (Bakan, 1967.xiii)

However relevant Weiss's and Bakan's criticisms may be to the natural sciences, Parlett and Hamilton (1976) argue that in educational research the interaction between the student and the context within which he works is too complex to justify a preordinate research design. The fact that the reductionist paradigm is being challenged in the field of the natural sciences (see Kuhn 1970, Toulmin 1972, Lakatos and Musgrave 1970, Feyerabend 1975) — from whence it came — may be seen to add weight to the arguments of those advocating change in the social sciences, particularly in educational research.

The alternative paradigm for research in the social sciences derives from social anthropology instead of from the natural sciences. It is termed 'naturalistic' in that it takes place in a natural setting and was developed by those who saw it as unrealistic to expect the reduction of human behaviour to laws by means of isolating individual components of behaviour in order to establish the relations between them. Cronbach (1975) proposed that researchers should concentrate on 'interpretation in context', obtaining
qualitative data using a holistic approach. Rist (1977) writes:

From their perspective (qualitative methodologists), it is precisely because reality cannot be broken down into component parts without the severe risk of distortion that a holistic analysis is necessary. Focussing on a narrow set of variables necessarily sets up a filtering screen between the researcher and the phenomena he is attempting to comprehend. Such barriers, from the vantage point of those employing a holistic analysis, inhibit and thwart the observer from a necessary closeness to the data, from an understanding of what is unique as well as what is generalisable from the data, and from perceiving the processes involved in contrast to simply the outcomes. (Rist, 1977.47)

The first difference between the two methodologies, then, lies in the choice of setting for research. Instead of setting up laboratory-type conditions, the naturalistic researcher attempts to study the phenomena in context, holistically.

Secondly, there is a conviction that any social phenomenon can only be understood, not through analysis
of behaviour, but through the perceptions of those actively engaged in the process. Rist (1977) maintains:

It is from an interpretation of the world through the perspective of the subjects that reality, meaning and behaviour are analysed. The canons and precepts of the scientific method are seen to be insufficient; what are needed are inter-subjective understandings. (Rist, 1977.44)

This involves a new stance on the part of the researcher, whose relationship to his/her subjects is of the form subject-subject in contrast to the earlier subject-object form. This shift in the methodology of the social sciences, according to Brent (1978) parallels a similar shift in the methodology of epistemological inquiry, in that empiricist 'objectivity' has become later-Wittgensteinian 'intersubjectivity'.

Thirdly is the question of method. Research in a natural setting, using a holistic approach to understand inter-subjective meanings needs to take account of contextual complexity. This is done by abandoning a methodology in which objectives are rigidly pre-defined in favour of a methodology that allows the focus of evaluation to develop as the study proceeds (Parlett and Hamilton 1976) - a process of progressively focusing
upon issues as they arise. Parlett and Dearden (1977) say that this process characteristically takes the form of three stages. During the first, exploratory stage the researcher becomes more "knowledgeable" about the problem under investigation, which allows him to enter the second stage with observations and inquiries more directed, systematic and selective. The third stage consists of seeking general principles underlying the data obtained.

Obviously the three stages overlap and functionally interrelate. The transition from stage to stage, as the investigation unfolds, occurs as problem areas become progressively clarified and re-defined. The course of the study cannot be charted in advance.

(Parlett and Dearden, 1977.18)

Finally, naturalistic research aims to be of direct use to the practitioner and claims to achieve this end by the development, at each stage, of progressively refined interpretive models of processes which illuminate the underlying structure of the particular problem studied, thus facilitating understanding and application. It is, therefore, in contrast to the aim of the traditional, 'scientific' research paradigm, using a quantitative methodology,
which is to deduce basic laws from experimental facts from which predictions can be made - an aim which has been viewed as singularly unsuccessful in influencing practice. The claims of success by naturalistic researchers stem largely from the fact that their theories are derived from the perceptions of the subjects studied rather than from external sources. Glaser and Strauss (1967) summarise this point:

Thus one canon for judging the usefulness of a theory is how it was generated - and we suggest that it is likely to be a better theory to the degree that it has been inductively developed from social research. We also believe that other canons for assessing a theory, such as logical consistency, clarity, parsimony, density, scope, integration, as well as its fit and its ability to work, are also significantly dependent on how the theory was generated.

(Glaser and Strauss, 1967.5)

3.32 Choice of Research Paradigm in the present study

Having clarified my research problem (3.2 above), the choice of a suitable methodology could now be made in the light of the above comparisons. With 'the
ability to work' as the main criterion, the research questions to be addressed are as follows:

1. What different types of student epistemology can be identified in departments of Higher Education?

2. What factors seem to influence the incidence of these different types of student epistemology?

3. To what extent and in what ways is the question of student epistemology addressed in the teaching provided and learning expected in departments within Higher Education?

4. What are the implications of the different epistemologies for the practices of teaching and learning?

Taking each of the above research questions separately, the following methodological decisions were made:

1. The process of identifying students' epistemologies, or views of knowledge, involves the elicitation of their individual, subjective meanings. In order to achieve this it would be necessary to:
a) gain their confidence. This might best be done by engaging in participant observation over a period, immersing myself in their day-to-day milieu, rather than by imposing structures and treatments of my own devising. Subsequent interviews could then be conducted on a basis of familiar informality.

b) allow them to talk freely. This would necessitate a minimum of structure in questioning, thus allowing subjects to reveal and elaborate upon their own perceptions and concerns. Categories emerging for further investigation would then be derived from the richness of qualitative data obtained.

2 Relationships between types of student epistemology identified above and the learning milieu would best be sought by means of further, more directed interviews, taking the whole context into consideration, rather than by attempting to separate out parts beforehand. In this way the focus of the evaluation would evolve as the study proceeds. The development of insights into significant contextual relationships and theories about underlying structure would then be generated from the data itself.
Evaluation of the extent of and ways in which the question of student epistemology is addressed in Higher Education would proceed from implicit and explicit relations identified during analysis of observations and interviews conducted earlier. These areas could then be focused upon for more in-depth observation and follow-up interviews.

Implications for practice of findings generated from the above methodology might be:

a) of specific interest and use to practitioners working in the particular situations and departments studied

b) generalisable to other, similar situations elsewhere where key issues are identified

c) instrumental in suggesting directions for future research in this area

d) of use as a methodological contribution to educational research development.

The above methodological decisions, based on the potential to answer my research questions in a way which would be of most use to practitioners, can be seen to
fall within the definition of naturalistic research methodology. In order to study the extent and effects of the fragmentation of knowledge upon student epistemology I will need to consider the processes involved. The traditional, or rationalistic paradigm is viewed (Guba and Lincoln 1982) as essentially unable to deal with processes. However, an acceptance of the notion of multiple realities inherent in the naturalistic model also prevents the researcher from engaging in a rigidly dichotomous methodological position. The selection of a methodological tool of inquiry is a matter of appropriateness to the particular phenomenon studied. There is no 'right' way. This needs to be understood if we are to avoid what Rist (1977) terms the accusation of 'methodological provincialism'.

3.33 Trustworthiness

The naturalistic approach being relatively recent, it remains to justify its trustworthiness in the face of critics of the approach itself and from the point of view of criteria which need to be satisfied in any research. Some advocates of the naturalistic model warn of possible criticisms which might be levelled at qualitative research.
For example, Entwistle and Hounsell (1979) write:

The insights which emerge from qualitative research reports can appear too much the product of the researcher's personal perspective and of the idiosyncracies of the specific situations examined ... But good qualitative research can, through cross-checking of interpretations and through awareness of its limitations, provide evidence as strong in its own way as that derived from conventional approaches (Entwistle and Hounsell, 1979.367)

Others (Magoon 1977, Cook and Reichardt 1979) criticise qualitative research reports on the basis that they fail to satisfy traditional criteria of authenticity such as reliability, validity and objectivity.

The value of scientific research is partially dependent on the ability of individual researchers to demonstrate the credibility of their findings. In all fields that engage in scientific enquiry reliability and validity of findings are important. While reliability is concerned with replicability of the scientific
findings, validity is concerned with the accuracy of scientific findings.

(Le Compte and Goetz 1982)

Guba and Lincoln (1982) believe that the concepts of internal validity, external validity, reliability and objectivity, though important to answer, are in some need of reinterpretation in order that they may be fully applicable to naturalistic inquiry. They suggest the substitution of the terms 'credibility', 'transferability', 'dependability' and 'confirmability'. These terms and steps I took to satisfy them are summarised below:

1. Credibility

This corresponds to the traditional term 'internal validity' and refers to the extent to which the data and findings of an inquiry can be shown to be authentic representations of the phenomena studied. Guba and Lincoln (1982) argue that as the phenomena studied in naturalistic research are largely the idiosyncratic constructions in the minds of individuals, credibility can be usefully monitored by asking those same individuals whether their constructions of reality have been appropriately represented.
I conducted this check for credibility both during and after interviews.

2. Transferability

This corresponds to the traditional term 'external validity', which refers to the degree to which the findings of an inquiry can be generalised to other contexts or with other respondents. Rejecting the traditional assumption that researchers should aim to produce context-free laws which have enduring truth value from the similarities found among parts, Guba and Lincoln (1982) believe that, nevertheless, some transferability is possible in naturalistic inquiry, depending on the degree of temporal and contextual similarity.

I aimed to maximise the potential for transferability by clarifying for the reader the salient characteristics of each situation studied for each stage of research and by addressing the key educational issues which could be recognised elsewhere.

3. Dependability

This corresponds to the traditional term 'reliability', which refers to how consistently the
findings of an inquiry can be repeated if the inquiry were to be replicated under the same circumstances in another place and time. Guba and Lincoln (1982) say that, since naturalistic designs are emergent, thus preventing an exact replication (a second researcher might choose a different path from the same data) the naturalistic researcher defines the concept of 'dependability', meaning 'stability' - 'after discounting such conscious and unpredictable (but rational and logical) changes'.

I have attempted throughout my research to describe systematically my methods of data-collection, analysis and interpretation, as well as to preserve my 'raw' data in the form of tape recordings, transcripts of interviews and notes taken during observations and interviews, so that it is possible for an interested party to utilise the same data to see how my findings might be replicated. Thus, all methodological steps and decision points are delineated and raw and processed data is publicly inspectable.

4. **Confirmability**

This corresponds to the traditional term 'neutrality' or 'objectivity', referring to the assumption that inquiry should be value-free.
Traditional methods guarantee inquirer neutrality and inquiry rigour and produce data that "speak for themselves", by virtue of the objective methodology employed. Guba and Lincoln (1982) argue that in naturalistic inquiry research is always value-bound which, they say, can be shown in the following four aspects:

i) in the choice of problem

ii) in the choice of paradigm

iii) in the choice of methods used to guide collection and analysis of data and in interpretation of findings

iv) in the context - the values that characterise 'sociobehavioural, human, organizational phenomena'.

The aims of objectivity, according to Guba and Lincoln, 'ought, therefore, to be removed from the inquirer and placed on data'.

With reference to the above four corollaries - problem, paradigm, methods and context - I have attempted in the course of my research both to justify each choice
individually and to show that careful consideration has been given to the degree to which they fit together, which Guba and Lincoln term 'congruence' or 'value-resonance', in order to produce meaningful, confirmable findings.

The choice of problem and paradigm having been discussed above, I now move on to outline my research methods. (The question of context-values is addressed in later chapters, as different settings and situations are described).

3.4 Research methods

There are a wide variety of research methods associated with the naturalistic paradigm. The ones employed here and outlined below were selected on grounds of appropriateness to the chosen problem and adequacy for the investigation of that problem.

3.41 Triangulation

Prior to making a specific choice of method I made the decision to use the technique of triangulation, a multimethod approach in social science research. Triangulation is defined by Cohen and Manion (1980) as
'the use of two or more methods of data collection in the study of some aspect of human behaviour'.

whereas the single observation in fields such as medicine, chemistry and physics normally yields sufficient and unambiguous information on selected phenomena, it provides only a limited view of the complexity of human behaviour and of situations in which human beings interact ..... Exclusive reliance on one method, therefore, may bias or distort the researcher's picture of the particular slice of reality he is investigating.

(Cohen and Manion, 1980.208)

In order to be sure that the data generated are not simply artefacts of one specific method of data collection, the researcher needs to demonstrate that different methods of data collection yield substantially the same results. Cohen and Manion (1980) give five situations in which the multimethods approach is appropriate:

a) Triangular techniques are suitable when a more holistic view of educational outcomes is sought.

b) Triangulation has special relevance where a complex phenomenon requires elucidation.
c) Triangulation is appropriate when different methods of teaching are to be evaluated.

d) Multiple methods are suitable where a controversial aspect of education needs to be evaluated more fully.

e) Triangulation is useful when an established approach yields a limited and frequently distorted picture. (Cohen and Manion, 1980.214-216)

The above five situations are relevant to the present research project. The specific methods I used were case study, observation and interviews.

3.42 Case study

The case study method is used extensively in naturalistic inquiry. Nisbet and Watt (1978) define it as 'a systematic investigation of a specific instance' which aims to illuminate some more general principle.

The case study looks at a single instance, and aims to identify the unique features of interaction within that instance .... the case study provides suggestions for intelligent
interpretation of other similar cases ..... It is a style of inquiry which is particularly suited to the individual researcher, in contrast to other styles which require a research team (Nisbet and Watt; 1978.3-9)

Case study characteristically employs a variety of techniques and goes through three stages (Nisbet and Watt). The first fairly lengthy 'open' phase seeks a general impression of the area to be studied and avoids prejudgement. The second, 'focus' stage is entered when the researcher begins to identify the central events or issues of a situation from the 'open' phase. These are focused upon and hypotheses tentatively formulated. The collection of evidence then becomes more systematic. The third stage involves a written draft of theoretical interpretations.

My own case studies were conducted in four departments of Higher Education. They are presented here cross-sectionally, as issues were explored simultaneously in all four departments. Finally, I presented two complete case studies on their own.
3.43 Observation

The purpose of observation in naturalistic inquiry generally and case study in particular is to afford the researcher the opportunity to gain a general impression of the features of a situation or setting as a whole, from which he may then be able to extract its more significant characteristics for further investigation. Of the two main types of observation - participant and non-participant - the non-participant observer remains apart from the activities he is investigating, whereas the participant observer engages, to various degrees, in those activities. Cohen and Manion (1980) maintain that the latter, participant observation, is eminently suitable for many of the problems that the educational investigator faces and that its advantages are:

a) Observation studies are superior to experiments and surveys when data are being collected on non-verbal behaviour.

b) In the observation study, the investigator is able to discern ongoing behaviour as it occurs and is able to make appropriate notes about its salient features.
c) Because case study observations take place over an extended period of time, the researcher can develop a more intimate and informal relationship with those he is observing, generally in more natural environments than those in which experiments and surveys are conducted.

d) Case study observations are less reactive than other types of data-gathering methods. For example, in laboratory based experiments and in surveys that depend upon verbal responses to structured questions, bias can be introduced in the very data that the researcher is attempting to study.

(Cohen and Manion, 1980.99-108)

In order to conduct observations I attended lectures, practical laboratory sessions, studio work and seminars. I took notes of such aspects as the number of participants at each session, the activities which took place and what was said and by whom. In lectures I behaved 'as if' I were a fellow student, taking notes and copying diagrams. I made a separate note of my impressions and later summarised the session. These methods correspond to Schatzman and Strauss' (1973) definition of different types of note taking as 'observational notes' (ON) and 'theoretical notes' (TN).
The two main advantages of early observations were that they:

a) established an informal relationship with students and lecturers I intended to interview at a later date.

b) significant features began to emerge which would provide focus for later work.

After this early phase I continued to conduct observations, building up a continuous record of events in progress. These later observations, however, were more purposive and often attempted to test out theories developed during the course of analyses of earlier observations and subsequent interviews.

3.44 Interviews

Parlett (1978) states that interviewing falls between conversation (undirected, very informal, open, rambling) and interrogation (highly structured, information producing, control vested in the hands of the interrogator, often pre-ordained or worked out in advance, clear direction). Parlett maintains that there is no degree of structure which is 'correct', but that it must depend upon the degree of appropriateness or
amount required at the particular stage of the study. Accordingly, I employed a predominantly open-ended, semi-structured type of interviewing technique during early interviews, graduating to a greater degree of structure as areas for investigation became more selective. At each stage, however, I was prepared to be flexible according to the response of individual interviewees.

Having negotiated the use of a tape-recorder with interviewees (none objected) I also took notes throughout interviews. Interviews were then transcribed from the tape recordings, compared with the notes and analysed with the intention of identifying emergent categories of concern. At various points during this process I discussed the validity of my interpretations with colleagues.

3.45 Analysis and Interpretation

The development and presentation of interpretive theories in this present research are in the nature of models, or what Guba and Lincoln (1982) term 'working hypotheses', temporary assertions about context-specific situations. Such models are a feature of naturalistic research and perform the function as described by Harre (1970):
Theories are seen as solutions to a peculiar style of problem: namely, 'why is it that the patterns of phenomena are the way they are?' A theory answers this question by supplying an account of the constitution and behaviour of those things whose interactions with each other are responsible for the manifested patterns of behaviour ..... To achieve this a theory must very often fill in gaps in our knowledge of the structures and constitutions of things. This it does ... by conceiving of a model for the presently unknown mechanism of nature ..... In a creative piece of theory construction, the relation between the model of the unknown mechanism and what it is modelled on is (also) a relation of analogy.

(Harre, 1970.35)

Models are employed in naturalistic research in the above way, in that they aim to supply an analogical account of the underlying interactions of the patterns identified during the process of data collection and analysis. Eisner (1981) maintains that the naturalist does not seek to uncover 'truth', but to create meaning. As such, his success depends very much upon the potential for recognition his work holds for the reader.
For this reason Eisner terms such research 'artistic' as opposed to 'scientific'.

I have attempted at each stage of research to delineate the process of model development in order to allow the reader to judge its relevance and applicability.

3.5 **Summary**

This chapter has addressed:

a) The nature of the research problem

b) the choice of a paradigm for research and the questions to be addressed

c) The steps taken to safeguard trustworthiness

d) The choice of research methods
CHAPTER FOUR

PILOT STUDY

4.1 Purpose of Pilot Study  

4.2 Organisation of Pilot Study  

4.3 Findings of Pilot Study  

4.4 Summary  

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4.1 **Purpose of Pilot Study**

As outlined in previous chapters, my broad area of concern was with the effects upon students' views of knowledge of the fragmented structure of knowledge within the education system, with particular reference to the division between the arts and sciences. After the literature review and methodological discussion I felt that the next step would be to conduct a pilot study to aid in the decision-making processes of the following three areas:

a) to determine the most appropriate size and type of sample

b) to test and refine research techniques

c) to begin to explore issues covered by my research questions, analysis of which data would provide a starting-point for the main study.

The following two sections describe how I organised these three tasks and the decisions made in the light of findings.
4.2 Organisation of Pilot Study

a) Size and type of sample

It was necessary for my sample to include an example from both the arts and the sciences. Although my concern with this divide had originated whilst teaching in the Primary sector, subsequent reading had led me to the opinion that it is possibly from the Tertiary sector that most influence is brought to bear on the whole education system. It both puts pressure on schools with regard to entry requirements and produces prospective school teachers. I, therefore, decided to conduct my research at the level of Higher Education.

I negotiated access into one science department - Biology - and one arts department - Fine Art - of an institute of Higher Education offering CNAA degree courses. This I did by sending a letter followed by a telephone call. In each case I was invited to the department to discuss my project. I had decided to focus upon the second year of the three-year degree courses, as I felt that students at this stage would be familiar with their subject areas but not yet preoccupied with the prospect of final examinations.
I was granted access to a practical laboratory session lasting three hours weekly and a weekly two-hour lecture in the Biology department. In the Fine Art department I was granted access to a weekly two-hour theoretical studies lecture and was free to contact students working in the studios. I attended both departments for six consecutive weeks. There were approximately twenty students on each course.

b) Research Techniques

During the six weeks in the two departments I acted as participant observer, sitting amongst the students during lectures and moving freely from group to group during the Biology practicals and Fine Art studio sessions. Observations made were general, exploratory and primarily intended to gain overall impressions of and insights into departmental ethos. After the first two weeks I began to take notes on such aspects as topics presented, teaching style, participants in discussions, responses to questions and student interaction. After each session I added my own interpretations separately. I also aimed to familiarise myself with the processes and people involved.

Towards the end of the six-week period I asked for volunteers to "come and talk to me for half an hour"
about their courses, explaining that I, too, was a student and would appreciate their help with my project. This technique, I felt, successfully disassociated me from the lecturing staff. I obtained a total of twelve volunteers, six from each group. Having arranged times of mutual convenience and located empty rooms in which we could talk privately, I interviewed the twelve students individually, using a tape recorder and taking notes. Each interview lasted from between thirty to sixty minutes, the duration determined by the student's desire to talk. Interviews were semi-structured, the structure provided by my own direct questions, usually at the outset of each interview, followed by an unstructured session (usually the longer of the two) in which I encouraged students to talk freely.

c) Issues addressed

Issues relating to my research questions (outlined in 3.32) were addressed through observations and interviews. Observations attempted to gain an early overall impression of the departments studied. Interviews addressed the following two areas:

i) My own concerns
I was interested to discover the background to students' present choice of specialisation, with particular reference to arts-science choices made at 'A' level in school.

ii) Students' concerns

Students' perceptions of their present courses as expressed in open conversation.

4.3 Findings of Pilot Study

The pilot study provided insights into and aided decision-making in each of the three areas I had set out to probe.

a) Size and type of sample

The process of conducting the pilot study alerted me to the necessity of expanding my sample: I felt it could not be assumed that two departments only would be sufficiently representative of the arts-science sides. I, therefore, determined to negotiate access to two more departments in the same institution.

Interviews with students in the Biology department revealed that they were looking forward with
pleasurable anticipation to the opportunity – at present under discussion with their tutors – of conducting projects of their own choice. They were also in the process of choosing coursework options. The students attached great importance to this aspect of their course. Fine Art students revealed that they had not long begun the particular theoretical studies course I was attending and that it was to continue throughout the course.

Data from the two departments, therefore, resulted in the decision to work in four departments and to interview students during the following year.

b) Research techniques

Observation notes at the outset were copious, all-encompassing and, consequently, difficult to analyse. Over the six-week period I developed a more succinct note-taking technique and devised a method of analysis, based on colour-coding, which facilitated the identification of emergent patterns for further attention.

Analysis of early interviews, through listening to tape-recordings and reading notes, revealed areas of ambiguity. I, therefore, made the decision to attempt
to clear up such problem areas as the interview progressed, also to go back over the complete interview with the student immediately after the end of the session in order to further clarify students' views. I found that this latter technique often resulted in the student talking in a more relaxed manner, enlarging upon his/her ideas, or having second thoughts. For this reason I left the tape recorder running after I had thanked the student and closed my note book. I also decided to transcribe interviews to aid analysis, which I could then colour-code, as I had begun to do with observation notes. This technique provided the opportunity for cross-checking the validity of issues identified.

c) Issues addressed

Observations:

Lectures and Practicals in the Biology department were highly structured and entirely subject-specific. Lectures were formal and took the form of the intensive transmission of 'facts' for the one hundred students present to note down and memorise. These lectures were intended to provide a theoretical background to the subsequent three-hour practical sessions in the laboratories. However, difficulties with organising an
over-subscribed course had resulted in the group of students with whom I was working having to attend the lectures two days after they had carried out the Practical session.

The Practicals began with a blackboard demonstration of the experiment to be performed, its method and results which was then undertaken by the whole group, students working in small groups. Casual conversations with students during the course of their work suggested that their priorities were:

i) to learn to use the laboratory equipment successfully

For example, when asked what he gained from Practicals, the following student gave a typical response:

You get the handling of the equipment out of it ... familiarity with the techniques more than anything

ii) to produce an acceptable write-up for later assessment.

During the course of Practical observations many students revealed in casual conversation that they were
concerned to get 'good marks' for the subsequent write-up. For example, one group of three students were having difficulties with their equipment. When asked what they usually did in such circumstances (regarding successful completion and understanding of the task) one of the students replied:

We just make up the result, or copy somebody else's. You don't want to get poor marks for it, for the write-up

Lectures in the Fine Art department were sometimes subject-centred, as in History of Art, and sometimes of a more general nature, as in Philosophy. Lectures were characterised by their informality, students being invited regularly to interrupt the lecturer for the purposes of clarification or disagreement. Discussion after the delivery of the lecturer's prepared topic was encouraged by lecturers, who commonly adopted the technique of requesting alternative viewpoints. The discussions were often lively, but sometimes desultory. Lectures in this department were rarely attended by more than thirty students, as attendance was optional, although students were required to attend a minimum of two weekly courses from the possible six throughout the year. Lectures in theoretical studies were intended to provide an overall
framework and background to the course in order to provide a broad resource for students' individual studio work and for their essays, the topics of which were negotiated between student and personal tutor. Casual conversations revealed a wide variety of views, ranging from those students who found the lectures "very useful" to those who found them "irrelevant" to their work.

The following students' comments illustrate this finding:

I've found the Philosophy lectures very useful. It helps you quite a lot to go to those ... with your thesis.

I've been interested in the theoretical work from the first year ... Otherwise you don't really think about what you're doing.

You don't get much from it ... you get more help from other students. Anyway, it's not very relevant to my painting and printmaking.

Studio work was entirely individually organised, each student being expected to discuss and justify his or her work once a term to the personal tutor and two other members of staff, with the accent upon "visible
personal development". Most students said that these sessions were helpful, a few finding them a source of frustration or conflict.

For example:

You get a lot of help from tutors. We have a personal tutorial every term and three tutors discuss your work with you ... the progress you've made. I find it good, because other people have different perspectives ... so ... it helps you understand

I know what I'm doing, but in the tutorial they kept trying to get me to change my style - less 'precious' and more 'free' ... I just got angry

Specific skills were taught individually or in groups as the need was perceived by the student during the course of his or her studio work.

Early analysis of observations suggested that:

i) The Biology course centred around the accumulation of objective knowledge to be learned.
ii) The Fine Art course centred around the development of subjective meaning.

I was aware that these differences may well be attributed to the large differences in numbers of students attending lectures as well as to the nature of the subject area. However, numbers in Biology practicals and in Fine Art lectures and studios were comparable.

Interviews

i) My own concerns

I asked each interviewee which subjects he/she had taken for 'A' level at school and then why those subjects had been chosen.

I found that many had been interested in taking an arts-science mix at 'A' level when required to choose their subjects at 16+. Of those, only two had been able to do so. The reason for lack of opportunity was attributed, in every case, to the organisation of the school timetable. Fig. 1 shows the distribution of numbers.
## Arts-Science Mix at ‘A’ Level

<table>
<thead>
<tr>
<th>‘A’ Levels at School</th>
<th>Biology Students</th>
<th>Fine Art Students</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arts/Science Mix Taken</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Unfulfilled wish for Arts/Science Mix</td>
<td>4</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>No Wish For Mix</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
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</table>

Figure 1
Of the two who had taken an arts-science mix, the Biology student had taken English Literature, Biology and Chemistry. She explained that she was very interested in literature and that she felt she could now write a reasonable assay, whereas some of the other Biology students were not very confident about it.

The Fine Art student had taken Mathematics, History and Art. She explained that she had obtained an 'A' grade in all three subjects and had considered taking a degree course in Mathematics, which she very much enjoyed. She was now considering taking an Open University degree in Mathematics after she had completed her Fine Art course, though she added:

Maths is too narrow, too closed in on itself, whereas Art looks out at the world ... well, it can do if you want it to

Of the four Biology students who regretted the opportunity to mix arts and sciences at 'A' level, all said they would have preferred to continue to study English Literature. The reasons given were that of enjoyment and, typically:

It would have helped me with essay-writing now. People find it hard to express their ideas.
Of the Fine Art students who regretted the opportunity to mix arts and sciences at 'A' level, all said they would have liked to continue to study Biology. The reason given, in each case, can be typified by the following student's remark:

It's useful for basic knowledge of anatomy. I'm finding my 'O' level Biology useful now.

Thus, the reasons given for the desirability of an arts-science mix were related by students to practical help with their present chosen specialisations.

A lack of opportunity to mix arts and sciences at school had been identified, as had a regret, albeit retrospective, at that situation. (These students had studied for their 'A' levels between 1982-84. The increased provision of post-16 education since that time has given greater flexibility of choice.

I next asked students why they had chosen their present degree courses.

In most cases the students had opted to continue to study their strongest subject at 'A' level. Five of the twelve students, however, had been obliged to accept their second choices. This was either because courses
of first choice had been withdrawn, or because they had applied after courses were fully subscribed. In each case in which an alternative had been accepted it was closely related to the subject of first choice. All students either volunteered or implied that they were now immersed in their present subject area. For example:

I considered doing a ceramics course, but it's too risky job-wise. I'm glad I chose Biology now. It's interesting.

ii) Students' own concerns

I invited students to tell me how they were finding their courses. Their responses tended to fall into two main categories: namely, what they liked least and what they enjoyed most.

Biology students expressed three sources of frustration.

a) volume of work too great

For example:

It takes me nearly all my time to get the Practicals written up. We've got a pretty full
timetable as well, so I don't get any time for background reading.

b) too much direction from tutors

For example:

Dr. D tells us at the beginning of Practicals what results we're supposed to get, so ... it's just going through the motions really ... sometimes I wish I could follow up some of the interesting things that turn up ... to see what's causing it. You know, experiment a bit

c) lack of opportunity to discuss the meaning of their work

I had observed over the six-week period that there had been no discussion sessions at the end of Practicals. I asked several students whether they had the opportunity to discuss their work with lecturers at any other time. Although the lectures were intended to provide background theoretical explanations for the Practicals, students expressed a degree of frustration at the lack of opportunity to discuss either problems encountered during Practicals, or the wider meaning of the work.
For example:

The topic's given for discussions in seminars. It's just extra work, really. You could go and find one of the lecturers to discuss your work ... if you're having trouble with it ... but I don't think they're that interested, really

and

... The only time I ever talk about biology is when I'm with flat-mates from other courses. We don't talk about biology as such on the course ... it'd be interesting ... Biology covers everything going on in the world

Fine Art students expressed an opposing frustration

a) too little direction from tutors

For example:

The tutors here are a bit apathetic ... I think they should tell you something you don't know
I think the tutors are superfluous. I get more from books ... and from discussions in the studios

Biology students enjoyed the following aspects of their course.

a) Conducting projects of their own choice (at present being planned)

For example:

I can't wait to get started on my project. It'll be a real change to choose something that's your own choice ... I haven't finally decided what I'll do yet

and:

I'm a bit nervous about the project ... I haven't done one before, but I'm looking forward to it ... I expect I'll choose one from the list

b) choosing specialist options for their final year
For example:

I'll be able to concentrate on the things I enjoy most

and

The subjects I've chosen are the ones I'm really interested in. I'm hoping to go into genetic engineering afterwards

Fine Art students reported enjoying two main aspects of their course

a) the opportunity for individual studio work
   (running throughout the three years)

For example:

I find the course fulfilling - working in the studio ... I've found art work helps you work out your problems

and

If you paint it's all self-discipline. I think everyone should do a Fine Art course to find out who they are ... the means to express themselves
b) the wide-ranging discussions in some of the theoretical studies courses.

For example:

We have lots of discussions - after lectures, as follow-up ... in seminars, in the studios ... and in a lot of the theoretical studies lectures.
Some of those are great. We talk about anything and everything on this course ... Hearing a lot of different viewpoints helps you understand

The above analysis showed patterns of student perceptions beginning to emerge. However, during analysis it was noticeable that some students were more critical and spoke in a generally negative way about their courses, whilst others expressed predominantly enthusiastic feelings. For example, the following two comments illustrate the negative feelings.

When I've finished this Biology course, that's it. I've had enough of education.

I don't like the attitude of the course. Fine Art is just a degree for a degree - you're expected to become a painter. The course is very elite and pretentious
In contrast, the following two quotations were taken from interviews of students who expressed enthusiasm for their courses.

I've always been interested in Biology. I'm enjoying it very much ... We can go into a lot of different fields, because we get the skills and the knowledge here.

Fine Art gives you a grounding for so many things ... I've really enjoyed it so far, especially the theoretical studies lectures.

Although examples of each standpoint were to be found in both departments, the enthusiastic students were mostly from the Fine Art department and the more negative students from the Biology department.

4.4 Summary

Analysis of data from the pilot study aided the decision-making process in the three problem areas.

a) Size and type of sample

I made the decision to work with students in four departments - two arts and two sciences - during the
following year, when projects would be in progress and theoretical lectures had been running for longer.

b) Research techniques

Methods of observation, interview and analysis were refined to provide greater clarity and efficacy.

c) Issues addressed

i) an arts-science preference was not necessarily exclusive, though students tended to become immersed into their chosen subject area

ii) the two departments were very different in course structure and approach. The type and amount of structure may be related to nature of subject area

iii) students stressed the importance of conducting their own work and of engaging in discussion

iv) a positive-negative dichotomy was identified regarding students' perceptions of their courses.

This early investigation into the issues surrounding my research questions provided areas on
which to focus for the main study. I had established that, given the opportunity, some students might well have chosen to study a mixture of arts and sciences. Now, however, they were immersed in their present subject specialisations which would provide the next area for investigation. Analysis of interview data regarding students' perceptions of their courses suggested that markedly different approaches existed towards the experience of Higher Education. It also suggested that students held a variety of epistemologies.

I felt it was now important to sample more widely and probe more deeply into these approaches. I aimed to identify representative types of student epistemology and to discover how they are influenced. This work comprises the following three chapters. As work in this area would need to focus upon student and staff perceptions, these three chapters concentrate entirely upon data collection and analysis from interviews.

The next chapter describes the first phase of the main study.
CHAPTER FIVE

FIRST PHASE OF MAIN STUDY

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CHAPTER 5: FIRST PHASE OF MAIN STUDY

5.1 Introduction

The previous chapter described the pilot study - a decision-making process which resulted in the following:

a) to expand my sample to include four departments of Higher Education.

b) the refinement of methods of observation, interview and analysis

c) to probe more deeply into students' perceptions of their courses in order to identify different types of student epistemology

The present chapter, then, sets out to address the following question:

- What different types of student epistemology can be found in departments of Higher Education?

I begin by describing the revised sample, followed by the procedure adopted, the analysis of data and, finally, the findings - the identification, with
illustrations, of four representative types of student epistemology across the four departments studied.

5.2 The Sample

I retained the original two departments - Biology and Fine Art - and negotiated access to two more - History and Physics. I now had four departments, two arts and two sciences, within which to conduct fieldwork during the following term.

Preliminary interviews in the two new departments, History and Physics, produced data which reinforced the pilot study findings in that:

a) the science course, Physics, appeared to be more highly structured than the arts course, History.

b) students expressed similar concerns to those expressed by Biology and Fine Art students during the pilot study; namely, the importance to them of conducting work of their own choice and the opportunity for discussion, either formal or informal.

c) widely varying perceptions of courses existed, ranging from positive to negative.
5.3 Procedure of data-collection

As my intention at this stage was to attempt to identify different types of student epistemology, I decided that this could best be achieved by means of further semi-structured interviews. I, therefore, decided not to conduct observations at this stage (although this technique was employed again later in the research).

I introduced myself, as before, as a student from another institution needing volunteers to help with my research project, which I described as "to find out why students choose their courses and how they are finding them". The former explanation - of my identity - sought to establish myself as a fellow student and, thus, enlist their sympathy whilst, at the same time, disassociating myself from the staff. The latter explanation - the description of my research project - was phrased with the intention of demonstrating that my interest lay with the student's personal feelings and, as such, would pose little threat.

There were between fifteen and twenty students present in each of the four groups addressed. Response to my requests for volunteers to talk to me was varied, ranging from enthusiastic (Physics students), needing a
little coaxing (Biology and Fine Art students), to the need to approach each student individually (History students). In the event I interviewed ten students from each of the four departments.

Arranging times and places of mutual convenience I conducted semi-structured interviews, attempting to both elicit information concerning students' perceptions of their courses and to encourage them to expand on their own concerns, as they arose in conversation. I stopped to clarify areas of ambiguity during the course of interviewing and, at the end of each interview, went over the main points which had arisen with the student.

5.4 Analysis of data

As soon as possible after each interview I played through each tape-recording and read my notes in order to gain an overall impression of the student's response. I later transcribed each one, writing notes both during and after transcription. Finally, when all transcripts were completed, I analysed cross-sectionally, looking for emerging patterns.

Early analysis of data resulted in the identification, in more depth, of the two categories of
students' perceptions of their courses noticed earlier on, in the pilot study:

a) those students with predominantly positive perceptions of their courses, who spoke enthusiastically and at length about a wide variety of issues

b) those students with predominantly negative perceptions of their courses, who spoke sparingly, their responses limited mainly to answering my own questions.

When all transcripts were analysed, however, there emerged a considerable body of students who could not be satisfactorily said to belong to either of these two categories, since they exhibited attributes of both. Careful re-reading of these transcripts, coupled with re-running of the tape-recordings, revealed that, whilst these students spoke enthusiastically and often at length, they expressed a degree of confusion and frustration with their courses. This group comprised a third category. Analysis had so far suggested three main categories of student perception for further analysis.
A - negative and unforthcoming
B - positive, talkative but confused
C - positive, talkative with good understanding of the course

I then undertook a detailed analysis of individual transcripts to see whether each student could be identified satisfactorily with one or other of the above three categories. This exercise resulted in the addition of a fourth category - students who had previously appeared to belong to category 'C', but who, on closer analysis, could be seen to have interests extending beyond their present courses of study and who either implied or expressed an interest in the nature of knowledge. These students were few, but merited the inclusion of a further category, category 'D'.

These categories, which were later seen as four different types of student epistemology, are described in full in the next section, accompanied by illustrative quotations for each type from all four departments.

5.5 Findings

I identified four main types of student epistemology - A, B, C and D. Membership of these categories was not exclusive, as some students appeared
to have a degree of overlap between A/B, B/C or C/D, although, in each case, the student could be said to belong predominantly to one category. However, to reflect the lack of rigidity of boundaries, I have devised the following model of student epistemologies: see Figure 2.

The above four types of student epistemology were found in the four departments, although the distribution was uneven (see table below fig. 2). The four types are now explained more fully and illustrated from students' quotations in order to make clear to the reader the grounds upon which I devised the categories and, subsequently, attributed membership. I have given two quotations from each department for each of the four categories (where possible). Students may be identified by means of the following symbols:

<table>
<thead>
<tr>
<th>Department</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology students</td>
<td>BIO 1 - 10</td>
</tr>
<tr>
<td>Fine Art students</td>
<td>FA 1 - 10</td>
</tr>
<tr>
<td>Physics students</td>
<td>PHY 1 - 10</td>
</tr>
<tr>
<td>History students</td>
<td>HST 1 - 10</td>
</tr>
</tbody>
</table>

5.51 Type A epistemology: definition and illustrations

This type of student sees knowledge as consisting of right/wrong 'facts' and his/her task as being
primarily to memorise information. Dissatisfaction is expressed if the lecturer does not provide easily assimilated factual information. This student displays low motivation and resents having to undertake background reading. Thinking is fragmented in that no connections are seen or sought between different parts of the course. Wider issues are seen as irrelevant. Most Type 'A' students have no intention of working within the subject after graduation, but see the purpose of the course as a means to obtain a 'good job'.

The following illustrative extracts from students' interview transcripts are presented in order to demonstrate that students categorised as holding a Type 'A' epistemology may be seen to hold corresponding views to the above definition.

1. Physics department

I think, at the end of the day, to get a degree, you don't need to know that much. ... I'm not interested in anything to do with science ... I didn't want to do it. It's because I want to get a good job. It's very boring. I think Physics makes you so narrow-minded. [PHY.2]
The better the notes you get the better you do in exams. Dr. X explains it and gives you notes on a spoon ... he dictates it all and you write it down. Dr. Y just comes in, scribbles a few things down, jumps to something else ... no continuity ... People doing Physics here, they don't really want to know "why am I doing Physics?."  

2. Biology department

You don't need to know it [the historical development of Biology] ... I don't know what research is going on in our department ... I don't read Physics and Geology articles in Scientific American ... I don't think physicists are doing that much. Physics is all laws and theorems.

- No second example here. I identified only one Type 'A' student in the Biology department.

3. Fine Art department

I identified no Type 'A' students in the Fine Art department.
4. History department

I don't know about enjoying it ... well, the way I feel I've just had enough now, basically ... quite a few people have. You've got a lot of time on your hands and it gets a bit painful. We sit in the Union and talk about doing some work, but don't do it ... not much motivation ... so ... I don't know ... HST.5

This year I'm just plodding along, fed up with it ... You don't need lectures or seminars, you can just get the books. I don't take notes in lectures ... it's not worth bothering. HST.9

5.52 Type B epistemology

This student also sees knowledge as consisting of right/wrong 'facts' but is prepared to work hard to learn them. However, he/she experiences problems with the work for which he does not blame the lecturer or method, but tends to assume that he is at fault. This student feels confused when alternative views are presented, has no academic interest outside the subject and sees the purpose of the course as a means to obtain a 'good degree'. The Type B student is often undecided about whether to seek employment within the discipline.
1. Physics department

I chose Physics because I like things to be right or wrong ... Things are either true or false ... with Physics you can't really disagree ...
Physics is so general, it's amazing. We have all these beautiful equations ... We had a one hour a week course last year on logic, but we don't really understand it.

The tendency is, on a theoretical Physics course, which is what we're supposed to be doing, is that people will tend to look into the theories behind things and do experiments about that. Myself, I'd rather build something that has a use ...
It's like the great big thing ... the accelerator, where they accelerate particles very quickly - that's no use to you. It furthers man's knowledge, but it's no use to the man on the street.

2. Biology department

It often happens that I don't get the right result. Sometimes it's because you don't fully understand how to work it out ... sometimes the preparation doesn't do what it's supposed to do,
so you just get a crib from somebody else ... 
that's the problem with Practicals. You could go and talk to a lecturer on your own about problems with Practicals, but I haven't. I don't think they want to see your results. 

There's no use for arts subjects in society, especially History and Geography. ... I'd throw out all the arts courses. ... Interaction between departments wouldn't be beneficial. Within the department the lecturers are totally different - what would be the point? ... I'm enjoying the course very much. I'm investigating why tadpoles develop two tails ... it's experimental, no-one knows why.

3. Fine Art department

You don't get much help from the lecturers, you get more from other students. I think the lecturers are pretty superfluous. They should tell you something you don't know ... Art is problem-solving - it's all self-discipline ... I want to be an art therapist
My work is not influenced by things and people outside ... Other subjects are too defined ... My relationship with tutors is a bit 'hit and miss' ... Art work helps work it out [personal problems] 

4. History department

... writing essays, I just used to copy out of books and hand them in [at school]. Here, you've got to think about what you're writing and try not to plagiarise. I've never had to think before ... at first I didn't know what I was supposed to be doing.

I've always leaned towards the Left. Coming here gave me the chance to find out more about it ... I'm very involved in the student 'occupation' ... I want to do Industrial Relations when I leave ... to try and fight the system.

5.53 Type C Epistemology

This student sees knowledge as consisting of a variety of interpretations and his/her role to explore the subject thoroughly. Motivation is good and a large amount of background reading is undertaken, although

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little academic interest is evident outside the subject area. The purpose of the course is seen as being to provide a good basis for later employment within the discipline.

1. Physics department

I think it's more development of attitude towards the subject rather than, "Go away, learn this and use it". It's more getting you to develop your own thoughts ... I'd love to see a course where more of that could be included - the historical background, the philosophical background, etcetera.  

PHY.10

I've learned a lot ... understanding how different areas of Physics clicked, which perhaps I didn't before - how they're all branches from the same trunk, whereas I thought before they were all different trees in an orchard ... Certainly, it makes you more open-minded about issues. You try and put both sides to an argument and then make up your mind, your own point of view 

PHY.4
2. Biology department

If you follow a course like this there's no way that you're going to go away and think, "Oh great! That was marvellous" and just not think about it any more ... You've just got to love the subject. I don't think you can do it for the money or the job prospects ... People have different views of things ... I prefer the argument-type to right/wrong answers ... Biology is wildly exciting

- No second example here. I identified only one Type C student in the Biology department.

3. Fine Art department

It's basically up to you to read journals and historical works ... it's a requirement of the course that you should do that. I've done it out of interest anyway ... You tend to find on an art course that a lot of people talk about art and what they should be doing and shouldn't be doing anyway, quite naturally, without it being timetabled ... [Where timetabled] I find it interesting. Other people may point out things I
haven't grasped about what we've just seen.

FA.10

If you move from photography to film you have to understand the language because it's completely different ... but theoretical studies is a very strong area for me ... to know that your work has come out of a knowledge of something ... at the end of the day your work has to stand on its own.

FA.8

4. History department

The course has got better as it's gone along ... Last year we were looking at the political economists ... and the perspective they were writing from ... What's happening now you can relate to what's happened in the past and understand ... This course is so broad ...

[History is] never just what went on. HST.2

- No second example here. I identified only one Type C student in the History department.
5.54 **Type D Epistemology**

This student sees knowledge as relative, consisting of a variety of alternative interpretations and depending upon context. His/her task is to explore widely both within and outside the subject. Motivation is very high and intellectual challenges are welcomed. Usually intending to work within the discipline regardless of financial reward, this type of student frequently describes the purpose of the course in terms of the development of thinking skills.

1. **Physics department**

I live with students from Biology, Maths, Computer Science, Civil Engineering. We all sit round and discuss each other's subjects. It was the Biology student who came up with the idea for my project on guitars. You listen to the discussions at mealtimes and get completely different points of view that way ... There's no communication between departments ... and I think that's a shame. There's all this information floating around this department, but people never talk to each other - which is getting back to my interest in language and communication ...
science of language and the language of science.

... appreciating that there's a huge amount that you don't actually know ... it forms a basis for you to be able to go out and find things out for yourself afterwards ... it gives you a wider background, not just to Physics, but other things around it - appreciation of other people's sciences ... If we did more of that, just having a lecture on a series of lectures, just talking about where it came from and put it in perspective a bit ...

2. Biology department

I identified no Type D student epistemologies in the Biology department.

3. Fine Art department

Everybody perceives things in different ways ... I live with a mechanical engineer. He consults me about questions of design ... Only just recently I've discovered the link between my philosophical work and my art work. ... There should be a level, in one sense, where not
everything is fully explained, because once it's explained you might as well not make a work of art. FA.9

If you've no problems you're not working very well. Last year, the people getting 'firsts' were evidently struggling with problems. It's something ... fresher. I think on this course there's probably a lot more thinking going on ... you're continuously having to think about things. You're confronted by what you're doing and you're having to say why all the time and question things. As far as I can see education is mostly to do with being self-motivated and conscientious about your own needs as much as being taught. If you want to find out about something you go off and find out about it and not say it was a lot of hard work reading the books. FA.3

4. History department

I identified no Type D student epistemologies in the History department.
5.55 Model of Student Epistemologies

The four types of student epistemology illustrated may be seen as ranging from a fragmented (F) to a more relative (R) view of knowledge, as illustrated by Model I: Figure 3.

As well as reflecting the lack of rigidity of boundaries, the model implies movement along a continuum. I am aware that the students were interviewed during one term only of their three-year courses and, therefore, that data could not show whether the individual student had moved or would move along an F→R continuum during his or her course. Only a longitudinal study over the three years could provide satisfactory data on this question. However, indications that this was the case in some instances could be inferred from student's comments of the type:

e.g. "I used to think x ... now I think y" implying that development does take place.

5.56 Table of distribution of student epistemologies

As has been stated above, Model I reflects the fact that some students did not fall immediately into one particular epistemological category and closer analyses
of interview transcripts had been necessary. This allowed the ascription of individuals to the categories which their key constructs represented and resulted in Fig. 4.

Analysis of Fig. 4 reveals that, of the 40 students interviewed, 20 - exactly half - fall into the category B, which I have defined, briefly, as enthusiastic but confused. However, analysis of the individual departments reveals that the majority of Biology and History students fall into the categories A and B (BIO = 9:10, HST 9:10), whereas the Physics and Fine Art students fall in larger numbers into the categories C and D (PHY = 6:10, FA - 6:10). There was no ready explanation for this phenomenon at this stage of the research, neither could a difference been seen between arts and sciences.

I am aware of the possibility that, given different groups of students within the four departments, or a larger number of volunteers from within the departments studied, data might have produced an alternative distribution of student epistemologies. My intention at this stage, however, was not to assess the epistemological state of separate departments or disciplines, but rather to attempt to identify representative types of individual student epistemology.
Table of Distribution of Student Epistemologies

<table>
<thead>
<tr>
<th>Epist. Types</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHY</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>BIO</td>
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<td>8</td>
<td>1</td>
<td>0</td>
<td>10</td>
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<tr>
<td>FA</td>
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<td>4</td>
<td>3</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>HST</td>
<td>3</td>
<td>6</td>
<td>1</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>6</td>
<td>20</td>
<td>8</td>
<td>6</td>
<td>40</td>
</tr>
</tbody>
</table>

Figure 4
and, later, to suggest what factors might have an influence upon their development. The analysis of the distribution of student epistemologies across the four departments is, therefore, indicative, at this stage, only of the epistemological stance of the individuals and groups studied.

5.6 **Summary**

At the beginning of this chapter - the first phase of the main study - I set out to answer the question:

What different types of student epistemology can be found in departments of Higher Education?

I subsequently identified four different types, A - D, ranging from fragmented to more relative views of knowledge. An analysis of each interview transcript led to the discovery that there was an uneven distribution of the four types of student epistemology across the four departments studied. Moreover, no immediate difference could be identified between arts and science departments. This phenomenon remained unexplained at this stage.

The next chapter - the second phase of the main study - attempts to find explanations both for the
differing epistemologies held by students and for the uneven distribution found across the four departments. Analysis has so far focused upon individual students' broad perceptions of their courses. Attempts to find explanations underlying the present findings would, it is felt, require attention to more specific factors within the data, with attention to the differences between departments rather than between individual students. It was also felt that it was important, at this point, to interview lecturers in each department.
CHAPTER SIX

SECOND PHASE OF MAIN STUDY

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6.1 Introduction

The previous chapter described the identification of four different types of student epistemology across the four departments. These epistemologies ranged from a fragmented to a more relative view of knowledge and were illustrated by model I.

The epistemologies were found to be unevenly distributed across the four departments.

The present chapter sets out to address the following question:

What factors seem to influence the incidence of these different types of student epistemology?

To this end I conducted data-analysis across the four departments of student interview transcripts and interviewed, for the first time, one lecturer in each of the departments.

The chapter ends with the identification of three main factors which may be seen to influence the incidence of the different types of student epistemology
and the development of a second explanatory model - Model II.

6.2 Physics Department

In the previous chapter, the 10 Physics students interviewed were classified as holding epistemologies as follows:

Type A epistemology - 2 students
Type B epistemology - 2 students
Type C epistemology - 3 students
Type D epistemology - 3 students

I analysed student interview transcripts and that of the interview with Dr. X, with the intention of identifying the factors which most seemed to influence student epistemology. The analysis is described below with supporting quotations from interview transcripts.

6.21 Analysis of Interviews

Students volunteered many comments on the teaching methods used on the course. These were perceived as playing an important part in their understanding of the subject. The following student
illustrates the expectation of understanding on the part of students:

The most important thing in lectures, I'd say, is the significance of something; actually say what it's used for, rather than wondering, "why am I doing this?" ... We did a thing with Dr. X on Maxwell's equations and it was just pages and pages of equations and someone asked him, "why are we doing this?" and then he explained why ... and then it was accepted.  

Another student mentioned the pace of lectures as sometimes presenting a problem to understanding:

One or two lecturers are very organised, but one or two go through very quickly, too quickly, and expect you to follow it up in your own time. I like to be given notes, but if they're going fast all you can do is take down notes, then afterwards you might find you don't understand it

But he added:

We have two problem-solving classes a week with Dr X. If you don't understand because you've
missed a small point, if the lecturer goes back over it, then it 'clicks'.

In this department Dr. X provided problem-solving classes in which students could ask about any aspect of the course with which they were experiencing difficulty. Many other students mentioned these sessions. For example:

In the problem class, Dr. X either gives a two-hour paper once a week - it's an exam-type structure, but open-book: you're given the subject beforehand, then there's feedback. Or, it's a tutorial. That is, a question is posed to the lecturer to explain. Dr. X can find out about anything. People stay awake! It's very useful.

And another:

It's better if the problems (for problem classes) come from the students. The lecturer takes a problem once a week, goes over it, then the next week we answer a paper on it. It's very useful and helpful, especially with 'quantum'.

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Yet another student gave an example of the range of aspects covered in the problem classes:

In one problem class we asked him (Dr. X) to go through a set of lectures we weren't quite clear about and he just took us right through from the beginning right to the end and I thought that was quite good - a lecture on a series of lectures ... just talking about where it came from and put it in perspective a bit

And added:

We did Quantum Mechanics and we asked Dr X. to go through it and he went through the history of it and ... because it's a bit abstract ... and so after he'd done that it was much easier to understand. Very useful ... quite good.

Dr. X revealed his motive for supplying these sessions:

I enjoy taking young people through the process of understanding what ... your mind is for, in effect ... which is why I lecture in the department on subjects such as problem-solving.
From these quotations it would seem that Dr. X's teaching strategy was student-centred. The following student's observation suggests that this may be a general departmental approach:

I quite like lecturers who don't write everything up, but write up half of it, then you're made to listen ... we can interrupt in lectures; it's quite easy-going.

PHY.1

Another student commented more specifically upon the departmental approach towards the subject of physics itself:

They never say, "Well, this is true and that is it", unless it's something they know to be true. Otherwise, they say, "It's been discovered that, to date, as far as we know ... You know, you are let know that this can't be proved or disproved. Like the falsifiability thing. You know, you keep going until you find something that knocks the theory over.

PHY.3
This aspect of the perception of the subject area and the way in which it is presented to students was made clear when Dr. X told me:

Quantum Mechanics has got problems which are not sorted yet ... You see, this is another of the things that people misunderstand about science. Science is not about truth. Science is about producing usable solutions to problems and that's what you've got to get over to your students - that when people talk about, "Well, what is a real answer?" you don't know. You can only throw away all those things which are false. ... It was Koestler who said that scientific research is the art of the soluble.

Apart from commenting upon the type of teaching in lectures, students often referred to Practicals, making clear in the process what was expected of them in the department. The following three students illustrate this point:

You listen to the theory in class and it helps you understand. It gets you to know the equipment, to know where the errors are and gets you to appreciate that there are errors, even in quite sophisticated equipment ... Errors could
be yours, or in the equipment. You have to find it. If it's the equipment, that's okay, but if it's yours, you have to do it again.

PHY.1

You do it (the experiment), go and look at the result. If it's wrong you do it again - you're usually not very far out. I did one which was miles away, for instance, and found that I'd done the sum wrong at the end.

PHY.3

It's a personal write-up. You have ... as far as the introduction, it's the whole aim, what was the purpose of the experiment, then you write down the theory involved and then the method - putting theory into practice. Then you write down your results and draw conclusions from your results ... the conclusion is the important part ...

"I drew this from this, but because I had such-and-such an error, this could have gone wrong with it ... and ... this is how you can correct it. ... If it's corrected, then this result turns out.

PHY.8
The problem of a heavy workload was mentioned by two students. (These were the two students identified in Chapter Five as holding a Type A epistemology). They were finding the course difficult to cope with for three reasons:

There's a lot of information to take in this year ... notes are quite detailed, so a lot of it depends on reading the books, that kind of thing. You go to the library and find the books are out.

He asks if there's anything bothering you ... although nobody bothers to ask, because if you do he gives you questions to answer and that's extra work and we have enough work as it is ... At the moment there's too much work to stop and do things like that ... four nights a week just writing up Practicals - to do it properly - and that's without anything else.

The former student's worry about background reading and the latter's about problem classes and the time taken to write up Practicals were aspects mentioned by the other members of the group as presenting no difficulty, or as
being very useful. The only other student who referred to the heavy workload did so in a more positive way:

I don't think the course supervisors and those who structure the course are throwing too much at the student. But I think that, by the very nature of the subject, the student does tend to think that he's being put under a lot of pressure. I think you accept that when you go onto a science course, especially a Physics degree course. I don't think they want to see us crack up, have nervous breakdowns.

PHY.10

However, later on in the same interview, this student did offer criticism of the heavy workload, which he considered could be rectified by the lecturers. Firstly, he claimed that there were too many Practicals to be tackled, that the lecturers had increased the number. In the previous year, he said, the student had to complete as many as he could, then use the best ten for assessment. However, this year the lecturers had decided to take the best twenty, which meant that he had to spend five or six hours every weekend writing-up and that this time represented only 2-3% of the examination. He conceded that the write-up is an important part of
the Practical, but that a lot of it "is parrot-fashion copying out". He explained:

They give you a sheet saying "Do this, do that, do this, do that" and they give you results and what have you ... what you will hand back to them is another piece of paper, saying "I did that, I did this, I did that, I noted that, I wrote that" - a hell of a lot of it is just that. Whereas, if it was a lot more, simply "Take down your results, assess your results, draw conclusions, hand it in", that would be okay ...

PHY.10

Dr. X had remarked:

There's so much material in a Physics course now that you've got to do, that in fact the science goes out and it just becomes learning material

However, he went on to describe how he and one other member of the department had taken steps to mitigate this problem (referred to in later chapters) although he did not specifically mention the students' workload at any point.
When asked how they saw the purpose of the course and their own task for the three years, students typically answered in the following ways:

The course is getting you to develop your own thoughts, your attitudes, if you like ... Even at degree level you're still trying to create a good basis and a wide base, a wide infrastructure, if you like, on which that person can build. The wider that infrastructure is, the better.

PHY.10

One of the girls also mentioned the importance of breadth in the course:

I think it's (the student's task) to learn as much about Physics as an overall view as they can, do what they really like doing so that they can use it, because they'll spend the next forty years doing it ... Once you've decided, at this stage, to do something, it's up to you to put some effort in, rather than merely rely on them (the lecturers) to feed it to me.

PHY.3
All students expressed the intention of seeking Physics-related employment, but only one had put this at the top of his priorities.

The factor of discussion arose frequently during interviews. Students were enjoying the opportunity for discussion within the department and with friends outside the course. For example:

I discuss every aspect of Physics with other students - the politics of Physics, the job situation, the teaching situation in Physics ...

PHY.5

We do discuss a lot. We tend to discuss problems that we're given, our approach to things ... I'm surprised really, we do discuss more than you'd think.

PHY.3

This student went on to say:

There's always at least four people here (the kitchen in student flats) around six o'clock from different courses. We have some great
discussions. There's always something you don't know.

Another student said:

I know loads of Fine Art students and History students and you start thinking about things apart from Physics.

6.22 Summary

The above analysis of student interview transcripts suggests that the factors of most concern to students were:

a) that they achieved a good understanding of the topics presented on the course.

b) that teaching methods facilitated their understanding

c) that lecturers were open to students' questions (formally, in problem-solving classes and informally, in lectures)
d) that the course provided a wide base on which to build

e) the need to be self-motivated

f) the opportunity for wide-ranging discussion within the course

My general perception of this group was that there existed a high level of self-motivation, a perception of the teaching as good and an intrinsic interest in and enthusiasm for the subject.

Analysis of the interview with Dr. X suggests that he saw his role as primarily to develop students' thinking skills so that they could better explore the subject. To this end he provided problem classes and discussions of a wide-ranging nature, trying to convey his own enthusiasm for science. His teaching style was discussion-based.

There appeared to be a high level of congruency between students' and lecturer's perceptions of the course.
6.3 Biology Department.

In the previous chapter, the 10 Biology students interviewed were classified as holding epistemologies as follows:

Type A epistemology - 1 students
Type B epistemology - 8 students
Type C epistemology - 1 student
Type D epistemology - 0 students

I analysed student interview transcripts and that of an interview with Dr. A, with the intention of identifying the factors which most seemed to influence student epistemology. The analysis is described below with supporting quotations from interview transcripts.

6.31 Analysis of Interviews

The most commonly expressed positive perception of the course volunteered by students was the opportunity for them to conduct projects and choose course-options. These factors were amply illustrated. For example:

I'm enjoying the course more this year, because it's more what I want to do. The first two years
I ... didn't enjoy the Stats. or the Bio-chem. very much. The subjects I'm doing now are exactly what I'm interested in. I'm doing Cellular and Developmental Biology and ... Neuro-Biology. The Cells and the Development especially really interest me.

BIO.3

I'm enjoying my project very much. I'm looking at why tadpoles develop two tails. It's experimental. No-one knows why!

BIO.8

The following students were enthusiastic about their projects, but expressed reservations, for different reasons:

You've got the time, unlike the Practicals. I'm hoping to go off on a tangent if anything interesting happens along the way, only after I've finished the project - go back, show you've got some imagination ... I've got mixed feelings about the project. It's 20% of the degree, but I've never done one before. I'm worried about help. I don't want to spend six weeks and get no results. I'm looking forward to it, but not the write-up. You have to discuss the
implications of your results, but my English is not too good.

The other said:

You can't do a project until you've learned the techniques, the basic grounding, the background knowledge ... I'm not sure whether the projects cover new fields in biology. I think they're to clarify things, because we're not certain how some things occur ... I'm enjoying it, but projects are a lot longer than Practicals. I think one project is enough.

Dr. A spoke to me about the purpose of the projects

The project also (as well as the Practical) is training them ... what we're training them eventually to do is to go out from here, be able to go into any lab. ... with that training in method, and cope ... But it's the training that's important ... the training in method ... and the project, of course, is just an extension (of Practicals).
The topic of a heavy workload was quite often mentioned in interviews. One student expressed his worries about the lack of time to repeat inconclusive experiments or to write up the Practical properly, especially when he had not got what he termed a 'proper' result. He gave an example:

You should have a graph when increasing the concentrations. I didn't, because nothing happened ... If you wrote up exactly what happened you'd have to explain the reasons why. Dr. A said, "Do another one", but there was no time. I'd only have got three out of ten ... so I just made up the results ... looked at somebody else's ... It's not the same as getting a proper result yourself. I wonder if it happens to other people sometimes. I just keep quiet.

Several students complained that writing-up took too much of their time. For example:

You're **supposed** to go to tutorials once a week, but I find just writing-up the Practicals takes me 19 hours a week.
Another student claimed that the timetabling arrangements put pressure on the students:

There are problems with the timetabling. It means the projects are started too late - they take you right up to the exams. I'd rather get the exams out of the way then concentrate on the projects, like it used to be. They've changed the structure of the final year.

Dr. A was concerned about this problem for staff as well as students:

The staff-student ratio is very big. The course is over-subscribed ... we have about 100 students in lectures. Also, staff time is, you know, very occupied. Each Practical has to be given three times and unfortunately - it's just happened that way - the group you've been with have to have the Practical before the lecture, when it should really be the other way around.

Much of the reference to teaching in the interviews centred on the Practicals. Most students experienced difficulties with Practicals. For example, this student said:
If the experiment works, then it demonstrates to you that what the lecturer says is true. If it doesn't, well, then you just have to take their word for it ... it doesn't make me doubt what's said in lectures. It's either something I've done wrong, or something wrong with the equipment - the solution's maybe contaminated. I'm not saying it never works for me and that there's something wrong with the department. It's just my experience, you know ... I don't disbelieve what they tell me.

BIO.10

However, Dr. A stated:

You should never assume anything, you should never believe anything. ... Many of our students make the mistake of ... going for the stories. You know, "How does this work?" and you ... you can't say in biology, "This works this way". You have to say, "this is the evidence for that side" and "this is the evidence against it" - "now make up your own mind". And this is, I think, what we're trying to train them to do ... it's a very good discipline in which to train any student, because it teaches them logic ... scientific method ... numeracy ... computing and statistics
... as well as the more literary side, to express themselves in a way that, of course, physical scientists aren't asked to do.

However, yet another student confided:

If our experiment doesn't come out, we borrow someone else's notes to write up from.

When asked if there was an opportunity to discuss this problem with lecturers, she replied:

No. By the time the work comes back, we've moved on to something else.

Most students thought such situations to be both inevitable and acceptable, as long as they knew what 'should' have occurred. At the end of one three-hour Practical, Dr. A remarked to me:

They don't seem very interested, very involved with their work. I'm not sure why that is. They won't stay behind ever
Several students mentioned tutorials, which did not appear to be for general discussion, but for supplementary work. For example:

We have tutorials once a week. The topic's given; we have to read and discuss it in an essay—perhaps research something from Scientific American, or journals, or New Scientist. Some articles are interesting, but they're not related to what I'm doing. I read the journals, but not much in them relates to biology. I don't read physics or geology articles.

BIO.7

Another student said:

Sometimes we get feedback, but the tutorials are too long after the Practicals. They're not very useful.

BIO.1

Dr. A expressed regret that the teaching methods were not as she might have wished:

In actual fact ... in this place, we obviously have a different method of teaching from most universities, for instance ... because ... we're
rather cramped, we don't have good library facilities ... we don't have extensive ... tutorial systems - partly because there isn't time, partly because there isn't room ... and therefore, perhaps we teach them more in the sort of conventional school sense than many universities do. That is, we provide lectures where we synthesise the material ... certainly there is a largish element of feeding them information.

Some students stressed the importance to them of good personal relationships with lecturers. One student said:

If you pick a project, the supervisors tend to go with it, because it's their field. I certainly ... well, in my choice of subjects as well, I think I was influenced by this. Obviously, if you're not going to get on with a lecturer, I don't think there's really much point in doing the subject.

She went on to give a specific example:

I chose this particular project, because I know that Dr. B is ... he's really helpful, anyhow,
and he'll go through the project with you, where others ... just threw you a piece of paper and said, "Write down what you want to do" really, which I think is difficult.

Another student put the point succinctly:

Students find an affinity with a lecturer, because the lecturer is the subject.

The opportunity for discussion was a factor which arose frequently during conversations about Practicals and tutorials. One student expressed regret that in tutorials:

The topic is given for discussion, so really it's just supplementary work.

Another student said:

We have tutorials once a week. Sometimes there's a follow-up discussion. Usually it's preparation for next week's work.
The following student regretted the lack of opportunity to discuss his work problems:

We could discuss problems with Practicals in tutorials in the first year, but I've got the impression that now they're just for teaching—discussing articles in magazines.

But this same student volunteered the information that he enjoyed informal discussions with students from other departments in the student flats, finding a forum for himself to talk about biology:

Where I live there's students from the College of Art and Design, Russian Studies, Literary Studies—I'm the only biologist in the house. We have discussions over dinner. With the Russian Studies girl we talk about Trotskyism and Leninism. It's interesting to talk. The one doing H.N.D. Interior Design is very interesting. Great! He had to design a railway station. I couldn't do anything like that. I'm not creative. Art College students have different ideas, different viewpoints. Because he doesn't do Biology, I can talk to him about biology.
I felt I had identified a degree of frustration at the lack of opportunity for discussion of work-related problems within the department as well as an enthusiasm for more general discussion. Dr. A indicated that she thought more discussion techniques would be desirable, but was doubtful whether students would be able to cope:

In an Oxbridge system all they will get is very few formal lectures. They will get a lot of references and they will be told to go away and, you know, work up a subject and come and discuss it, and then write an essay on it, or write an essay first and then come and discuss it ...

Ideally, I would like more time with fewer students, so that one could actually do this, give them the basics, say "These are the fascinating problems ... here are a set of references ... let's explore this particular topic ... and ... you know, "Come back next week and we'll discuss it" ... but it's very difficult ... the weaker students, of course, can't do it like that - they don't know where to start

Later in the interview Dr. A told me:

There's still a large number of students who are getting fed into the system and they don't really
know why they're here ... they don't even particularly want to be here, or anywhere ...
We're not successful in a great many cases. I mean, you'll see when our exam results come out, there will inevitably be a large tail ... of rather weak degrees - who are the ones who are capable of mugging up the basic information and learning it and producing it again ... and then, of course, the rather fewer ones who can actually show that they can think and ... build up their own ideas.

6.32 **Summary**

The above analysis of interview transcripts suggests that the factors of most concern to this group of Biology students were:

a) the opportunity to choose course options and undertake projects of their own choice

b) the heavy workload

c) difficulties with Practicals

d) relationships with lecturers
e) lack of opportunity to discuss their work-related problems.

My general perception of this group was that they were experiencing a degree of frustration with the course, but were resigned to it. Apart from one student (BIO.3) motivation was low and their interest in the course extrinsic in that their purpose was mainly to get a degree as a means to obtaining a good job. Analysis of the interview with Dr. A suggested that she saw her role primarily as training students for future employment in commercial laboratories. The heavy workload for both students and staff she perceived as an inevitable consequence of cramped conditions and an over-subscribed course. She would have preferred more discussion-based teaching, but felt that students of this calibre would not be able to cope with a method requiring high motivation and self-organisation. In general, however, she viewed the course as providing a good basic training in logic, scientific method, numeracy, computing skills and statistics and literary expression. There appeared to be no more than a partial congruency between students' and lecturer's perceptions of the course: they did not agree regarding the aims of the course, but did agree that the workload was heavy and that there was little opportunity for discussion (though for different reasons).
6.4 History Department

In the previous chapter, the 10 History students interviewed were classified as holding epistemologies as follows:

Type A epistemology - 3 students
Type B epistemology - 6 students
Type C epistemology - 1 student
Type D epistemology - 0 students

I analysed student interview transcripts and that of my interview with Dr. P with the intention of identifying the factors which most seemed to influence student epistemology. The analysis is described below with supporting quotations from interview transcripts.

6.41 Analysis of Interviews

Most students commented upon the type of teaching taking place in the department. The following three quotations are representative of the group:

It's different than 'A' level. Here it's mainly social history and the way that politics interacts with it - the experience of the working classes ... trying to find out. We do social
theory here, historiography - studying the theory behind history. We use a lot of sociologists, economists and political writers, studying the writers rather than the history of the period. It's very useful.

HST.2

The History department encourages you to weigh up two sides of an argument ... This department has a reputation for being a bit radical.

HST.8

You're taught to study History, because there is a way to do it. The course gives you a base.

HST.6

Dr. P gave his perception of the content and aims of the course:

We talk about the background of the writer ... whether it's an obvious political perspective which is being taken ... what was going on in the society at that time which might have influenced this particular interpretation ... Increasingly, I think, we're looking at the development of ... what's the jargon? ... 'socially transferable
skills' ... so not just the ability to write, but to present cases logically, verbally.

In this final year the students were able to select a 'special study'. All expressed enthusiasm for this aspect of the course, even those who claimed not to be enjoying the general coursework. Two students offered general comments:

We do a special study. It's a glorified option. You can select one from five topics ... They haven't got the staff for you to make up your own.

HST.3

Another student appeared to contradict this statement:

You can offer your own ideas (for the 'special'). There's a lot of scope, so you can take different tangents in an essay.

HST.2

I sought clarification from Dr. P., who explained:

They have a choice of five or six special subjects which we have on offer. That's where we try and get a small group working on primary
sources ... It's in that area that they can
write, not a dissertation, but a long essay -
10,000 words - as part of the course assessment.
It's the equivalent of a dissertation without
having the problem of getting enough primary
sources ... It's more difficult here (than at a
university) because the subjects they want to
look at don't always have proper primary sources
... also, we have to settle for what we do best.

Other students in the group described their special
subjects to me:

I enjoy the 'Witchcraft' option. The lecturer
makes it really interesting. He's really
enthusiastic, which I think helps ... it's about
the only thing we all turn up for, anyway.

HST.5.

I'm enjoying the 'special' best - 'Medieval
Witchcraft'. You get so fed up with the
nineteenth and twentieth centuries ... concerned
with the British Labour Movement all the time.

HST.9

Some people choose, say, 'Music and History',
even 'Music Halls and the Commune' ... 'Science
and Society' is an option in the first year - how technology changed the pattern of work. The option on Fascism includes architecture - the options are very varied.

HST.2

The essay titles are given. You choose from the list. I'm interested in feminism, so I'm writing about the Suffragettes.

HST.6

Students sometimes revealed both their perception of the subject area and their approaches to study, as illustrated by the following comments:

History predicts the future. What's happening now you can relate to what's happened in the past and understand ... I've just spent a week listening to Wagner and his anti-semitism.

HST.2

If you do History you argue your own point of view ... History is the study of events which incorporate a number of interpretations.

HST.8
There's a lot of interpretations and you look at it all and make your mind up.

HST.5

I think History is the interpretation of change, more sort of social science at this level — investigating why things happened as opposed to just what happened.

HST.1

Although statements like the above were made, suggesting that students appreciated what the subject involved, or the aims of the department, many claimed to be 'fed up' with the course (with the exception of the 'special' options) and remarks were made which suggested that they did not tend to put these ideals into practice. For example:

You don't look at the different arguments so much ... the central figures crop up all the time ... It's only second-hand information. I just string a load of quotes together. They don't like you being objective, but ...
The following student was particularly negative about the course. He maintained:

I don't take notes in lectures or seminars ... it's not worth bothering. It's so loose. I get the books. Reading books on Marx's theory - it's the only one that makes sense - to me, anyway.

He added:

I'm doing a degree to avoid getting a job. I would have preferred to do Physics, because I'm interested in astronomy, but the workload's too heavy ... I'm not impressed at all with this course. I'm fed up with it. You go to the library and it's the same old books.

I found a very marked difference between the interested, well-motivated students and those (in the majority) who were not involved and not prepared to work on their own initiative. I realise I had interviewed only the ten students who volunteered to talk to me, but Dr. P made comments which suggested that he, too, was aware of these two contrasting types of student:
A good student is someone who's prepared to work quite hard, who's prepared to read more basic texts, who's prepared to look at a range of viewpoints, who's able to sit down and balance those viewpoints out ... A bad student is someone who's not prepared to do some, or most of those things ... to just sit back ... Probably no more than a quarter of the students in a bad year, in our terms, will be non-participants ... I think however, we're increasingly saying, "Well, you can't get away with that any more ... You need to be able to defend your own particular position and this is a skill that you do need to acquire"

Dr. P. added, perhaps in explanation:

I suspect some of the pressures in Higher Education distance staff and students. That's my impression. I think the staff find themselves having to do more and more teaching ... The tendency is to ... formalise that, just to get round it and I think that does shunt the students off

The factor of discussion arose in interviews with students and with Dr. P. Most students mentioned their
informal discussions with friends outside the department. Only one student mentioned discussion within the department:

Seminars are for discussion. The lecturers stay silent.

HST.9

Dr. P. had said, however:

I think I'd say the focus of teaching is the seminar. In every course we have weekly seminars ... they are the main emphasis ... and fairly well-structured seminars, not just "let's talk about what you've done in the last week", but material, or topics offered in advance, structured reading, discussion etcetera.

He gave an example:

It's saying, "Well look, in discussion of the Reformation there are four or five particular schools of thought, or major interpretations. Let's look at some of those now. What do you think of that? How do you think this view is supported? Do you think that's an adequate explanation? How would you challenge it? What
other ones would you use? ... So it's coming back on the material they've been presented with ... I think that's very much part of the teaching style.

So, although only one student had referred to discussion within the department, this might possibly have been because discussion-type classes were commonplace. It is possible, however, that seminars took the form of the lecturer posing questions to the students to answer - as described by Dr. P. above - and that students may not perceive such a structure as 'discussion'. Several students, however, spoke about discussions with friends:

My friends in the science department say History's illogical, that it doesn't follow any particular path ... "Who wants to look at the past? What relevance has it got? We are the people for the future" ... I argue with them ... about the way they see life. Well, disagreements, not arguments - they're friends - in pubs, in the Union, anywhere ... Because they think in a particular way ... I suppose arts students think in a particular way as well - they just seem to be very narrow-minded. They're fed with a path and that's it. They won't look anywhere else ... You do History, alright, you
might be a staunch Socialist, or member of the Monday Club, but you've got to know the other side and until you know what the opposition is saying, there's no way that your argument can stand up.

HST.8

I know Sociology and Geography and Fine Art students. They think like we do.

HST.6

A lot of the things that my friends are studying - one girl's doing Architecture and she could really do with knowing what Communism was and the basis of things. She's been borrowing my books. Another girl in my flat's doing Education. We've studied the history of Education and she comes looking for those sort of books.

HST.2

Some of the students who showed great enthusiasm for the above type of informal discussion were less interested in talking about the ideas they encountered on their course.
6.42 Summary

The above analysis of interview transcripts suggests that the factors of most concern to this group of History students were:

a) The opportunity to conduct a 'special study' of their own choice from a varied list

b) the opportunity to study a number of interpretations and present their own arguments

c) coursework was perceived as boring

d) students found difficulty in motivating themselves towards study

My general perception of this group of students was that - apart from one very enthusiastic student (HST.2) - there existed some confusion between their perceptions of the aims of the course and what they, personally, were prepared to undertake. Motivation was low; they were 'fed up' with the coursework, enjoying only the 'special study'. Interest in the course was extrinsic in that their main aim was to get by in order to get the degree, which was seen as a means to a good job.
Analysis of the interview with Dr. P. suggested that he saw his role as primarily to develop 'socially transferable skills' in the students. He saw the departmental teaching style as informal, discussion-based. However, he was aware that some students were 'non-participants' and attributed this to a heavy teaching commitment which tended to force staff into a formal teaching style, although students should not be allowed to 'get away with it'. At first there appeared to be a high level of congruency between students' and lecturer's perceptions of the course regarding its aims. However, upon analysing students' attitudes to the course and general motivation, it appeared that students' stated aims bore little relationship to their practices. Congruency was, in reality, quite low.

6.5 Fine Art Department

In the previous chapter, the 10 Fine Art students interviewed were classified as holding epistemologies as follows:

Type A epistemology - 0 students
Type B epistemology - 4 students
Type C epistemology - 3 students
Type D epistemology - 3 students
I analysed student interview transcripts and that of my interview with Mr. R, with the intention of identifying the factors which most seemed to influence student epistemology. The analysis is described below with supporting quotations from interview transcripts.

6.51 Analysis of interviews

All of the students in this department commented upon the teaching style. Some expressed reservations, whilst others were more appreciative. For example:

My relationship with tutors is a bit 'hit and miss'. Some I can relate to - two or three - others I avoid ... they seem to have no understanding and no interest. I changed my painting tutor for one more sympathetic

But he added:

That's no criticism of the course. I'm now clear in myself what I'm going to do ... I find the course fulfilling

Another student enjoyed the theoretical element of the course and offered the following criticism:
I wish there was more academic content in the course. The thesis is 20% (of the degree) and practical work 80%, but you can do a bigger thesis. A 6,000 word thesis is nothing for a degree. We ought to have to do more written work over the three years, based on our own work (in the studio).

Another student described what occurred in personal tutorials, in her experience:

Sometimes they (the three tutors who conduct individual tutorials) just attack you. They do it if they think you're not very forthcoming. It's a technique. I do it to other students and they do it to me ... I get more help from other students.

She went on to say:

I enjoy the Philosophy and Psychology here. 'S' and 'T' make links between the philosophy and art. I've just done a seminar on Sartre and I'm wondering what existentialist art would be like.
In fact many of the students mentioned the theoretical studies with enthusiasm. Two more students, for example, commented:

I found the theoretical studies quite separate from my own work at first, but now it's beginning to fit in.

FA.3

The theoretical studies are helping me. It's a good idea to have a general picture about the way that people work in a certain area - different approaches and traditions gives it a historical context which I think is important.

FA.10

During my interview with 'R', he referred to the theoretical studies element of the course, comparing it favourably to what used to happen in Fine Art departments:

In the fifties ... you know, you had your mass drawing classes ... someone would come round putting your paintings 'right' and so on ... I think, as things are now, they get a better kind of humanities education through the process, because it brings again a close link between the
studio work and the theoretical work ... they're being asked to think theoretically, to pour the theory into the area of their practice ... and see what it means in those terms.

When I asked what they thought the tutors expected of them, one student gave the following reply, which was fairly representative of the group:

I think they (tutors) are looking for someone who's used the opportunities of the course creatively - they've stretched out, they're trying to progress and perhaps they've learnt where their limitations lie and where their possibilities lie ... personal progression and development of the medium

'R' had mentioned the criteria used for assessing a student's work, stating:

It's relative to the current art-world, but it's relative to other art schools. It's relative to previous years ... and it's relative to how that individual student has moved through the course and developed. To a certain extent, we measure
it by how far they've come ... as well as by how far they've got.

Several students stressed the importance to them of tutors who aimed their lectures at an appropriate level for good understanding and who, also, were willing to take ideas from students:

Basically, I prefer someone who will be able to communicate. There are a lot of people here who are very intellectual - aesthetes - who aren't able to communicate with people who are only at this stage - or find it very difficult. 'Q' reads from translations. I prefer discussion. But 'P' will take different people's (students) ideas. It's necessary - to understand ... when you hear other people trying to explain their ideas to you, it becomes clear, easier to understand.

FA.3

A second student expressed similar feelings:

I like the way 'H' does his lectures. It's light-hearted. Sometimes if you go to a lecture you're a bit overawed by the knowledge that this
person at the front has. Sometimes you don't understand.

And a third:

'H' is about the best lecturer you could have for theoretical studies. It's good because it's quite free with 'H' ... Well, that's why I changed from 'Q', because he ... I don't know ...he's not really interested, he has to be ... intellectually stimulated by what you're doing - you know, "think at this level", which is quite hard to do, because ... you can't write a couple of volumes.

FA.4

The students on this course frequently referred to the 'thinking' which took place in the department, which they appeared to find very stimulating. One student said:

You're trained to think in a certain way and you go out after college and you're still thinking.

FA.7
Another said:

I'm trying to train myself to think more ... on this course there's probably a lot more thinking going on ... you're continuously having to think about things ... you're confronted by what you're doing and you're having to say why all the time and question things ... I think you're very lucky because you've got the chance to think about things in a different way.

FA.3

A film-studies student reinforced this view:

I think the externals are probably asking you to express yourself as well as you can verbally to them: what you're doing, why you're doing it, the history of it - to know that your work has come out of a knowledge of something

FA.8

When I asked 'R' what was expected of students in the department, he also stressed this point:

You're looking for a relatively original use of sources, for a level of absorption of the sources, whether they're pursuing the argument
through those sources ... it's the thoroughness and exhaustiveness with which they've explored the ... kinds of artistic problems you get in Art, which in some cases is a highly rational process and in some instances isn't

The question of what kind of process students were engaged in was a factor addressed at length by some students. Most talked freely about their methods of study, which varied greatly. As one girl put it:

The nice thing about it (the course) is that you can choose your own methods. Mine is analytical and there are a few more like me. Many of them use more spontaneous, or emotional methods.

She went on to describe her working method, which is illustrated below, followed by an example of another student's very different approach:

I work scientifically, controlling variables. I think it out beforehand ... If I want to compare two colours, say red and green, then I've got to cut out all the other factors. I'm not to have one that's got a really textured surface and one that's flat. They've both got to be flat, or
else I can't compare them, because the textured surface would interfere ... with what I was reading.

She added a caveat:

But no matter how well you think out something beforehand, unlike a scientific experiment, you come up against certain problems in carrying it out, so that you do have to change slightly ... I read a lot of maths. books and I suppose that's influenced a lot of the work.

FA.5

The following student had a different method:

I don't normally make drawings before I start working ... You're not just making an image ... there's also problems of form, colour composition, balance - technical problems, also the material side of things ... it's survived all these metamorphoses that it's gone through and it's the only solution possible at the end ... Whereas, if you start with a very obvious idea of what you're going to do, it hasn't gone through that. You'd then have to do fifteen different paintings that's come to that kind of solution at
the end ... that has to be evident in the end product. It's part of what a painting is.

R. explained the method of assessment in the light of students' varied approaches:

People are positioning themselves so differently ... you can't have just this single set of criteria. You have to ... be shifting the criteria slightly all the time, according to ... really, in what tradition the students have situated themselves ... you can look at the intelligence with which they take it up with their theorising and in their painting.

One of the film-studies students was aware of a need to be consistent in his work:

For my thesis ... as I've been shooting in a rural location it seemed logical to look for what other people have produced with landscape ... in commercial British films, because they're more relevant ... You're trying to present an argument in your thesis and if you can tie it up to your practical work it's probably better.
Another student was aware of the need to avoid a fragmented approach:

There is a danger, because you're only getting bits and pieces. Unless you're reading around it all the time and looking at things, you are only going to pick up bits and pieces and still be very much unaware of other things. There's a stress on reading, but it's kind of self-motivated really – you either do it or you don't.

FA.3

One rather less talkative student made an opposing statement.

My work is not influenced by people and things outside

FA.2

But this student summarised the more general view of the group.

Art is problem-solving ... It's all self-discipline

FA.1
Discussion, both formal and informal played a major role in this department. Formally, within the department, students volunteered the following statements:

I think it's the theoretical studies side that really ... where you can discuss your ideas

FA.5

It's a good education in a broad sense-painting, ideas from other people and lectures and discussions ... rather than learning from a book

FA.7

It (the course) enables people to talk about themselves ... I've worked out a lot about me

FA.1

You tend to find on an art course that a lot of people talk about art and what they should be doing and shouldn't be doing anyway, quite naturally, without it being timetabled ... (where timetabled) I find it interesting. Other people may point out things I haven't grasped ...

discussions are arranged after lectures and films as follow-up

FA.10
R. referred to the discussions and gave an example of the type of topic addressed:

In our department, up to the present stage, it's been very much a hand-wrought education, sort of coach-built. I mean, it's been very much up to the individual students, having a tutorial group, building a relation with a tutorial group ... they take up very strong positions about, you know, artistic method - whether artistic method is the same as scientific method or not ...

Students also referred enthusiastically to their discussions with friends from other courses. For example:

I think it's important to contact students in other departments, or you can get into a rut.

I have friends in Cultural Studies, History, Latin American Studies, Politics - from the Hall of Residence and the Students' Union. They think Fine Art is really easy and lazy because we don't have exams. They think the idea of a thesis is the best thing that could happen, because we're
not given a title. I think that makes it so much harder in a way.

FA.4

It couldn't do any harm - a criss-cross between departments. Geography students come in here and ask questions. Talking to an outsider can be a good thing ... Cultural Studies students are quite interested in our course. They do film here. I discuss what I'm doing with students in Hall - one from Cultural Studies, a French student, a Russian student, a History student and one outsider who does Civil Engineering ... We discuss our general level of ambition, what we're doing and why, how interesting and how different our courses are - value judgements

FA.8

I live with a Mechanical engineer. He says his tutors say they should have more input from Fine Artists, because Mechanical Engineering students tend to be very narrow-sighted, whereas Fine Artists tend to have a broader side, which makes design more ...

FA.9
I have friends in the Geography department. People think we don't do anything because they have a heavy workload, lots of lectures. In fact, most people are here from 10 am 'til 5 pm, sometimes 7 pm. ... and the work doesn't stop when you get home ... and the piece of paper at the end of the course is less important than what's happened to you on the course.

FA.3

6.52 Summary

The above analysis of interview transcripts suggests that the factors of most concern to this group of Fine Art students were:

a) the opportunity to engage in a wide variety of theoretical studies

b) the freedom to choose one's own methods and develop one's own work individually

c) to achieve a good understanding of ideas presented on the course

d) the opportunity for wide-ranging discussion on the course
e) the necessity to be self-motivated

My general perception of this group of students was that they were enthusiastic about their course, were highly-motivated, perceived the teaching as good and had an intrinsic interest in the subject.

Analysis of my interview with R suggested that he saw his role as primarily to encourage students to see knowledge as active, to help them to form their ideas and to think theoretically about the meaning of their work. He saw the departmental teaching style as discussion-based.

There appeared to be a high level of congruency between students' and lecturer's perceptions of the course.

6.6 Discussion

The concerns of students and lecturers identified in the above analysis may be grouped into three interrelated categories: learning, teaching and departmental ethos. These three areas have become the subject of educational research in recent years. The work seen to be of significance to the present analysis is outlined below and applied to that analysis in order to further clarify the factors seen to be influencing
the incidence of the four different types of student epistemology identified in Chapter Five.

6.61 Learning

Researchers have reported a variety of studies on student learning. (Parlett 1970, Entwistle and Hounsell, 1975; Marton and Saljo, 1976, 1984; Pask, 1976a; Ausubel, 1978; Entwistle et al, 1979; Biggs, 1979; Marton, 1981, 1988; Ramsden and Entwistle, 1981; Pope and Keen, 1981; Entwistle and Ramsden, 1983; Beard and Hartley, 1984; Gibbs et al, 1984; Marton et al, 1984; Johansson et al, 1984; Brown and Atkins, 1988; Ramsden, 1988). Of these, the research seen to be of particular relevance to the present analysis is that dealing with students' strategies, styles and approaches to learning.

In one of the first studies of the processes of student learning, Marton (1976) investigated students' ways of reading an academic article. The concept emerging from this and his later work (1984) was 'approach to learning', incorporating the two categories 'surface' and 'deep'. Students adopting a 'deep' approach are characterised as actively attempting to understand the author's meaning and to relate it both to their own previous knowledge and to their personal
lives. The students adopting a 'surface' approach, however, view the task as primarily to memorise the facts for later reproduction and see the subject matter as unrelated to their academic and personal lives.

In the present analysis, most students studied in the Physics and Fine Art departments could be seen as employing a 'deep' approach to their work, since they revealed themselves as actively attempting to understand the meaning of subject matter and relating theory to practice. Most students in the Biology and History departments, in contrast, could be seen as employing a more 'surface' approach in that most students displayed little intrinsic interest in their subjects, were more passive in approach and made few connections between theory and practice. These two contrasting constructs - 'deep' and 'surface' - may also be seen to correspond to the 'fragmented' and 'relative' poles of the model of student epistemologies - Model I - in the previous chapter, in which a majority of 'A' and 'B' - type epistemologies were found in the History and Biology departments and a majority of 'C' and 'D' - type epistemologies amongst students in the Physics and Fine Art departments.

Pask (1976) conducted learning experiments from which he identified two types of student learning
strategy - 'holist' and 'serialist'. The 'holists' employed illustrations, analogies and anecdotes in developing an overall understanding of a topic: this he termed 'comprehension learning'. The 'serialists' relied upon step-by-step accumulation of facts and analysed in detail the arguments and evidence presented: this he termed 'operation learning'. Whilst Pask's work may not be directly relevant to the present analysis, which is based on students' and staff perceptions of their courses, his work and that of Marton and Saljo was included in an inventory of approaches to studying developed by Entwistle, Hanley and Hounsell (1979). They reported three main contributory factors - orientations towards 'personal meaning' (a deep approach with comprehension learning); 'reproducing' (a surface approach with operation learning); and 'achieving' (organised study techniques with achievement motivation).

In the present study, most students in the Physics and Fine Art departments demonstrated orientations towards personal meaning, seeing their intellectual development as more important than gaining a qualification - these were the students holding 'C' and 'D' - type epistemologies. Most students in the Biology department, whilst well-motivated towards their chosen options and projects, were primarily concerned to
<table>
<thead>
<tr>
<th>Epistemology</th>
<th>Approach to Study</th>
<th>Type A</th>
<th>Type B</th>
<th>Type C</th>
<th>Type D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disorganised and dilatory</td>
<td>Surface approach</td>
<td>Reproducing and Achieving</td>
<td>Personal meaning</td>
<td>Deep approach</td>
<td>Comprehension learning</td>
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<td></td>
<td>Surface approach</td>
<td>Operation learning</td>
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<td>Reproducing and Achieving</td>
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<td>Operation learning</td>
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<td>Reproducing and Achieving</td>
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<td></td>
<td>Operation learning</td>
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</table>

Figure 5
achieve good grades (achieving orientation) - these students held mainly 'B' type epistemologies. Most students in the History department demonstrated a reproducing orientation in their concern to rehearse the arguments presented in lectures using the recommended format - these students also held mainly 'B' - type epistemologies.

Ramsden and Entwistle (1981) later added another category to the three above. This they described as 'disorganised and dilatory'. It was a further dimension of 'achieving' orientation and showed a close relationship with self-rating of academic progress. This last factor could be seen to correspond to students found to hold an A-type epistemology in the present study, of whom 2 were identified in the Physics department; 1 in the Biology department; 3 in the History department; and 0 in the Fine Art department.

A summary of the application of the above research on students' approaches to studying to the present study is illustrated in Fig 5.

The above literature on learning approaches applied to my own data analysis suggests that students' approaches to studying effect the quality of learning...
outcome and may be seen as a contributory factor influencing student epistemology.

6.62 Teaching


Fox offers four basic 'theories of teaching'. These comprise the 'transfer' theory, which treats knowledge as a commodity to be transferred from one vessel to another: the 'shaping theory', which treats teaching as a process of shaping, or moulding to a predetermined pattern: the 'travelling theory', which treats a discipline as a terrain to be explored, climbing hills for better viewpoints with the teacher as travelling companion, or expert guide: and the 'growing' theory, which puts more emphasis upon the intellectual and emotional development of the learner. Fox states:

whichever theory a teacher uses to help him think about the process, it will affect the strategies he uses and it will colour his attitudes to students and to any training programme that he
Fox further classifies his four theories into two more general descriptions. He refers to the 'travelling' and 'growing' theories as 'developed theories', because he considers they are more likely to be held by experienced teachers and because they appear to coincide more closely with current theories of learning. The 'transfer' and 'shaping' theories he refers to, in contrast, as 'simple theories'. Whilst none of the four lecturers interviewed could be said to fit exclusively into one of Fox's four theories of teaching, they each display a predominant disposition towards one or other of them.

Dr. X in the Physics department demonstrated a strong leaning towards a 'travelling' theory of teaching. He expressed enthusiasm for his subject, which he viewed as largely unexplored territory and enjoyed sharing explorations with his students. His students, in turn, found the process of leaning in this department both stimulating and rewarding. It could be stated that both lecturer and most students in the Physics department held matching 'developed' theories of teaching.
Dr. A in the Biology department showed a marked tendency towards the 'shaping' theory of teaching. She perceived her role as 'training' students to cope in a commercial laboratory: this training involved the development of the ability to solve problems, manipulate data and to handle equipment confidently. Dr. A also, however, displayed some of the attributes, outlined by Fox, of the 'transfer' theory, in that she saw her role partly as 'processing very tough material into more easily digestible nutrient for rather simple minds' and saw failure to learn on the part of the student as a consequence of poorly motivated candidates being "fed into the system". Both the 'shaping' and 'transfer' theories are classified by Fox as 'simple' theories. Her students, on the other hand, regretted the lack of opportunity to discuss their work in a meaningful way within the department. This they attributed to a heavy workload and over-full timetable. Fox's analysis of such a mis-match between teacher's and students' theories would tend to suggest that, in this instance, the lecturer has a 'simple' theory whilst some of her students may have more 'developed' theories of learning and teaching.

Dr. P in the History department appeared to employ a 'growing' theory of teaching, believing that it was his students' task to develop "socially transferable
skills" rather than to aim for subject-based goals. He saw his department as providing - through an informal atmosphere - ideal conditions for students' growth. His students, in contrast, expressed disillusionment with the course and an unwillingness to become actively involved with their own learning, except in the case of their one 'special' option.

As in the Biology department, there would appear to be a mis-match between teacher's and students' theories. In this case, however, the situation is reversed in that the lecturer is the person holding the 'developed' theory and his students, possibly, holding more 'simple' theories of learning and teaching.

The Fine Art lecturer interviewed, R, like Dr. X in the Physics department, demonstrated a marked tendency towards a 'travelling' theory of teaching. He, to, perceived his students as travelling companions in the exploration of a multi-faceted subject. He saw his role as facilitating students' individual investigations, encouraging them to develop thinking skills and a theoretical over-view of the subject. The students interviewed in this department found their course both personally challenging and rewarding. It could be concluded that the lecturer and most students
## Relationship of Learning and Teaching to Epistemology

<table>
<thead>
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<th>Students: Approach to Study</th>
<th>Lecturers: Teaching Theory</th>
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</thead>
<tbody>
<tr>
<td><strong>Type A</strong></td>
<td>Disorganised &amp; dilatory</td>
<td>Transfer or Shaping or Growing or Travelling</td>
</tr>
<tr>
<td></td>
<td>Surface Approach</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Operation Learning</td>
<td></td>
</tr>
<tr>
<td><strong>Type B</strong></td>
<td>Reproducing &amp; Achieving</td>
<td>Shaping or Growing</td>
</tr>
<tr>
<td></td>
<td>Surface approach</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Operation learning</td>
<td></td>
</tr>
<tr>
<td><strong>Type C</strong></td>
<td>Personal meaning</td>
<td>Travelling</td>
</tr>
<tr>
<td><strong>Type D</strong></td>
<td>Deep approach</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Comprehension learning</td>
<td></td>
</tr>
</tbody>
</table>

*Figure 6*
in this department held matching 'developed' theories of learning and teaching.

The two departments categorised above as having both lecturer and students holding matching 'developed' theories - Physics and Fine Art - were the two departments having a majority of students identified as holding C and D-type epistemologies. The other two departments - Biology and History - which were identified above as showing a mis-match between lecturer and student theories - between 'simple' and 'developed' theories - were the two departments having students identified as holding mainly B-type epistemologies.

A summary of the application of Fox's work to data-analysis of interviews with lecturers, added to the analysis of learning approaches is illustrated in Fig. 6.

The application of Fox's theories of teaching to my own data analysis suggests that teaching theories held by the lecturers may be seen as a second factor influencing student epistemology.
The context in which learning takes place has been seen by some researchers as an important factor influencing students' approaches to their studies. (Bernstein, 1975: Bliss & Ogborn, 1977: Ramsden, 1979: Laurillard, 1979: Ramsden & Entwistle, 1981). Although not a great volume of research in this area has appeared in the literature, the research to date has relevance for the present study, in which students frequently mentioned their academic environment. The terms 'context' and 'academic environment' may be seen as referring to a general departmental ethos.

Ramsden and Entwistle (1981) examined links between students' perceptions of their main academic departments and their reported approaches to studying (the latter is reviewed above). They studied students from 66 academic departments in 6 contrasting disciplines, finding that the departments with highest mean scores on 'personal meaning' orientation were perceived by students as having good teaching and allowing freedom in learning. Departments with highest mean scores on 'reproducing' orientation were seen to have a heavy workload and a lack of freedom in learning.
Analysis here is also based on student interviews and upholds Ramsden and Entwistle's findings. The two departments found to have students demonstrating a 'personal meaning' orientation towards their studies - Physics and Fine Art - were the two departments which were perceived by students as having good teaching ('interesting', 'helpful', 'open to questions' 'stimulating discussions') and freedom in learning ('we can choose our own methods', FA: 'our essays can be about anything, they don't have to be Physics-related', PHY). In contrast, the Biology and history departments, in which students were identified as holding predominantly 'reproducing' and 'achieving' orientations, were perceived by students as having a heavy workload (Biology) and a largely prescribed content and method (History).

Ramsden (1979) cites Becker (1968) and Miller and Parlett (1974), who emphasise the disjunction between the formal requirements of academic environments - 'thought, creativity, competence, independent thinking, critical thinking' - and the actual requirements as perceived by students - 'memorisation, fact-gathering, conformity and rote learning'. Ramsden sees it as a matter of urgency that we should understand more about the links between students' approaches to learning and the context in which it takes place. Ramsden reported
data from a course perceptions questionnaire, finding that students in different subject areas see themselves to be studying in markedly different environments.

Analysis of student interview transcripts in the present study also identifies a disjunction between departmental requirements and student perceptions of requirements in the Biology and History departments. In these two departments a high degree of confusion was identified among students regarding what they thought was expected of them and these perceptions neither matched what the lecturers perceived as departmental requirements, nor what the students actually did. The analysis also suggests that students in all four departments do indeed perceive themselves to be studying in markedly different environments, but this aspect is not so much related to the nature of the subject area as to a facilitating or non-facilitating departmental ethos, particularly with regard to assessment. Physics and Fine Art students seemed more concerned with understanding their work, finding lecturers helpful in this respect, whereas Biology students were anxious to obtain good marks and so concealed their difficulties.

Laurillard (1979) gathered data on 30 students' perceptions of their work in the learning situation and concluded that students' styles and strategies of
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<th>Student Approach to Study</th>
<th>Lecturers Teaching Theory</th>
<th>Departmental Ethos</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type A</strong></td>
<td>Disorganised &amp; dilatory Surface approach Operation learning</td>
<td>Transfer or shaping or Growing or Travelling</td>
<td>Negative</td>
</tr>
<tr>
<td><strong>Type B</strong></td>
<td>Reproducing or Achieving Surface approach Operation learning</td>
<td>Shaping or (Mismatch with student theories)</td>
<td>Heavy Workload Lack of freedom in learning</td>
</tr>
<tr>
<td><strong>Type C</strong></td>
<td>Personal meaning Deep approach Comprehension learning</td>
<td>Travelling (Good match with student theories)</td>
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<tr>
<td><strong>Type D</strong></td>
<td>Relative</td>
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Figure 7
learning are context-dependent. Bernstein (1975) used the term 'educational knowledge code' to refer to the underlying principles which shape curriculum, pedagogy and evaluation. 'Underlying principles' could be seen as the 'context' within which students work in academic departments, or as an alternative term for 'departmental ethos'. In the present study students in all four departments revealed either explicitly or implicitly that their perceptions of their departments had an important influence upon their approaches to study and to the subject itself.

The application of research literature on departmental ethos to the present analysis of students' perceptions of their departments suggests that departmental ethos may be seen as a third factor influencing student epistemology.

A summary of the above findings on departmental ethos, added to that on learning and teaching (Fig. 6) is illustrated in the table Fig 7.

6.7 Summary

This chapter began with data-analysis of students' and lecturers' interviews. Three main interrelated categories of concerns were identified:
Model II

Student epistemologies are influenced by factors of

Figure 8
learning, teaching and departmental ethos. Research literature on these three areas was then reviewed and applied to the previous analysis, to which it was perceived as adding further clarification.

Model I, of student epistemologies, can now be extended to include these influencing factors: Model II, Fig 8.

This chapter has, thus, provided clarification of the factors influencing student epistemology and suggested reasons for the incidence of the four types of student epistemology within the four departments studied.

However, the data also reveals that the organisation of knowledge and learning activities were structured in markedly different ways in the four departments. It is felt that this factor might have important significance for the present study. The next chapter focuses upon these structures in order to further elucidate the factors influencing the incidence of the different epistemologies.
# CHAPTER SEVEN

## THIRD PHASE OF MAIN STUDY

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CHAPTER 7: THIRD PHASE OF MAIN STUDY

7.1 Introduction

The previous chapter described the identification of three factors—learning, teaching and departmental ethos—which were seen to influence the incidence of student epistemology. These findings resulted in the formulation of a second explanatory model, Model II.

During the course of data-analysis, however, another factor was revealed which suggested the advisability of a further area of inquiry. The present chapter, therefore, continues to address the question:

What factors seem to influence the incidence of these difference types of student epistemology?

It describes the formulation of a third explanatory model, as a result of an investigation into the relationship between knowledge, as structured and presented in the four departments, and students' perceptions of knowledge, or their epistemologies. The chapter ends with the identification of four distinct modes of knowledge, which are seen to be a further factor influencing both student epistemology and styles of teaching.

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The analysis of the four modes of knowledge also provided an answer to the third research question:

To what extent and in what ways is the question of student epistemology addressed in the teaching provided and learning expected in departments within Higher Education?

It was decided to examine this question more fully in chapters 8 and 9.

7.2 Nature of the Problem

The task of comparing the diverse bodies of knowledge represented by the four departments studied is beyond the scope of the present study. The problem would parallel that identified by Guba and Lincoln (1982) in their discussion of research methodology:

Since the realities are multiple ... it is futile to expect inquiry to converge. One cannot converge on a 'common' or 'typical' reality, since each is idiosyncratic. The more individuals [subject areas] one explores, the more realities one encounters; inquiry diverges.
as a result ... every inquiry finally raises more questions than it answers

(Guba and Lincoln, 1982.239)

Rather, the intention is to converge upon the common underlying principles which typify the ways in which knowledge is structured and presented. Schwab (1964) said of the problem of comparing bodies of knowledge with few similarities:

The differences we see disappear if, but only if, a new conception is given birth which permits the study of (both) collections of phenomena in one set of terms and therefore makes for unity where diversity existed before

(Schwab, 1964.10)

The present chapter seeks to capture the format for presenting knowledge in each department in a way which will allow the departments to be compared in one set of terms. The examination proceeds through analyses of interview transcripts and departmental course descriptions.
7.3 **Analytical Knowledge**

The foremost activity associated with any department of Higher Education, and which for present purposes will be viewed as un-problematic, is the day-to-day activity of learning and teaching (however conducted) the formal body of knowledge belonging to the discipline. This most usually takes place through the media of lectures, practical laboratory sessions and individual study. The disciplinary knowledge to be acquired by the student is divided into separate parts, in much the same way as the school curriculum, for the purpose of in-depth attention. Students may be seen to be engaging in guided analyses of academic concepts. I have, therefore, termed this main part of courses Analytical Knowledge. This fundamental part of students' courses is necessarily common to all four departments and is summarised below from course descriptions.

**A Physics department**

The parts specified for separate study in the three-year Physics degree course are listed in the course description. It states that a 'full basic course in Physics' is offered in the first two years. In the final year there is a choice of options from Atomic,
Molecular and Magnetic Spectroscopy; Magnetic and Electronic Properties of Solids; Nuclear Physics; Crystallography; Microwaves with Electromagnetic Theory and Communications; Material Science and Crystal Physics; and Digital Electronics. Students are also required to offer Quantum and Statistical Physics.

Teaching takes place through the media of lectures, practicals and seminars. Assessment of the course is through coursework assessment and final examinations.

The Physics department states in its prospectus: 'Students are treated as individuals, personal tutors helping and advising at all stages, and consequently there has been a high success rate both in examinations and subsequent careers ... students completing this course will be equipped for industry, research, development, teaching, or for any occupation requiring an unspecified recognised degree'.

The present chapter seeks to identify the different ways in which knowledge is presented to students and to elicit their perceptions of these areas. The area of Analytical Knowledge in the Physics department is identified by the above list of formal components of the course. Students' perceptions of this
area were generally positive: the work was seen as interesting and the teaching good.

Biology department

The parts separated out for attention in the three-year Biology degree course are listed in the course description. It states that the course is in two parts. Part I is intended to provide a broad basis for subsequent specialisation. In Part II, for the first term, students elect to study three out of six options from: Marine Ecology; Quantitative Ecology and Soil Science; Biology of Pests; Parasites and Diseases; Enzymology; Microbiology and Cell Physiology, Immunology and Development. The three courses selected form essential pre-requisites for third year study, in which students read one main and one complementary course. The main courses are: Marine Biology; Applied Ecology; Crop Biology; Biochemistry; Microbiology; Cellular and Developmental Biology. Complementary courses are: Applied Marine Biology; Populations and Environment; Applied Entomology; Plant Pathology; Biotechnology; Neurobiology; Parasitology.

Teaching takes place through the media of lectures, practicals and tutorials. Assessment of the course is through coursework and final examinations.
The Biology department states in its prospectus: 'The course aims to provide students with a sound biological training, which involves gaining a knowledge of biological systems and acquiring appropriate manipulative skills. In keeping abreast with recent advances in knowledge, the course seeks to equip graduates with training well suited to the needs of industry. At the same time the design of the programme is such that students are trained in a manner that will enable them to handle future changes within the discipline'.

The area of Analytical Knowledge in the Biology department is identified by the above list of formal components of the course. Students' perceptions of this area - their main coursework - were generally characterised by confusion. Whilst finding the work interesting, many students reported experiencing difficulties with practicals and complained of a heavy workload.

History department

The parts for separate attention in the three-year History degree course are listed in the course description. It states that in all three years there are compulsory courses on European History which span
the periods chronologically from c.1450-1780 (Year I), c.1780-1880 (Year II) and c.1880-1940 (Year III). The courses are organised thematically around the major historical problems within the period; these are dealt with in some detail, for example the Reformation and European Society in Year I, Fascism and Anti-Fascism in Year III. In years I and II there are compulsory courses on Social Theory for Historians. The student chooses on option in both Year I and Year III and the two options in year II. In Year III the student also has a choice of a special subject. Finally in Year III all students must attend a compulsory course on Historiography.

Teaching takes place through seminars and assessment through coursework and examination.

The History department states in its prospectus: 'The Honours Degree course in Historical Studies seeks to introduce the student to the problems of how societies develop and change and the difficulties which face the historian in collecting evidence and analysing this process. There is a strong emphasis on social theory and the student is encouraged to use insights drawn from the social sciences where relevant'.
The area of Analytical Knowledge in the Biology department comprises the above list of formal components of the course. Students' perceptions of this area revealed a general lack of motivation and feeling of alienation from the course.

Fine Art department

The course description for the three-year Fine Art degree is not presented in terms of compulsory and optional courses and appears to be less formally structured than the other three departments studied. It states that the first year of the course introduces students not only to the basic philosophy of the course and its theoretical core, but also the the main areas of study and the supporting studies and workshops.

Embracing a range of media and related processes and techniques, which include film, video, animation, audio visual, computer graphics; photography, print; drawing, surface design; ceramics, modelling, casting, metalwork, the course addresses the 'designed environment' as its object of study.

An appropriately integrated programme of Business Studies specifically related to the experiences and
practice of designers will enable students to market their skills.

Students are required to examine thoroughly the nature of the media and their interactions, the nature of the designed environment and its multiplicity of meanings, and the language and meaning of these relations. This theoretical framework provides the themes and issues for the course, its team design projects and the development of a student's programme of work.

Complementing these theoretical, aesthetic and professional inputs will be a strong and accessible technological data base.

The Fine Art department states in its prospectus: 'The course aims to educate the multi-disciplinary designer who is equipped with a range of practical skills as well as theoretical and critical knowledge. Such a designer will be able to respond flexibly, creatively and with social responsibility in a variety of contexts ... This course with its balanced mix of educational and vocational objectives, aims to produce graduates who can work in a range of industrial, professional, educational and cultural contexts which includes the design and communications industry, film
and television industry, environmental-urban design, arts administration and management.'

Teaching takes place through the media of lectures, seminars and individual studio work, which is underpinned by specialist technical expertise and regular tutorial advice and critical assessments. Assessment of the course is through individual exhibitions of work, representing 80 per cent of the final degree, and a 6,000 word thesis, representing 20 per cent.

The area of Analytical Knowledge in the Fine Art department comprises the theoretical studies courses listed above. Students' perceptions of this area were generally positive: the work was seen as interesting and the teaching good.

7.31 Summary

The mode of knowledge here termed Analytical Knowledge has been identified by Hirst and Peters (1970) in their discussion of educational objectives:

Fundamental (to all these) are those distinct, public modes of experience and knowledge which man has now achieved ... underlying all the more
sophisticated objectives such as autonomy, creativeness and critical thought there must necessarily be the achievements of objective experience, knowledge and understanding ... there can be no experience or knowledge without the acquisition of the relevant concepts

(HIRST AND PETERS 1970.61)

It was with reference to the main academic areas of students' courses that they expressed widely differing perceptions. The following sections represent a progressive identification of other modes of knowledge presented by the four departments, with the intention of illuminating underlying differences.

7.4 Own Work (Personal Knowledge)

The next most immediately apparent format for presenting disciplinary knowledge to students is the practice of allowing students to engage in work of their own choice. This takes place in all four departments. Data analysis revealed that students perceive their Own Work to be a significant aspect of their courses. It takes two forms. Firstly, after an initial period of introduction to all elements of their disciplines, students are able to select coursework options, reflecting their own interests. This may be seen to be
part of the process of Analytical Knowledge, but, whilst still presented in the same format, it tends to be seen by students as actively chosen rather than passively received. Secondly, students have the opportunity to conduct projects (or a special study or studio work) on an entirely individual basis, in which they apply the knowledge gained in the Analytical Knowledge area of courses. Although found to be taking place in all four departments, this Own Work element of courses varied in form and scope between the four departments.

A Physics department

i) Course options

Physics students were required to choose four out of eight options in their final year. The students interviewed reported that they were experiencing more personal involvement with the course now that they were engaged in their chosen course options. For example:

In the first year it was basically the same as 'A' levels ... but the second year improved and this year ... I enjoy it this year - these are my options this year - I'm enjoying them so far.
Another student expressed similar feelings:

All along, at school and here, there've been very few choices ... But in the final year you can choose four subjects out of eight. The options go together. I'm doing Digital Electronics, Electromagnetic Properties of Materials, Electromagnetic Theory and Microwaves and ... Quantum Mechanics - everyone takes that. I'm enjoying it

Another said:

Electronics and Nuclear Physics is the most interesting part of the course; they're my options

A fourth student explained the grounds for his choice of options:

I'm interested in electronics. I'm enjoying my options because of the electronics aspect. It's practical. I don't like theoretical Physics ...
I hope to do microwave engineering and digital electronics. I've applied to five companies.

Dr. X commented:

I'm certainly very keen on parts of the course where students make their own choices ... it's interesting; most students jump at the chance, but there are always a few who ... want to be told

ii) Projects

The Physics students interviewed were very enthusiastic about their individual projects, which many described at length. Below is a selection of extracts from interviews which demonstrates the type of project chosen and students' perceptions of its purpose.

If I have an idea, I like to see it right through to the end and I like to work on every aspect of it ... I'm building a robot which will detect cables behind walls - my Dad drilled through the wall one day and went straight through a cable ... It's a buggy on wheels controlled by a computer. Ideally I'd like it to detect cables
under roads, but that's too expensive for a project here. I was told by a chief engineer from Southern Electricity that they guess where the cables are under the ground when they're digging up the road! ... I'm designing it, building it and writing about the theory.

PHY. 7

The next student saw the relevance of projects to her possible future employment:

We choose our own projects to work on ... I presume, in the real world, not in College, you are given problems that other people want solved. When you come into contact with people that do Physics you find that this is the case: "I want this to work. Why doesn't it? or "I want that to happen. Can you make it?" I enjoy the practical side of Physics ... I see now how it relates to everything you do.

PHY. 3

Yet another student emphasised the practical aspect of projects:

I enjoy more practical things. For my project I'm looking at the moisture content in the top
layer of skin, using microwaves, which is fairly practical. You can use it in dermatology, pharmaceuticals - lotions and ointments - or for burns patients,

Another student described his project to me, explaining that he was computerising an experiment to discover the half-life of a radon. He explained further:

Half-life is the radioactive decay. In a certain amount of time so many molecules die off and in another space of time, in the same interval, half of that goes, then half of that, but you never actually get to nought ... I like computers, so I thought I'd do a computer experiment

This student appeared to enjoy explaining his work to a layman. He went on to describe his project for the following term:

It's acoustics this time - to do with reverberation time. When you talk into a room you have to measure the reverberation ... the time interval for the sound to drop to $10^{-6}$ of the intensity it was before ... When you stop talking, for example, it's a very short time that
the sound dies out, and it's different for different rooms, obviously ... You go into an empty hall and the reverberation time is very large, but when it's packed with people it's very short ... (it's used for) designing theatres etcetera

He added:

Before, it was just set experiments you had to do (in practicals) ... it was 'rigmarole' really and this is your own interest - this is what you've chosen

Dr. X revealed:

Projects are their own choice and, in fact, it's nearly always the significant thing that they look back to ... you know, that was very important to them

It became apparent during the course of interviewing that students perceived their projects in terms of the kind of employment they would later take up. The experience of conducting projects had the
effect of changing students' self-perceptions from that of learners to that of physicists.

Biology department

Course option

Students in the second part of the Biology course choose three out of six options for the first term. For their final year they then choose one main and one complementary course. Very few students in the Biology department chose to discuss their course options. Even when asked specifically, most preferred to discuss their projects. Those who did, however, reported that they were enjoying them. For example:

It's better now we're doing our options. I'm interested in Cell Development. I might do a post-graduate course, but you need a sponsor for that ... or I could do industrial research. It's important to me to do what I want.

I'm enjoying the Cell Development option, Embryology, very much ... and Neurology ...
Ecology is an easy option compared to Embryology - it's only waffling. Embryology is factual,
Ecology is just looking at life in general ... The job prospects aren't very good - you need a Ph. D ... There's no money in Embryology, but it's fulfilling.

I'm enjoying the course more this year, because it's more what I want to do. The first two years I didn't enjoy the Stats, or the bio-chemistry very much ... the subjects I am doing are exactly what I'm interested in ... I'm doing Cellular and Developmental Biology and ... Neuro-Biology ... the Cells and the Development especially really interest me

Whilst discussing students' options Dr. A had volunteered:

In some ways Ecology is viewed as a slightly soft option, because you don't get a lot of data, a lot of experiments, a lot of ... you know, notes which you then have to furiously write up and understand and then read round ... there are so few jobs in it that it tends to be looked upon as an 'interest' subject, rather than as training for something. Whereas, if you're really after a
training for something, you tend to go for the more bio-chemical, molecular end.

ii) Projects

In the Biology department students' projects represented 20 per cent of their degree. They were allowed six weeks in which to complete the project, during which time lectures were suspended. Students told me they were expected to do 50 hours' practical work and 50 hours writing-up. The students interviewed were keen to discuss their projects, although some expressed worries about a successful outcome. For example:

I haven't decided which project to do from the list. I'm worried that I might not get results

This student had confided his difficulty with practicals, in which his 'experiments' seldom produced the required results. He, therefore, lacked confidence to tackle an individual project.

The following student was concerned that the time-tableing of the projects meant that he would have very little time left before his final examinations:
For my project I'm doing the development of the thyroid gland in mammals. My next one is about the nerve cell in the leech. I chose from the list, but you could have a free choice. They're started too late, though; you don't get enough time to revise for the exams.

Another student revealed his motive for his choice of course options and project:

I'm doing a project into the development of the limb bud in mice and frogs - in embryos. It's just a rudimentary structure that becomes the full limb. I'd like to do something to do with developmental science when I leave ... with the subjects I'm doing I stand a better chance of getting a job

Dr. A revealed the departmental aim behind the projects:

The aim is to ... review the evidence, propose a hypothesis - and the essence of a good hypothesis is that you can test it - and therefore the aim, for them, is to think of experiments which will ... test whether their hypothesis is a good one or a bad one, and will lead to other questions
which will reject that hypothesis ... 'what is the alternative? What is your evidence for that? ... the project, of course, is just an extension (of practicals).

Most Biology students saw their course options and projects in terms of the employment they hoped to obtain. They were largely pessimistic about their prospects of obtaining employment in biology-related fields and were aware that remuneration would be low, whether in industry or in research. They viewed this factor, however, as being of less importance than personal fulfilment. Course options were referred to with more confidence than were projects, since some students felt they had not had sufficient practice at conducting individual projects and others had experienced difficulties with their practicals. In spite of the worries of a practical nature, however, students spoke with enthusiasm about work of their own choice.

C History department

i) Course options

Students interviewed in the History department were required to choose one option in both Year I and
Year III and two options in Year II. Students reported gaining greater satisfaction from the course in the areas which they had chosen. The following extracts are representative of the group.

The course has got better as it's gone along. For my option this year I'm writing about the Suffragettes, because I'm interested in feminism.

HST.6

I've always leaned towards the Left. Coming here has given me the chance to find out more about it. I'm writing about Marxism (for my option). Just reading the books shows you how the system's 'screwing' everybody - unless you're one of the 7 per cent, is it? who owns 80 per cent of the land ... I don't want to carry on with history. I want to do industrial relations when I finish.

HST.8

Another student was interested in the political aspect of the course and explained how his views had been changed by his studies. He had chosen an option which reflected his political interest:

The first year is worst; I wasn't impressed at all. The second year is better. This year I'm
just plodding along, fed up with it; everyone's fed up ... but the option is better - Marx's theory. A lot of people started the course with no political outlook. Now 85 per cent of the course are Left as a result of the course, me included. I was right the other way when I started

Dr. P revealed that the department ran a personal tutorial system which was based on students' options:

so it's someone they see academically every week anyway, but also fitting in that personal tutorial. So we recognise that the course is demanding, so it does need a bit more monitoring, as it were

This revelation might be seen as one reason for students' greater involvement with options.

ii) Special subjects

The Special subject, offered in the third year, in addition to the compulsory courses and the option was the aspect of the course spoken about most positively by students. The following extracts from interviews
demonstrate students' interests and the fact that many saw the opportunity to conduct an individual study as a welcome change from general coursework.

I'm interested in doing a comparative study of Medway Towns — my home — and Portsmouth: their politics, because it's different. They're both naval towns. You can choose your own study if you're doing a dissertation. You have the choice. You can either do a 10,000 word dissertation, or two 5,000 word essays where the titles are given ... I'm going to do teacher training when I leave. It's why I came here.

HST.2

The option on Mediaeval Witchcraft was very popular with students. Several had chosen to present this for their Special study. The following two students explain the reason for its popularity.

In the Special subject this year, that involves looking at quite a few documents and we haven't really analysed documents as such before ... I'm doing Witchcraft, so mine are quite old ... It's interesting. It makes a break from all the other sort of history we're doing — the Nineteenth and Twentieth Century ... It's just nice to do.
Witchcraft, because we're getting fed up with all
the other sort of history

HST.5

The 'Special' is best - Mediaeval Witchcraft.
You get so fed up with the Nineteenth and
Twentieth Centuries ... It's nice to go back

HST.9

Dr. P. had explained the aim of the Special subject.

It actually counts for two out of the eight
papers and its really detailed work. It's where
we try and get a small group working on primary
sources ... It's the equivalent of a dissertation
without having the problem of getting enough
primary sources, because most regulations on
dissertations for history say that it should be
from primary sources.

The History students interviewed were the ones
who expressed most dissatisfaction with their course.
All except one student (HST.2), who was enjoying the
whole course, perceived the opportunity to conduct work
of their own choice - the option and Special study - as
a welcome relief from the tedium of compulsory courses.
The one exception (HST.2, the only student on the
History course classified as holding a C-type epistemology) intended to teach History as a career. None of the others reported the intention of seeking history-related employment or academic research, although, as Dr. P. had pointed out, there are very few openings for historians. It appeared that many students from this department found employment in personnel management. Others went into such occupations as teaching, accountancy, social work, probation work, librarianship, museum work and one or two into research or law.

D Fine Art department

i) Course options

Students in this department were required to select two from six lecture courses in theoretical studies each term, some courses lasting more than one term. These they reported as enjoyable. The following comments from interviews illustrate some of the kinds of subject-matter offered.

There are courses on different things. I've done a lot of reading for myself and I've particularly enjoyed two courses this year. One was Structuralism and Semiology; the other was
Philosophy. 'J' is an ardent structuralist. I can understand its application to language and I'm trying to see its application to painting. The Structuralism course was originally run here for Architecture students, but in the end there were 4 Architecture students out of 20 - the rest were Fine Art students.

Last year I did Music and Psychology. This term I'm going to African Art and Photography. In African Art we're looking at the male-female aspect and how it relates to today. The Photography course especially helps me in my own work. Someone comes in each week and brings in their photos and talks about what they're doing and why they're doing it.

There's quite a cross-section of things you can go to. For example, Photography and Women's Studies. It helps you quite a lot if you go to those theoretical studies. I've found the Philosophy ones have helped. I've enjoyed it immensely. the way I'm thinking now is related to those lectures.
The lecturer interviewed, 'R', had explained that the department employed a large number of part-time specialists. This was partly as a result of departmental policy: R explained that this was traditional in Fine Art departments because practising artists tended not to want full-time jobs, preferring to 'travel round a lot of colleges and pick up work from one year to the next'. This explained why there was such a wide variety of options available to students. It was also noticeable that not all options could be said to be strictly subject-related. The reason for this was, perhaps, that the department saw itself as providing, in R's words, a 'humanities education'.

ii) Studio work

Fine Art students' individual studio work corresponds to project work in the two science departments and the 'special study' in the History department, although in those departments these activities take place during the third year of the course only: Fine Art students engage in individual studio work (whether printmaking, painting, sculpture, film or photography) from the outset of their course. This work, in fact, represents 80 per cent of the degree and, consequently, assumes greater significance in students' perceptions than in the other departments.
For this reason it is perhaps understandable that Fine Art students appeared to be more involved in their individual work and talked about it at greater length during interviews than students in the other three departments. The following extracts demonstrate examples of the content of and attitudes towards their studio work.

I'm doing Printing. The things I make prints about are all about personal memories, so I'm doing a seminar and essay on 'Memory'. I'm reading Roland Barthes, Sontag and Freud. I thought it would be easier if I related the two things, then I could learn a lot more about what I'm making prints about at the same time as writing ... Fine Art is vocational. When you leave you can get a studio space, or teach, or work in a gallery, repair old tapestries, make stained glass, film directing - anything

I'm trying to produce as much work as I possibly can and from that I'll select work for the final degree. I've made three films on the farm where I live in Worcestershire - basically because it's a location I'm familiar with. If you're worrying about how to frame things right and expose things
right, it's best at least to be familiar with your subject-matter, rather than going somewhere you don't know - worrying about what's going on in front of the camera and what's going on inside as well ... I don't think I'm as artist with something great to say ... My ideal is to be part of a successful commercial film - to be part of something

FA.10

The above student said that he, too, was linking his dissertation to his studio work because 'it seemed logical to look for what other people have produced with landscape' in order to present a well-argued thesis with the benefit of personal experience of the subject.

The next student saw art in terms of personal, emotional therapy:

I started off doing very autobiographical work, but now I've moved into architectural space. I'm looking at Van Gogh and El Greco ... I'm going to do art therapy training. The role of art therapy is to put in a 'third person'; it enables people to talk about themselves. I do it myself - why did I paint that? - then I can start to
think about my problems. I want to do community work.

FA.1

I'm interested in textiles that you walk around, so I'm situated half way between painting and sculpture ... Perhaps I'll get some part-time commercial work and also do my own work. I'd like to work in the theatre.

FA.7

The following student revealed an ideological interest underlying her work and saw art as a means of communication:

I'm working on the alternative perceptions people have of the town versus the countryside; perceptions of them through the media - socially, economically, politically. My painting, photography, filming and thesis are all about that. It's about capitalism. I hope people will see it and start to think for themselves, to use my work as a foundation on which they can build their own ideas. Art is to convey ideas. It's selfish just to paint for yourself.

FA.6
The following student saw his work as a means to a professional career:

I'm using film and photography. I prefer photography. I'm interested in 'stills'; my films have sustained, single shots. If you move from photo to film, you have to understand the language, because it's completely different ... But there are more employment prospects in photography; it's a worthwhile career

FA.8

It may be seen that Fine Art students perceive their personal work in terms of their future careers. They demonstrated a high degree of commitment to their work

'R' spoke about the effect upon students' self-perceptions:

The position is that they think of themselves as being more autonomous, as being ... more in the position to make the content of their lives, even if they don't earn their living doing what they want to do
Summary

Students in all four departments perceived the Own Work aspect of their courses as enjoyable, useful and directly related to their future lives, except in the case of the History students; they enjoyed their 'special' subjects, but saw them more in terms of a release from the main course-work.

Much has been written about project work in Higher Education (for example: Adderley et al, 1975; Bliss and Ogborn, 1977; Hewton, 1977; Jacques, 1977). There are variations to be found on the way a project may be defined but all perceive it as a valuable tool for student learning. Adderley et al (1975) cite Chambers (1972), who:

... draws attention to the Hale Committee's statement that the aim of the undergraduate course should be not only to equip the student with knowledge, but also, and more importantly, to teach him to think for himself and work on his own. Chambers argues that the best way to attempt to do this may be through the practical and the project

(ADDERLEY 1975.74)
The above observations could be equally well applied to the Own Work areas of the History and Fine Art courses. Pope and Keen (1981) put forward the following argument which, in the light of the present findings, might be seen to summarise the contrasting perceptions students held of their main course-work (Analysis) and their individual studies (Own Work):

It is important we realise that significant learning will only take place if the learner perceives personal relevance in the matter being learned

(Pope and Keen 1981.27)

7.5 Historical Knowledge

Having established the prevalence of Analysis and Own Work factors in the way disciplinary knowledge is presented in the four departments, further data-analysis indicated the presence of a third mode of presentation within course structures. From time to time during the progress of interviews, most often in relation to the issue of 'discussion', students mentioned the historical perspective of their work. It became apparent that this aspect of disciplinary knowledge was, in some departments, both explicitly addressed and perceived as an important factor in many students' appreciation of
their subject. Data was, therefore, analysed to determine the extent of this element, the Historical dimension, within the four departments.

A Physics department

Students in the Physics department frequently mentioned the historical context of their work. Both students and Dr. X referred to a part of the course entitled Contextual Course Studies. This was the area within which the historical development of Physics was addressed. The following quotations from interview transcripts reveal the format for presentation of this element and the perceptions of it.

Of the wider Contextual Course Studies (CCS) the following student explained:

We have lectures, problem classes and continuous assessment - CCS. We're given as continuous assessment Logic, which is helping us to think more logically; we have to read the New Scientist, which gives us an overview of other science subjects; and Magic to Science, to give us more of the background, to show us why it's science
Of the specifically historical Magic to Science course she said:

Dr. X's Magic to Science course is very interesting. I think the aim of the course is to make us take a broader view, because it's ... most subjects are completely narrow, because you don't find out what's going on elsewhere and you don't know the background to the subject

She added:

It always surprises me to learn that some of the things we're doing today were discovered so many years ago. You look at them and you think "Oh, I thought that was new", and it's not that new, it's just looked at in a different way ... and it's interesting to know that there are things that people don't really understand still ... the things that you base your knowledge on, we haven't got the ... knowledge yet to understand ... like Einstein's work
Another student gave his assessment of the course:

The Magic to Science course is very well run, very well planned out by Dr. X. ... I'd say it's to broaden the student's mind as to ... both the history behind the subject and the context within the subject ... mainly the history behind the subject: how the subject has been used, abused, or whatever ... You get bored, you see, with just reading formulae and noting down experiments

The following student pointed out a social use for the Magic to Science course:

When you go out with people and they say, 'What do you do?' and you say, 'Physics', well! [laughs] ... Whereas with this you've got something you can talk about to people - it gives a bit more interest to other people. People can relate to it
The next student revealed how the course had influenced his perception of the subject of Physics:

It's given me an understanding of how different areas of Physics 'clicked', which perhaps I didn't know before: how it's all branches from the same trunk, whereas I thought before they were all different trees in an orchard. It makes you more open-minded about issues. We examine the historical and social aspects of physics. (In essays) you try and put both sides to an argument and then make up your mind - your own point of view

PHY.4

Another student compared the Magic to Science course to the main coursework:

It's more interesting ... Maths is all figures - there's nothing to look at, no ... sort of pictures in your mind or anything

PHY.9

This aspect of the course - CCS and, more particularly, Magic to Science, were not mentioned in the course description. I consulted Dr. X, who said:
My lecture course on Magic to Science is dealing with the origins of science ... how it developed out of magic and ... finishing with science and religion. It's quite optional. It's not part of the course, but they all turn up, which is a most unusual thing, because very often they don't turn up for the real lectures ... It isn't examined. I give them a test - it's fun.

He went on to explain his reasons for introducing this optional course into the department:

What you get with teachers is that you don't get the history of science in their courses. The history of science has gone out. There's so much material in a Physics course now that you've got to do, that in fact the science goes out of it and it just becomes learning material ... instead of actually saying, 'Well, one day in 1900 a gentleman called Plank was having breakfast and he turned to his son and he said "Today I have changed the world!"

... Departmental policy to do History of Science grew. Dr. Z pushed for this ... there was a great deal of opposition to doing this in the department and in many areas (of the institution) they dropped it ... I used to go round and find there were people who
weren't supposed to be there in my lectures — architects, and ...

He then explained how it started:

It was Dr. Z who said, 'No, no; we've got to do it!' ... We got one of the people out of History to do a lecture on magic, which I then pinched. It put me on the track and I started reading back ... and we've developed this course. We've been running for about five years now, from a very tentative beginning

It was apparent that both students and Dr. X derived great pleasure from this part of the Physics course. I asked Dr. X if he also thought it affected students' learning. He replied:

Oh yes, I'm sure it does. Certainly it enhances their appreciation of what they're doing, gives them a ... gives them a motivation and understanding that can be applied

I had found, then, that the Historical Knowledge element of the Physics course was perceived as an important element, even though it was voluntary and not examined.
In the Biology department there were no formal lectures on the history of the subject and comments upon this aspect of the discipline were rarely made in interviews. One student's comment suggested that passing references were made to it. In answer to my inquiry whether lecturers ever talked about the history of the subject, he replied:

"Only briefly. Sometimes when we start a new topic they give names and dates"

He added:

"You don't need to know it"

He also demonstrated that he had no interest in the wider scientific community:

"Now we have to do fortnightly essays from Scientific American, journals, or New Scientist. Some articles are interesting, but they're not very related to what I'm doing - not much of them relates of Biology. I don't read Physics or Geology articles"
Another student, who said he was enjoying his course 'very much', expressed an even stronger lack of interest in other sciences, and a somewhat fragmented perception of his own subject:

I don't think much of the other sciences. I can't stand Physics, Maths or Chemistry. ... You can't integrate subjects: what would be the point? ... Interaction between departments wouldn't be beneficial. People are too narrow-minded. Within this department the lecturers are totally different - different lifestyles, a set amongst themselves.

Dr. A had said:

Within Biology there is an enormous spectrum of approaches and disciplines. I mean, in this department, where we have forty-odd staff, we have people who came in as Physicists and chemists who are looking at basic properties of molecules ... how they interact. At the other end of the spectrum we have people who came in as straight zoologists, or ecologists and environmental scientists - very much with a sort of geographical - psychological bias - and they look at communities and eco-systems, and the two
are poles apart: they don't really talk the same language ... and yet they're all biologists

However, she went on to say:

There's a terrible tendency to split it into that (the macro and the micro) and really one wants to make sure it isn't split, but is a spectrum

Two students expressed an integrated view of the subject, seeing the different branches as interdependent. One was the only Biology student categorised as holding a C-type epistemology. She stated:

Biology is the study of plants and animals ... right the way from the actual bio-chemical things that happened in their bodies ... right the way up to their environmental structures. It's really ... a very big spectrum of things

The other student said:

Subjects in Biology are not isolated; they interact. You can't understand Ecology without
These two students, however, in common with the others in this department, displayed no overt awareness of the historical development of Biology, or of science in general.

C History department

The extent to which the History students studied the history of the development of the discipline was not easily determined, since the subject itself is concerned with the study of the past. I had ascertained, in the previous chapter, that Dr. P and his students saw the aim of the subject to be the study of different interpretations of historical writers, although I had also found that all students, except one, were poorly motivated to actively engage in this ideal. However, the course description stated that Historiography was a compulsory subject in the final year. It was described as:

- organised around a series of workshops which discuss different types of historical interpretation, recent controversies amongst
historians and new approaches to history as a discipline

When perceptions of their course were elicited, only one student - the only one categorised as holding a C-type epistemology - mentioned this part of the course. She said:

We do social theory here - Historiography - studying the theory behind History ... studying the writers rather than the history of the period

When asked if the department addressed the history of History, Dr. P had said:

Yes. We have ... a dimension. Well, we do that all the time, I think, when we look at different interpretations. Part of the assessment is: who wrote this? When did they write it? Why might they have written it in this particular way? ... For example, we talk about ... analysis of Fascism and you say, 'Well, why was there a theory in the immediate post-war period which dealt with Fascism as a kind of aberration of the personality?' and ... well, the exposure of the extermination camps, the sheer horror of that was
something that people found very difficult to explain in any kind of rational sense ...
whereas, stepping a bit further back ... there are attempts to explain it, you know, beyond that, in social, economic and political terms. So, yes, we do deal with it all the time, I think, but we also deal specifically ... there's a core element in the third year which looks at historiography as such

And so the Historical aspect of the course was both explicitly addressed and seen by Dr. P as implicit within the main part of the course. It was not immediately evident why 9 students out of the 10 interviewed in the History department made no mention of it and used the words 'boring' and 'fed up' so frequently. Dr. P had referred to 'non-participant' students and yet he spoke enthusiastically about his teaching, which he perceived as student-centred. He had commented

I think it's quite an exciting History course, without boasting too much - challenging

The structure of the course included the study of the history of the discipline - an aspect of their course which the Physics students reported as stimulating and
useful for their main studies. One possible explanation for students' withdrawal from the subject might possibly have more to do with teaching style than with the course content or structure. Dr. P had stated:

We don't make it too simple. In the first year we make it quite difficult for them ... we teach a social theory course which is really quite demanding in terms of the things you're expecting them to get to grips with - really quite rigorous academic ideas. Now, the basis for that is that I think it's better to confront them with these issues right at the start, rather than to build up very, very gradually ... It's like going in the sea for the first time - it's better to go straight in and then get acclimatised.

One of the students had remarked:

In the first year I hadn't a clue; the things we were expected to look at and think about ... I didn't know what I was expected to do. It was very difficult ... I've never had to think before. After the first year the second year got a lot easier for me. This year ... I've just had enough now, basically.
Another student had confided:

You just get argued down if you speak in seminars. Dr. S could argue anyone down. He'd get a degree for arguing!

HST.10

It would appear that some students felt intimidated, both by different subject-matter and by a confrontational teaching style and by the third year were lacking involvement. Whatever the reason for students' lack of involvement in the course, however, I had discovered that there was a Historical Knowledge element of the course, even though students did not appear to be responding positively towards it.

D Fine Art department

The Fine Art department had History and Theory of Art as an established course running throughout the three-year course. It was one of the courses subsumed under the general heading of Theoretical Studies, which students perceived as interesting and an important part of their course. Of the History and Theory of Art students had commented:
It's a good idea to have a general picture about the way that people work in a certain area - different approaches and traditions give it a historical context which I think is important ...

Most people do Art History ... You have an introductory course in the first year, then it's basically up to you to read journals and historical works, theories and critical works: it's a requirement of the course that you should. I've done it out of interest anyway

FA.10

The following student revealed the kind of discussion which took place on the course. Here, the nature of art has been debated:

There's always been a debate about art for society and art for oneself. There's never been a satisfactory solution ... If you talk about graphic arts, the majority of them are used in consumerism, commercialism - that's the only way they communicate - but in Fine Art we're using different types of levels, different languages to communicate. Different ways of expression means certain things to certain people. Everybody perceives things in different ways ... but you'll
Another student referred to the content and approach of the course:

I enjoy the History of Art on this course. My thesis is about the history of art, when you apply it to painting - the body of ... the theory of painting ... We've had various lecturers in the department standing up and saying their piece from their own angle. 'J' gave a definition of Minimalism, then 'R' gave his view of Post-Modernism, then 'C' talked about anthropology and the cultural perspective ... we had an essay on Art History; the different views of Art History rather than a chronological thing

A part of the purpose of the course, then, was to examine the nature of Art History as a discipline as well as that of art practice. The following student reinforces this point and reveals that students continue to discuss the issues when working in the studios:

I learn a lot from studio discussions with other students; you get different viewpoints. For
example, Art History has usually been written from an Idealistic point of view. I'm now reading it from a Materialistic viewpoint.

In the next extract the student demonstrates that the theories addressed have been applied to areas of the arts beyond Fine Art:

I'm interested in the history and theory, especially of film and photography. My thesis is Photography and Realism - the work of Walter Ellis. Realism in art developed in the nineteenth century I'm looking at its effects on the other arts. I've a chapter on French literature - Flaubert.

R had explained the form and purpose of the History and Theory of Art course which he ran:

It's critical art theory, I would say ... Art History, as I see it, has become completely re-defined ... It was structured traditionally through such a narrow set of definitions, but now I see it as an area of cultural studies and cultural history ... which means that students
are less weighed on by traditions. The main thing which they do is to have historical courses and theoretical courses about the nature of artistic production as a form of cultural production in general ... an approach to the notion of art or artists as a historical phenomenon which changes through time and which they are at a particular stage of development ... which, in a sense, is a way of making them feel responsible for that phase of development.

R explained that the Theoretical Studies part of the fine Art degree course, which included his History and Theory of Art, was provided to give a background framework upon which students could draw for their studio work - which represented 80 per cent of the final degree assessment - and for their thesis - which represented 20 per cent. I had found that both students and R considered the historical element of the course to be of fundamental importance.

7.51 Summary

Analysis of the Historical Knowledge element of courses has revealed that three of the four departments (Physics, History and Fine Art) explicitly addressed this area of disciplinary knowledge. Of those three,
the students and lecturers interviewed in the Physics and Fine Art departments perceived it as an interesting and useful part of their courses, whilst in the History department the lecturer viewed it as important, but the students appeared unresponsive.

An explanation for this difference in response was provided by the Fine Art lecturer - R - who offered the information that he also lectured on a History of Art option in the History department. Unaware that the present study involved data-collection in the History department, R reported:

The different response from the students (Fine Art and History) make you re-define the subject area and to think of it as having two completely different functions ... The difference resides within the student and the course. If it becomes a kind of critical, cognitive value, then Art students tend to be very acquisitive of knowledge. They tend to be very anxious to reproduce knowledge ... and in a much more active way (than History students). History students ... even the very good ones - I mean even the very good ones - tend not to view knowledge as essentially cognitive. They tend to view it as rather repetitive. You see ... although they
might be quite inventive or creative, or do new work, they don't view it that way. They view it as essentially ... you know, repetitions and rehearsals.

When asked why he thought this was the case with History students, R replied:

Because the initial input isn't on self-expression ... from the department ... from the function of the course. In the case of the Fine Art students I can be quite ambiguous. You know, it can be quite self-indulgent, but it can make them see knowledge as positive and active, rather than as something which you acquire and then reproduce more or less efficiently. So the good Art students tend to have a slightly different conception of their relationship to knowledge than a good history student ... it means they never want History (of Art) for quite the same things.

It would seem to be a valid point that History students experienced less freedom of choice over their work and were less autonomous than Fine Art students.
The Historical Knowledge element of students' courses, where it existed, may be seen as an examination of the discipline through the perspective of time. It was presented as looking back over the development of concepts within the discipline, thus placing present-day work in context. It also looked forwards, by implication, or sometimes explicitly, making students aware of disciplinary knowledge as currently active and changing. It could thus be seen, in Physics and Fine Art, to be influencing students' perceptions of their own relationship to their discipline away from themselves as passive receivers of a static body of knowledge to one in which they themselves are potential contributors to the future direction of the discipline.

Schwab (1964) argued the necessity for making explicit the substantive structure of a discipline to students. He stated that enquiry has its origin in a conceptual structure through which we are able to formulate a 'telling question'; that it is through the telling question that we know what data to seek and what experiments to perform to get those data; and that once the data are in hand, the same conceptual structure tells us how to interpret them, what to make of them by way of knowledge: finally, the knowledge itself is formulated in the terms provided by the same conception. Schwab maintained that in each science and in many arts
such conceptual structures prevail and, furthermore, that the dependence of knowledge on a conceptual structure means that any body of knowledge is likely to be of only temporary significance, since new complexities of the subject matter arise, which call forth new concepts which give rise to new bodies of enquiry and, therefore, to new bodies of knowledge stated in new terms. For these reasons Schwab argued that:

> The significance of this ephemeral character of knowledge to education consists in the fact that it exhibits the desirability if not the necessity for so teaching what we teach that students understand that the knowledge we possess is not mere literal, factual truth, but a kind of knowledge which is true in a more complex sense. This in turn means that we must clarify for students the role of concepts in making knowledge possible (and limiting its validity) and impart to them some idea of the particular concepts that underlie present knowledge of each subject matter, together with the reasons for the appropriateness of these concepts and some hint of their limitations

(Schwab 1975.13)
Holton (1973), in his discussion of the thematic origins of scientific thought, quoted from Einstein, (1916) who stated that:

It is (therefore) not just an idle game to exercise our ability to analyse familiar concepts, and to demonstrate the conditions on which their justification and usefulness depend and the way in which these developed, little by little ...

(Holton, 1973. Frontispiece)

The element of Historical Knowledge identified in courses was found to be addressing the above concerns. It was also the first area of significant difference found between the course structures of the four departments. It is suggested that disciplines presented to students as having a backwards and forwards momentum will encourage them to see knowledge in their own discipline as relative in time. Discovery of a predominance of C and D-type student epistemologies in the two departments found to be successfully offering Historical Knowledge of their disciplines suggests that this was occurring.
7.6 Philosophical Knowledge

As in the previous section - Historical Knowledge - Philosophical Knowledge as an element of students' courses was identified through listening to students' many comments about discussion within their departments. The section is entitled Philosophical Knowledge because students' references and descriptions implied that it addresses the area of knowledge-in-general and, whilst links are made to students' main disciplinary areas, is not primarily subject-specific. It appeared that this aspect of learning was, in some departments, explicitly addressed and perceived as an important factor in some students' appreciation of their education. Data was analysed to determine the extent to which the element - the philosophical dimension - existed within the four departments

Physics department

As with the historical dimension of their subject, the element of philosophical consideration in the Physics department took pace within the small collection of complementary courses entitled Contextual Course Studies (CCS). Specific courses on Logic and Problem-solving had been mentioned by both students and Dr. X, but it was during discussion of Dr. X's Magic to
Science course that students revealed that considerations ranging beyond the weekly subject-centred topics presented by Dr. X took place. The following extracts from interviews provide an indication of the content of these discussions and the type of thinking it stimulated.

This student gave her perceptions of the course:

It (Magic to Science) gives you a wider background, not just to Physics, but other things around it: an appreciation of other people's sciences. It's extra, to make you more aware of things outside. I think it's a good idea

The following student's comments provide an example of the kind of questions addressed and the way in which discussions were conducted:

Dr. X's Contextual Course Studies are very interesting. This year's group is not so talkative. Last year people questioned more, especially on religion - we had a Muslim in the group. Also, there was more discussion on ... for example, 'What is a Scientist?' Everything is questioned. We needed an extra week last year
because of all the questioning. Dr. X will stay quiet for twenty minutes while people argue across the room.

The student in this extract gave her perception of why the course was seen to be necessary and revealed that it addressed fundamental questions:

There are so many branches in Physics. You specialise in one branch and still find it varied ... Dr. X's Magic to Science course is very interesting. I think the aim of the course is to make us take a broader view, because most subjects are completely narrow - you don't find out what's going on elsewhere. It's to give us more of the background, to show us why it's science.

She went on to explain what the course had taught her (other than the development of Physics) and demonstrated a view of knowledge as relative in the process (as well as an awareness of a subjective element in science):

Everything has an effect on what you do. No matter what you do, something has an effect on.
it. You can't divorce yourself from what you're doing or how you're influenced. When you're young and a bit gullible, perhaps you think you're independent of what happens around you, but I don't think this is the case ... Contextual Course Studies gives you an overview.

The following student reported that he had enjoyed a wide-ranging General Studies course at school and saw CCS as an extension of that:

I would love to see a course in Physics where more of that (CCS) could be included - the historical background, the philosophical background ... there are opportunities to develop that. You do get projects, assignments ... we've got one this Christmas. I'm doing 'The Copernican Revolution' ... I thought it was a good idea to use that chance ... I wasn't necessarily thinking 'let's do some philosophy', but, yes, along that line, something different ... It depends on what your background reading is. If it's history of science, general philosophy, to some extent it's going to affect your attitude to the subject.
This student explained why he enjoyed this aspect of the course and what Dr. X had told them:

The main part of the course is mostly facts given to you - thump, thump, thump - you know. There's one thing that annoys Dr. X more than anything, which is that they don't teach us how to think, which is what we're supposed to be doing ... a proper thinking course. Have a word with Dr. X. He's really intellectual. I admire him.

I consulted Dr. X. He explained:

It's telling them what the mind is for, why people do science, because ... when you talk to students, you see, you have difficulty. They do science, but they don't know why they're doing science and they don't know what science is. They don't know why Chemistry is science and Biology is science and Physics is science - they don't understand that ... and many of the people who lecture them don't understand what that is about ... But once you break it down, then you get them into groups and try to work out what science is; they gradually come to a realisation what it is, in fact, they're doing - that they
are actually involved in solving problems by ... various techniques that are available to them

Dr. X went on to say that once the individual understood the basics of logic and problem-solving, these skills could be applied across the whole range of activities; that the method does not change, only the context, even when dealing with non-linear situations, architectural or economic, in which one could not set up a closed-ended experiment. He said:

In a way, it gives the tools across the subjects for so many different things and then they can go away and apply it and they can understand ... about what they're actually doing.

He added:

If you're in France, of course, you talk to French students of eighteen and they know what pedagogy is, they know about epistemology, they know quite a bit of metaphysics, logic, rhetoric ... in the lycee that's part of their course. Philosophy covers all these things. You ask the average Englishman what pedagogy is and he doesn't know. That's why they enjoy my lectures so much ... it's never been the same from one
I'm just planning my next course. I'm basing it on Harre's book 'Twenty Great Experiments' – he's fascinating! I talk about, for instance, the role of accidents in science, the role of technology in science, to try to get them to understand that what they're doing when they go out of here ... they've got a degree, they're going into the big wide world where people have got problems they want solving ... And whether you go as an accountant, you go into administration, as a teacher, that's what you do – solve problems.

It could be suggested that the above extracts show that students not only found the philosophical dimension of Dr. X's lectures stimulating, but were aware that they were being exposed to a range of alternative conceptions which influenced their own views of science in particular and knowledge in general.

B Biology department

There was no course offered in the Biology department which dealt with Philosophical Knowledge. Throughout interviews with students only one person suggested that she held a view of knowledge as relative. This was, as in the previous section on Historical
Knowledge, the only Biology student categorised as holding a C-type epistemology. She saw Biology as a discipline which reached out from both ends of a large spectrum to merge with other disciplines, such as Chemistry, Sociology and Geography. She mentioned her educational background and revealed that she had not specialised in science subjects exclusively, which suggests a reason for her breadth of view. She reported:

(At school) I liked doing English Literature and Greek Literature and Translation, and I still like ... you know, Classics and that sort of thing. When I went for interviews they said, 'Oh good. We'll at least have a literate biologist for a change'. Apparently, most biologists do all sciences, so they don't write essays usually

She later said:

Everybody in the Life Sciences, I mean, including Chemistry I would have thought and Pharmacology and Medicine - they all work together on the same sort of projects ... The chemists are the ones that split things up for us really. If you haven't got the know-how, you go to a chemist.
No other student, however, offered comments about the relationship of Biology to other sciences, or showed that they had considered the nature of scientific inquiry within the department. Any such discussions mentioned took place informally, in social situations outside the department and were conducted amongst peers.

The interview with Dr. A suggested that she saw the different branches of Biology as an integrated spectrum (see previous chapter) and that whether you follow Biology as a specialisation or for interest:

you are likely to get a more unbiased view of man and his behaviour ... the world around him and how he fits in with the other animals and the bio-system

She added:

It's a very sane subject, if you know what I mean ... it, I think, puts things into perspective

We later discussed Ecology. Dr. A said:

F, in particular is perhaps a good example (of an ecologist) because ... he's very bright and he talks about the more philosophical aspects of the
problems of Ecology ... He talks about them in a rather nebulous way ... and the students find his lectures fascinating ... But they come out not having any notes, because they've found it very, very difficult to take notes from that sort of chat ... and the good students will, therefore, do well and the bad students do very badly, because they've nothing ... behind ... on which to revise or anything ... in some ways, therefore, it's viewed as a slightly soft option ... you don't get a lot of data, a lot of experiments, a lot of ... you know, notes, which you then have to furiously write up and understand and then read around ... because it is more philosophical

So, although Philosophical Knowledge was not contained in the course structure, one lecturer in the department included that perspective in his Ecology lectures. Dr. A, however, implied that it was both unusual and not viewed very seriously by the department at large. Students had referred to the Ecology option as 'not proper Biology'.
Although Dr. P had stated that the History course attempts to give students 'more than an interest in history', students were found to be unwilling to discuss the meaning of their work, beyond stating that it consisted of analysing different interpretations. One student - the only one categorised as holding a C-type epistemology - said:

We discuss the ideology prevalent in any period. Why Marx was adopted by different groups is ideology.

No other student offered such remarks. Dr. P had compared this History course, which he perceived as having an informal departmental ethos, with the more formal course he had experienced as an undergraduate:

It's also obvious to me here that the course - compared to the one I used to be on - is much more demanding. The students are asked to read more, to actually make more evaluative judgements and so on. Now ... whether we can get the student to do that because of the more relaxed atmosphere, to get them more involved ... Yes,
now I think about it, it probably is the case ...
this is the course that gives them more
preparation ... for anything. For understanding
history, but also for becoming a more developed
personality

He added:

There are never any definitive histories, and
their (students') problem is how they come to
terms with that ... I think it's still difficult
for students who find that they've been taught in
a particular way and been prepared for a
particular experience, like 'O' and 'A' level
exams and then find that they have to re-learn
the techniques which they've acquired. For some
it takes quite a lot of adjustment ... I think
the transition is often very difficult

Dr. P's observations are reinforced by students'
perceptions of the course. Their response often seemed
to be to lose interest. The departmental method of
encouraging students to get to grips with new and
difficult issues was, as pointed out in the previous
section, to 'confront' them.
In this department, then, Dr. P saw the departmental aim to be to prepare students not only to understand history, but to become 'more developed personalities' and to acquire 'socially transferable skills'. Interviews with students, however, suggested that there existed no forum for philosophical discussion and a predominant feeling of alienation from the course.

D. **Fine Art department**

The dimension of Philosophical Knowledge in the Fine Art department was found to be explicitly addressed. As with the historical dimension, it took place within the Theoretical Studies area of the course. There were several courses which could be described as dealing with the philosophical dimension, but many students had mentioned one in particular, the 'Philosophy' course run by 'H', which they perceived as well-run and stimulating.

I asked one student if the Philosophy course had any relevance to her own work. She replied:

Definitely, especially basic questions like cause and effect, which are very much connected with practice as far as I can see ... What came out of it is just ... because I hadn't thought about
philosophy at all before that and it's just ... different ways of thinking and looking at things ... ideas that I hadn't come across, but were obviously there and I was thinking about in a different way ... thinking about it and working through it ... After the Philosophy lectures some people talked in groups over coffee, but I go home and go over my notes, so it's more of a personal thing

The following student also mentioned the effect of the course on her work. Unlike the previous student, however, she enjoyed the discussions afterwards:

I've found the Philosophy lectures have helped. Everyone that's done it said it's helped them - for their theses.

When asked if it had any relevance to her studio work she replied:

I think it probably has. Not ... to any great extent at the moment, but I think it probably will ... I think the way I'm thinking now is related to his Philosophy lectures ... Well, after the lectures everyone used to go upstairs
to the canteen for about two hours and hammer out philosophy up there and H used to join us for that, which was good

FA.4

The student's comments in the following extract made a more general statement about her educational development:

In the first two years I was more interested in the social implications of different art movements, but now the philosophical implications are more ... I feel as if my sort of level of knowledge has gone up a whole step. The first sign was that I had to buy a new dictionary ... suddenly I was coming into an area with a lot wider vocabulary ... and that's the first thing that made me realise how much further I was getting

FA.5

The next student also reported that the Philosophy lectures had kindled an interest in alternative ways of viewing the world, which he had followed up in his individual reading:
Yes, they've been very useful. I've become interested in Taoism - my thesis is about that. The Chinese view the world in a different way. For example, Taoists say 'soft always overcomes hard'. It's about simplicity, a philosophy of stillness and emptiness. We can learn from that in the West ... It's only just recently that I've discovered a link between by philosophy work and my art work - it was too much of a complex statement I was trying to make - subtle. I developed into interiors and from there to just objects ... taking ordinary objects and trying to evoke atmosphere, mysticism

I had not yet interviewed H (see CH. 9), but R had said that the whole area of theoretical studies - including historical and philosophical studies - were not directly examined, but were included to provide a framework from which students could draw for their art practice and their theses. He explained that it was difficult to define in terms of a set of fixed educational criteria, but gave his perception of its effect upon students:

It may not directly help them to form their ideas, but it gives them the freedom to think much more widely ... I think the range of what
they read, the kinds of problems they get involved with, the fact that some of them feel free to become very involved with art theory and cultural studies and do a lot of work in that area ... some of them far exceed the requirements for their final year thesis, for example.

He clarified further by stating that without such dimensions:

... you'd just then be running, very simply, ...

Painting, Sculpture, Ceramics - technical courses

The above extracts suggest that students in the Fine Art department perceived their philosophical studies as being of fundamental importance to their work and to their personal development.

7.61 Summary

Analysis of the Philosophical Knowledge area of courses has revealed that two of the four departments, Physics and Fine Art, were explicitly addressing this aspect of knowledge. In the Biology and History departments the two lecturers interviewed revealed a view of their disciplinary knowledge as an integrated whole and believed such a view to be implicit in their
courses. No explicitly philosophical courses were offered, however, and students in these two departments showed little awareness of issues outside their disciplines. These students had been categorised as holding mainly B-type epistemologies.

The analysis also reveals that, unlike the other three areas identified - Analytical Knowledge, Own Work (Personal Knowledge) and Historical Knowledge - Philosophical knowledge was not subject-specific, but was concerned rather with knowledge in general. It could be seen to give students the opportunity to engage in a meta-discussion of their own and others' disciplines and their interrelationships through the medium of philosophy. It, thus, fostered an extended view of knowledge, introducing the concept of knowledge as relative in space - within, around and beyond their own discipline.

It is suggested that it may, perhaps, have been the presence of a philosophical dimension in the Physics and Fine Art departments which accounted for the fact that these were the only two departments in which students holding a D-type epistemology were found.
Pope and Shaw (1971) argue for relativity in constructions of reality and suggest why scientists often lack this view of knowledge. They cite Kuhn:

Kuhn suggests that professional scientists are educated in the 'normal' scientific mode, which involves solving problems within the limits of the theory the scientist has been taught. The theory itself is not questioned.

(Pope & Shaw 1971.231)

They also cite Esland, who maintained:

De-reification of knowledge shows barriers between subjects to be only human constructs. This can be brought about by questioning.

(Pope & Shaw 1971.231)

Students in the two departments offering philosophical studies reported their courses as characterised by questioning and discussion.

Piaget and Inhelder (1969) argued that:

The explanatory level involves underlying structures which inevitably cut across the...
traditional boundaries between the different disciplines

(Koesther & Smythies 1972.148)

and Thorpe (1969) stated:

When we shift, as we must, from analysis to synthesis, we do so by raising our sights from single objects to their interrelations with others

(Koesther & Smythies 1972.429)

The philosophically-based courses in the Physics and Fine Art departments could be seen to be concerned with such interrelationships.

With reference to Kelly's work (1955), Pope Watts and Gilbert (1983) suggest that:

Philosophy may be seen as emanating from a constructivist viewpoint in that the situation has been provided in which the student can articulate his personal constructs

(Pope Watts & Gilbert 1983.33)

The Philosophical Knowledge element of courses may be seen to be supported by the literature.
7.7 Findings

Analysis, supported by the literature, in the foregoing sections has resulted in the identification of four distinct modes of knowledge presented to students across the four departments studied.

a) Analytical Knowledge

This is the main area of study in which students are examined for their degrees, except in the case of Fine Art students, for whom their individual studio work represented the main area. It was seen to be subject-specific, inward-looking and usually highly specialised. It was found in all four departments.

b) Own Work (Personal Knowledge)

This aspect of courses was found to consist of two related areas: course options and projects (including 'special' studies and studio work). It was seen to be subject-specific, inward-looking and an extension of Analytical Knowledge in that it required students to apply the concepts learned in that area of their studies. Own Work was found in all four departments.
c) Historical Knowledge

In this area of courses students were found to be reviewing the conceptual development of their disciplines and, in the process, becoming aware of the substantive structures underlying them. It was seen to be subject-specific and both backward and forward-looking. Students showed that they were becoming aware of their disciplines as dynamic areas of knowledge. It introduced students to the dimension of time as an important factor in disciplinary knowledge. Historical studies of disciplines were found in three departments - Physics, History and Fine Art - although in the History department students appeared to be uninvolved.

d) Philosophical Knowledge

In this element of courses departments dealt with knowledge in general and was, therefore, seen to be non subject-specific and outward-looking. It addressed the philosophical bases of students' own and others' disciplinary areas and introduced students to wider issues. It, thus, gave students the opportunity to develop what might be termed a spatial awareness of knowledge - away from a view of their own disciplines as discrete areas to one in which many bodies of knowledge may be seen as interrelated.
Model III: Course Structure

Figure 9
The above findings are encapsulated in the model, Model III, Fig. 9 which seeks to illustrate that the two areas of Own Work (O0), the area of Historical Knowledge (H) and that of Philosophical Knowledge (P) Provide complementary perspectives upon and enhance learning in Analytical Knowledge (A). Moreover, the two elements H and P, which were found to exist only in the two departments having students holding mainly C and D-type epistemologies, were seen to contribute a dynamic thrust (in space and time) to what otherwise might have been a static model of course structure in Higher Education.

An analysis of the extent to which these four areas are addressed within the four departments studied reveals the following information:

Physics ..... H O0 PA
Biology ..... O0 A
History ..... (H)* O0 A
Fine Art ..... H O0 PA

* offered, but not effective

It may be seen that the two departments addressing all four areas (H O0 P A) - Physics and Fine Art - were the two departments having students categorised as holding predominantly C and D-type epistemologies (Fig. 10).
### Relationship of Course Structure to Student Epistemology

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<tr>
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Figure 10
Findings, thus, suggest that the incidence of student epistemologies is influenced by the type of and number of modes of knowledge offered to students in their departmental course structures.

7.8 Discussion

Whilst in the process of identifying the different ways in which knowledge is structured within the four departments, I consulted the literature on the subject - (for example, Hirst and Peters, 1970; Hirst, 1974; Brent, 1978), finding that the emerging categories of the present analysis corresponded to authors' perceptions and treatment of the whole area of educational knowledge. A subsequent questionnaire circulated to colleagues demonstrated that this is the most commonly held perception. As such, it could be seen as evidence revealing a notion of knowledge as consisting of discrete areas, or a fragmented view of knowledge.

Analysis here has found that four forms of knowledge are present within two of the four departments studied and thus suggests an alternative conception of a model of forms of knowledge - as a potential representation of knowledge in any disciplinary area. These two alternative conceptions may be seen to have
similarities with Bernstein's (1975) 'collection code' and 'integrated code'.

All four departments were found to include Analytical Knowledge and Own Work. The extent to which disciplinary departments include complementary modes of knowledge, such as Historical and/or Philosophical Knowledge, in their course structures depends upon each department's collective view of knowledge. This, according to Bernstein (Berger & Luckman, 1967; Blum, 1970; Esland, 1971) is socially constructed.

The epistemological stance of disciplinary departments, however constructed, has been seen by many authors to be characterised by a dichotomy. Lawton (1973) referred to the classical (subject-centred) and Romantic (pupil-centred) dichotomy: Gergen (1982) to an 'exogenic' theory of knowledge granting priority to the external world in the generation of knowledge and an 'endogenic' theory of knowledge, which holds the process of mind as pre-eminent: King and Brownell (1966) saw two major characteristics of the modern world of knowledge - the 'autonomy of the disciplines' and the 'pluralism of the modern world'. These dichotomous analyses could be seen to be reflected by the 'traditionalists' versus the 'progressives' argument.
Authors delineating the two sides of the dichotomy have often done so in the process of both calling for a unity of approach and suggesting ways in which it might be achieved. King and Brownell state:

Integration and unity of knowledge are achieved by the inquirer as he surpasses boundaries of divisions of knowledge by means of generalised intellectual skills

(King & Brownell 1966.41)

Brent put forward his method for resolving conflict:

There are rationally and epistemologically based principles which transcend "warring ideologies and their curricular factions". The discovery of these principles is possible only if one sees philosophy as effectively synthesizing apparent differences

(Brent 1983.12)

It is suggested that the modes of knowledge found to be effective in the present study and illustrated in Model III - the HOOPA model - might be seen to represent and bring together both sides of the dichotomy see Fig. 11
Relationship of Course Structure to Dichotomous Theories

Figure 11
Such a representation suggests that in the case of the two departments offering students all four modes of knowledge - Physics and Fine Art - the factual learning and formal tasks associated with A and O0 are balanced by H and P studies, which were seen to deal with relationships, in space and time, between facts, using student-centred methods.

The success of the H and P elements of courses, which it is suggested influence students towards the development of C and D-type epistemologies, was attributed by students to a discussion-based milieu as well as to content. Entwistle (1975) maintains that many lecturers in Higher Education see the development of critical thinking as their main objective. He cites Perry (1970), who terms it 'qualitative, contextual, relativistic reasoning'. All four lecturers interviewed in the present study expressed such aims. Only two departments, however, were seen to be explicitly and successfully addressing this area.

7.9 Summary

This chapter set out to investigate the relationship between student epistemologies and the way in which knowledge is structured in the four departments studied. Four areas, or modes of knowledge, were
identified. Literature on these four areas was reviewed within each section. Finally, Model III was formulated and discussed.

Model III can now be joined to Models I and II to provide an extended model. This final model represents a more comprehensive explanation of the factors influencing the incidence of student epistemology.

In Model IV Fig. 12 student epistemology is shown to be influenced by modes of knowledge in course structure, both directly and as transmitted through factors of learning, teaching and departmental ethos. The latter are shown as both influenced by and influencing course structure.

It was found that the two areas of Historical and Philosophical Knowledge were explicitly addressing the problem of student epistemology. The findings, therefore, provided an answer to the third research question:

To what extent and in what ways is the question of student epistemology addressed in the teaching provided and learning expected in departments within Higher Education institutions?

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It was felt, however, that the two areas of Historical and Philosophical Knowledge merited closer examination. Access was, accordingly negotiated to two such courses. The following two chapters give an account of the subsequent observations, interviews and analyses.
Model IV: Factors Influencing Student Epistemology

Figure 12
CHAPTER EIGHT

EXTENSION OF MAIN STUDY: I

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CHAPTER 8: EXTENSION OF MAIN STUDY: I

8.1 Introduction

The previous chapter resulted in the identification of four complementary modes of knowledge presented to students in departments of Higher Education. It was found that two departments only offered all four elements. Furthermore, it was found that the presence of Historical Knowledge (the changing nature of knowledge) and Philosophical Knowledge (the relativity of knowledge) directly addressed the problem of student epistemologies in the Physics and Fine Art departments and coincided with a predominance of C and D-type epistemologies found within those departments. Findings were illustrated by Model III - the HOOPA model of course structure. The chapter ended with the formulation of Model IV, of the whole thesis, to illustrate findings - that student epistemologies are influenced by course structure, which is both transmitted through and affected by factors of learning, teaching and departmental ethos.

The following two chapters represent an extension of the main study and are intended both as further clarification of findings and supplementary data on the content, presentation and significance to students of
two sub-courses dealing with Historical and Philosophical Knowledge in the Physics and Fine Art departments respectively.

The present chapter addresses the third research question: To what extent and in what ways is the question of student epistemology addressed in the teaching provided and learning expected in departments of Higher Education? It describes an eight-week course entitled From Magic to Science which took place in the Physics department and had been identified as addressing the element of Historical Knowledge (or the changing nature of knowledge). It describes the principle content of the course, analyses of interviews with participant students and staff and, finally, a summary.

8.2 The course

The course, From Magic to Science, took place for two hours weekly in the Physics department, running for eight weeks. It was an optional, non-examined course, presented by Dr. X and attended by an average of fifteen students. Throughout the eight weeks I sat amongst the students, taking notes, as they were, playing the role of participant observer. Interviews were conducted after the final week. I had already interviewed Dr. X,
so took the opportunity to interview Dr. Z, who had been named as the instigator of Contextual Course Studies.

The following summary of the course is intended to provide the reader with a resume of the topics presented, in order to put into context the subsequent interviews and analyses.

Week I

Dr. X introduced the course by explaining its purpose: that upon discovering that the history of science was not included in the departmental course structure, he and Dr. Z had decided to 'rectify the situation' by introducing a series of optional 'background lectures'.

He then gave an overview of the eight-week course, explaining that man developed magic, and then science, because of his wish for influence over nature; things, animals and people. This was for two main reasons:

a) He wanted the power to predict for practical purposes e.g. predicting frost for crops.
b) He wanted knowledge, which would lead to power and wealth.

Witches were persecuted because they threatened the economic position of priests and doctors.

Week 2

This week's lecture presented an explanation of the two main types of magic: 'correspondence' and 'contagious', both of which were 'a way of looking at nature based on a belief in cause and effect'. Magic produced a series of 'recipes'. Newton was influenced by it and wrote 'The Vegetation of Metals'.

Week 3

This week's lecture described the reason for the growth of science. Man found that magic had a tendency to fail and was neither consistent nor reproducible, so in the sixteenth century Bacon and Descartes decided that man needed a 'new magic'. Bacon developed a route to reliable knowledge: from a theory, you predict, then test. Following Bacon were Hooke, Halley, Boyle and Newton. At the end of the seventeenth century the Royal Society was founded by Charles II. With Bacon's system man would be able to cure all his ills and control
nature. It was at this time that the word 'magic' changed to 'science'. Dr. X asked students for a definition of 'science'. He then gave dictionary definitions, definitions from other languages, then definitions from individual writers (Harre, Ziman, Spencer, Huxley, Valery, Koestler, Einstein and Bondi). At the close of the lecture he circulated a questionnaire entitled 'What is Science?' to be discussed the following week which included such activities as chess, history, boxing and computer programming.

Week 4

Week 4 was characterised by very active discussion of the questionnaire, 'What is Science?' For this reason I have included quotations from comments made.

Before Dr. X arrived, students were discussing the questionnaire:

St. A: Science is just observing and seeing what there is.

St. B: Isn't it interpretation, too?
St. A: Well, it's the same thing, isn't it?

St. C: (to myself): This adds spice to the drudgery!

St. B: Scientists can predict with accuracy.

On the blackboard in the lecture theatre an exercise had been left unerased. It read:

Give a mathematical statement of the 2nd law of thermodynamics and discuss its consequences for

a) irreversible changes in an isolated system

and

b) the future of the universe

(11 marks)

When Dr. X arrived he referred to the questionnaire, saying 'I deliberately didn't put it in the right order to draw attention to the difficulties'. He then asked students what they had decided.

St. D: I thought they were all sciences.

St. E: I thought none of them were.
After asking around the group, Dr. X suggested that 'we don't really know what science is'. He asked 'what do scientists do that makes them scientists?'

St. F: Make predictions based on fact

St. G: Investigate natural phenomena

After a silence Dr. X commented:

Scientists aren't used to doing this. They're used to being told, but that's not science ... What, when you've got your degree and go into industry, will you be doing that others don't? ... What is a scientist? ... Where do you find scientists ... normally? ... You don't seem to have much idea what you've been doing for three years ...

St. G: Study natural phenomena

Dr X: Magicians did that

St. G: He adds proof to it
Dr. X: You're like all science students. You're expecting me to give you the right answers. You don't like to stick your neck out and be wrong.

After lengthy discussion, which was inconclusive and included such exchanges as:

St B: He studies to achieve improvement

Dr. X: You can say that of a lot of things. Is that true of stamp-collecting?

Dr. X offered his own definition on the projector:

Science is the process of the systematic solution of problems

He then went through all the activities included in the questionnaire, distinguishing scientific activities from logical or technological activities. He then gave students a series of puzzles and problems to consider.

Finally he introduced and explained the word 'paradigm' in preparation for the following week's discussion, 'what is a solution?'
Week 5

This week's lecture was also characterised by lengthy discussion. Dr. X invited students to consider 'the way in which we come to accept the world around us'. The ensuing discussion centred around the problems of paradigms, subjective bias and types of solutions to problems.

Week 6

This week Dr. X led a discussion on solutions to problems by 'lateral thinking' and gave many examples and anecdotes. He then displayed visually ambiguous pictures on the projector to demonstrate that students' guesses were related to their own pre-conceptions.

Week 7

This week's lecture was entitled, 'The Science of the Insoluble'. The discussion dealt with problems not open to scientific analysis, such as modern art, poetry, advertising, language, concluding that 'you can have aphorisms - general laws - to help with insoluble problems'. Intuition was also discussed as a means to solving an urgent problem.
Week 8

This final week dealt with the relationship between science and religion. Dr. X displayed a list of religions which, apart from the major accepted world religions, included communism, atheism, capitalism and humanism. There followed a discussion about how one can reconcile science and religion. The major tenets of each religion were identified and assessed according to how 'testable' they were. It was concluded that science and religion may limit each other's sphere of activity, but that they can co-exist. The question then arose, 'Does this imply different types of knowledge?' Dr. X suggested:

a) There is a whole world of knowledge outside science

b) You can 'know' things which can't be tested, and that's called 'metaphysics'.

The first three weeks of the course consisted of formal lectures, supported by an overhead projector, in which students took notes. The fourth week marked a turning-point, however, when the questionnaire 'What is Science?' provoked a lively discussion. The rest of the course was characterised by an informal, relaxed
atmosphere in which most students questioned, commented and argued during each session, frequently staying behind to continue discussions after Dr. X had left. Throughout the eight weeks Dr. X's teaching style included a wealth of visual aids, anecdotes, jokes, riddles, puzzles and humorous repartee.

8.3 Interviews

Students were interviewed after the final week of the course. I also interviewed Dr. Z. Although Dr. X had presented the lectures, I had already interviewed him (chapters 6 and 7). Dr. Z had been identified as the main instigator of Contextual Course Studies (C.C.S.) in the Physics department.

Students' comments during the interviews fell into two related categories:

a) their general feelings about the purpose and effect of the course

b) their work for assessment
8.31 General feelings

Most students reported having enjoyed the course. The following quotations illustrate its significance to them.

It's made me feel a bit more easy about Physics; it's not as hard as people might think it is. People tend to think it's in a little box and you can't touch it, whereas it's not really that difficult ... Before this year I used to think "I can't do Physics, I'm not good enough", but Magic to Science has changed by mind a lot ... He's brought it down to an easier level ... It makes you think about it much more. You're not just sitting there copying everything down ... Magic to Science makes you feel more confident ... I suppose that helps you do your work.

PHY.1

You read around the subject in a more general view. We can give a talk to someone who hasn't got a lot of Physics understanding and they can understand it in that way ... It means use of more open background, being detached ... The object is to ask questions, not to give answers
... We examine the historical and social aspects of Physics

PHY.4

Magic to Science is to give us more of the background, to show us why it's science ... I see now how Physics relates to everything you do. When we first started I thought it was pretty vague. I did wonder whether we'd get anything from it ... But, yes, it's shown me lots of different ways of looking at things ... CCS is the overview

PHY.3

I would say, mainly, Magic to Science is just interesting, but I would say useful as well ... I think it's more development of attitude towards the subject ... It gives you basic knowledge of a theory - the grounding; it gives you a knowledge of the process of the subject - not only knowing the theory, but where it comes from; and appreciation of the consequences of the subject - social responsibilities of a person active within that science ... Not teaching Physics as an isolated subject, but trying to teach ... not science for science's sake - there has to be a contextual element to the course ... you get
greater insight at degree level. 'A' level science is a mechanical process

He summarised:

CCS ... when I'm taught something now, I try and consider the context - uses, philosophy, thinking behind it - rather than as a mechanical process ... It broadens your horizons, broadens your outlook on life

PHY.10

The following two students were less appreciative of the course. The first expressed very negative feelings:

I thought, "What's this rubbish?" I stopped taking notes. I thought, "I've never heard such rubbish!" ... I just couldn't believe it ... all this Occam's Razor business and falsifiability ... I thought it was just a waste of time

PHY.2

The second example reported some enjoyment, but related his criticisms to a heavy workload and saw the course as unrelated to his general coursework:
Magic to Science is meant to give you a broader idea of what science is all about, I think ... They're good lectures, but there's better ways to spend your time, with the pressure of work ... It's quite enjoyable, a break, but we have a heavy day and you don't have the energy left to listen. A lot of it I didn't know and a lot of it I didn't understand, to tell you the truth. Dr. X is very interesting in that kind of thing. He enjoys it and tries to put it over to us ... but it's not important to me really. I'm not interested in it. It's not going to help me find a job. It's no help with the work. Religion and science is not going to help me in a practical ... It might help in an interview - it gives you something to talk about

During my interview with Dr. Z she revealed that she was aware of a minority of students who did not respond to what she termed the 'broadening side' of the course. She said:

I'm certainly very keen on getting parts of the course where students make their own choices ... It's interesting, most students leap at the
chance, but there's always a few who really resent this and want to be told

One student's comments suggested that a possible explanation for some students' non-involvement might be related to lack of previous experience of wide-ranging discussion. He volunteered that he had taken General Studies at school, and saw CCS as an extension of this:

In General Studies we looked at ... life, the universe and everything. Not, "Do you know this? Do you know that?", but "Can you use your common sense to determine this?" ... We were tested on maths., general knowledge, history, politics, philosophy ...

PHY.10

However, of the two students from the ten interviewed who did not respond favourably to the Magic to Science course, the first (PHY.2) had expressed a lack of interest in the course generally and the second (PHY.9) had implied that he might have been more responsive were it not for his heavy workload.

Dr. Z also expressed what she saw as an opposing danger; that some students like the freedom of the 'open-ended' aspects of the course, but neglect the more
formal side. However, Dr. Z demonstrated that both she and Dr. X were continually monitoring students' responses to the CCS courses and were prepared to be flexible. For example, two students had mentioned that they found the Logic course 'boring'. Dr. Z said:

We're, in fact, going to try a different type of ..., 'Scientific Thinking' course next year, because we know that one of the courses that the students are doing at the moment is one that isn't catching their imagination, I think, that they are finding it dull. That's the Logic one ...

We're thinking we're going to incorporate things like different ways of problem-solving ... and then some formal logic and something about the way the big computing programmes are tackled - what sort of thinking processes are going on there ... also things like games theory - at the moment we're just throwing everything into a melting-pot and seeing what comes out of it ...

One of our new lecturers, Y, has done a history and philosophy of science course and he's saying he wants very much a component of "Ah, but scientific thinking isn't nearly as tight as you think", or the uncertainty of it
Dr. Z then explained the rationale behind the CCS element of the Physics course. She revealed that they were trying to do two things: to respond to CNAA and to actually prepare students for employment, in the wider sense:

"It's really trying to sort out, 'What is the characteristic thing about a degree?' and 'what is it that makes a person a thinking person, an educated person?'"

Throughout the interview Dr. Z referred to these aims. For example:

What makes somebody open-minded?

and

I would hope that they (students) don't think that Physics is the only science, that they can see that science is a network of subjects and the barriers between sciences are artificial

She summarised the rationale by saying:

"It all depends how you interpret CNAA's Clause 3"
She explained Clause 3 and at the end of the interview offered me a photo-copy. Clause 3 is entitled, 'The balance and aims of a programme of studies' and contains seven paragraphs, or separate points. Dr Z, however, drew attention to the last of these, which she considered to be the crucial point. It reads:

The student must be encouraged to appreciate the nature of attitudes, modes of thought, practices and disciplines other than those of his or her main studies. He or she must lean to perceive his or her main studies in a broader perspective. As part of this process he or she must be enabled to develop an informed awareness of factors influencing the social and physical environment

Dr. Z interpreted:

*They're* saying that they don't want narrow physicists going out into industry that have got no respect for anybody else's subjects and don't see that *their* subject is influenced by what's going on around them ... and don't see how interlocked physics is with the world outside
She added:

This is not specific to Physics. It's all (CNA) courses.

8.32 Assessment

Dr. Z explained that the students on the Magic to Science course were asked to present an essay:

What we're saying is that we want students to research a subject which is science-based ... and interpret Clause 3. I call it 'Science in Context' ... It's about presentation - the formal skills of writing essays and being able to present them orally ... and they usually hate it when it's coming, but are very glad that they've done it in retrospect, usually.

Students had also revealed that after having researched and written their essays, they were then required to present them orally to the group. They were asked to speak for fifteen minutes, followed by a further fifteen minutes for questioning and discussion. The following comments illustrate both the topics they had chosen and their feelings about this manner of assessment.
I enjoyed it. My first essay was on nuclear physics and my second on the transmission and distribution of electricity. I went to the library, found the journals and I'd written up most of it before Christmas ... You try and put both sides to an argument and then make up your mind, your own point of view ... Mrs. W comes in to tell you how to write an essay. We also get a book on essay-writing.

My essay is about kites - to find out the latest developments ... problems. There was an article about ultra-light and hang-gliders - kites are used for that. I used Scientific American and books ... The essay presentations make you more confident of talking to other people.

My essay's on windpower - that's my own choice. There's an experimental windmill in Wales.

My essay's on the Strategic Defence Initiative: Lasers in Space. It just seemed interesting ... the conclusions I've got - I mean, I don't know how practical they are, but I've found the more
research you do ... I mean, you can't really make conclusions about anything until you've done the research ... so I've learned something from that ... I'm trying to do it from an unbiased point of view, but then everyone has a natural bias ... You have to have some proof of your ethical considerations

PHY.3

The essays can be on anything. Mine's non-physics. I did 'The Science of Language and the Language of Science'. It included psychology, theology - anything I could think of. Then you present your essay to the group. It was very interesting. I tried an unusual presentation. Another student did an essay on animal communication. It could be biology, social science, psychology ...

PHY.6

I'm doing 'The Copernican Revolution'. Given that we don't do much of that on the course, rightly or wrongly - the historical and philosophical background to the subject - I thought it was a good idea to use that chance ... I'm interested in the Copernican Revolution - the Renaissance, around that period - so I'd already
done the background reading around the subject ... If you read history of science and general philosophy, then to some extent it's going to affect your attitude towards the subject

PHY.10

We have a Christmas essay, then next term we present it to the group. It's definitely good for me. It was a big barrier. It's changed my approach to life - it's given me self-confidence and ideas. Looking back, it was very good, although I didn't enjoy the essay presentation at the time - probably because of my Welsh accent!

PHY.5

The following student revealed that students had also been required to sit a paper on Magic to Science, 'to see how much we've taken in':

He asked ... the three types of natural magic and what different things came in ... what came in realms of problems ... and Occam's Razor ... what's falsifiable in six different statements and ... which ones you could experiment on to check the falsifiability and also ... questions based on lectures, to see if you'd taken it in, thought about it and could use it

PHY.3

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Dr. Z said of the assessment procedure:

The essay presentation does sometimes 'take off', because each person is given fifteen minutes and then a slot for questions. That can be very entertaining. Sometimes students are just being nasty to their friends [laughs] ... but that can produce some very hot discussions, and that can be quite fruitful ... It doesn't always. It obviously depends a lot on the nature of the subject they choose.

At the close of the interview with Dr. Z, I asked whether Contextual Course Studies had any direct effect on students' degree results. She replied:

Oh yes, I'm certain it does. Yes, it does affect their degree results

8.4 Summary

Dr. X's explicit intention in running the Magic to Science course was to introduce background lectures on the history of science to students in the Physics department. Observation of the course, however, revealed that his teaching method was implicitly
directed at challenging students' pre-conceptions and inviting them to consider alternative conceptions.

Interviews with students revealed that most were responding favourably to the intellectual challenges presented by Dr. X and were actively re-examining their attitudes, both to Physics and to knowledge in general. They reported gaining in confidence, particularly as a result of the method of assessment, which required them to present their essays verbally to the whole group. The choice of this method of assessment, along with the wide and free choice of topic, could be seen as emanating from Dr. X's student-centred teaching style (identified in chapter six) and from students' perceptions of departmental ethos as 'openness to students'. Students also demonstrated increased enthusiasm for their discipline.

The interview with Dr. Z revealed that the underlying purpose of Magic to Science in particular and Contextual Course Studies in general was to respond to CNAA Clause 3, by broadening students' views of their own subject and awareness of other people's subjects.

Findings suggest that the course was both explicitly addressing the problem of student epistemologies and largely succeeding in that aim.
# CHAPTER NINE:

## EXTENSION OF MAIN STUDY: II

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CHAPTER 9: EXTENSION OF MAIN STUDY: II

9.1 Introduction

At the conclusion of the main study, in chapter seven, it was found that student epistemologies are influenced by course structure, which is both transmitted through and affected by factors of learning, teaching and departmental ethos.

The present chapter represents a further extension of the main study. It provides clarification and supplementary data in answer to the third research question:

To what extent and in what ways is the question of student epistemology addressed in the teaching provided and learning expected in departments of Higher Education?

The chapter describes a sub-course in the Fine Art department which was identified as addressing the element of Philosophical Knowledge (or the relativity of knowledge). The course, which was entitled Philosophy, was observed for nine consecutive weeks in one term. The chapter describes the principle content of the
course, analyses of interviews with participant students and staff and, finally, a summary.

9.2 The Course

The course, Philosophy, took place for two hours weekly in the Fine Art department, running for two terms. I observed the course for nine weeks during the first term. The course was optional in that students were required to attend two out of six theoretical studies courses. It was assessed by essay, and the course was intended to provide background information on which students could choose to draw for their final year theses, which represented 20 per cent of the degree. In fact, many of the students attending the Philosophy course opted to base their theses on their work for that course. The course was presented by 'H' and attended by an average of twelve students after the first two weeks. Throughout the nine weeks I sat amongst the students, taking notes and acting the part of participant observer. Interviews were conducted during and after the final week of term and during the following term. I also interviewed 'H' during the following term.

The following summary of the course is intended to provide the reader with a resume of the topics
presented in order to put into context the subsequent interviews and analyses.

Week 1

H introduced the course to students in the following manner:

This course aims to introduce the major Western philosophers and their ideas, concentrating on areas which artists have found of special interest. Foremost among these are, perhaps, the theory of perception and the theory of knowledge.

He then distributed a background reading list, divided into four sections: general books, the 'ancients', the British analytical school and modern European thought.

H. explained to students that he had two goals: firstly, for students to 'understand the philosophical ideas embedded in art criticism' - terms like 'Cartesian dualism', 'materialism' and 'empiricism'; secondly, to see if some of the philosophical ideas encountered have meaning in terms of students' own art work.

He explained that he had chosen a 'chronological treatment' to examine why philosophy is important in our
culture and that he would be presenting formal lectures to be followed by discussions, which he hoped would be in the form of 'dialogues'.

H. went on to outline what philosophy is and what it does. For example:

Philosophy questions 'certainties', like time and space ... and so have artists from the end of the nineteenth century

And:

Philosophical ideas in one era became questioned in another because of advances in another field - for example, psychology

H. explained the difference between two kinds of philosophy; substantive and analytic.

H. then went through a 'short history of philosophy' from pre-Socratic philosophers to nineteenth century Romanticism, adding that contemporary philosophy would be discussed during the following term.

After the above introduction, H. distributed a photocopy of Plato's 'Cave', which was discussed at

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length. He drew attention to the division of the world into 'intellectual and sensual', or 'mind and body', which is 'very strong in our culture' and pointed out how it could be seen as existing within the department in the form of theoretical studies - mental - and studio studies - physical.

Finally, H. discussed 'reality' and 'appearance' and suggested to students that 'these questions are examined through philosophy, film and photography'.

Week 2.

This week's lecture dealt with the origins of philosophy; ideas and culture from Babylon and Egypt which spread to Greece (1000 B.C. Bronze Age) and the myths and legends which are 'still important to artists'. He then introduced the earliest recorded philosophers and their ideas: Thales, Anaxomander, Pythagoras and Heraclitus. There followed a discussion of the influence of their ideas upon artists - the Golden Section, Constructivism, music and harmony. H. observed:

It is astounding that ideas we have and use now can be traced back to another time and place.
This prompted a discussion of whether ideas can exist without language and that language carries meanings from the past. One student commented:

Yes, but ideas are based on our previous experience.

There followed a discussion of 'natural or cultural products?' and the notion of shared meaning. H. observed that Shakespeare and Magellan both lived in the same era, occupied the same area of ideas, but did not know of each other's existence. Also, that Cezanne connected subjective and objective ideas for the first time and died in 1906, whereas Einstein published the theory of relativity in 1905.

Week 3

H. presented the idea prevalent in the late eighteenth century that we live in a fragment, rather than the whole; that the whole had been lost, 'which was why the Romantics - Shelley, Coleridge, Baudelaire - expressed a sense of loss'. He elucidated:

The theme of these lectures is how to understand the times we live in and how to conceptualise them.
To illustrate this he gave the example of Modernism (1900-1920), in which Picasso, Matisse, Shoenberg, Stravinsky and Joyce conceived culture as 'breakage'—breaking up something which was formerly whole. H. warned that the 'fashionable criticism' that Modernism represented a complete break with the past is questionable, since their ideas echoed those of the Romantics, one hundred and fifty years earlier, in which subjective consciousness was seen as the key to understanding human existence. He then asked students:

Are we late Romantics, where all acts are private or inner—introspection—or are we more closely linked to things happening in our own century?

After a lengthy discussion, H returned to the topic of Plato's Republic. He asked students what they thought of the idea that reason rules the senses, then observed that, walking around the studios, he was able to identify 'those students who work with reason and those who work with sensation', adding:

In principle, looking at all works of art, you should be able to gauge the artist's philosophy... We live in a relativistic universe; there are no absolutes; we can't measure ourselves, except against each other.
Week 4

This week's lecture began with a comparison of the beliefs of Kant and those of the Existentialists. H. told students:

The core of philosophy is to connect things up.

H. had arrived late and so decided to throw the session open to students' questions. The first question raised by a student concerned ethics and morality. A variety of examples were offered by students for discussion, including starvation in the Third World, sacrificing jobs to bring down inflation, nuclear power, deforestation and acid rain: all were discussed in regard to short-term versus long-term solutions and cause and effect. H. introduced the notions of 'inevitability' and 'changeability', mentioning Heraclitus, Buddhism and Kant on personal responsibility. H. summarised:

It's all about means and ends

Week 5

The lecture and discussion revolved around Plato's theory of ideas - the way in which Plato's idealist philosophy permeates down into other areas.
The 'ideal', which transcends the world we live in, was very important to early Christians, who were trying to establish a place in philosophy for Christianity. H. pointed out that the link between Christianity and the Ancient Greeks was very easily made, because the New Testament states, for example 'My Kingdom is not of this world' and Plato believed that life was a series of illusions which we must transcend.

The discussion then moved on to a consideration of the relationship between science and religion. H. maintained that in the later Middle Ages we find the origin of what we call 'science', which to some degree acted against Christian beliefs. This was because the Christian idea was that of life through death, whereas scientists emphasised the life we live. Early science grew out of magic, alchemy and mythology. Later scientists had a belief in Aristotle, who was the first philosopher to write a coherent book about physics and geometry.

There followed a discussion of Plato's definition of the difference between reality and appearance, knowledge and opinion and of Plato's Theory of Universals, which gave stability in a changing world. There was also a lively discussion of why Plato excluded artists from his scheme, H. adding that artists in this
century can be seen to be still influenced by Plato's ideas.

**Week 7**

This week's session was very wide-ranging and included discussion of Plato (reality beyond the senses, observable in mediaeval paintings), Aristotle (earth-centred) and Descartes ('cogito ergo sum'). Also discussed was whether it is possible to prove the existence of God by rational means, the Realists, Nominalists, William of Occam and Umberto Ecco. The most lengthy discussion was about science and religion. H. explained that Aristotle's theories were based on deduction, whereas Bacon maintained that the scientist works inductively and that, therefore, scientists cannot work according to Aristotelian logic.

**Week 8**

H. introduced this session as marking the end of Part I of his lectures - philosophy up to the present day. Each of the following term's lectures were to be divided into two: a lecture on modern philosophy, followed by students' seminars on a subject of their choice. These presentations could be written-up and
presented as the essay for assessment at the end of the course.

This week's lecture dealt with the seventeenth and eighteenth centuries, in which, H. said:

They tended to ask the same things as we do about personal identity, certainty, the status of ideas and how concepts relate to actions and experiences.

The group then discussed the problem of Cartesian dualism. H. suggested that the mind-body split cannot be solved, because it is a 'false problem', that the division does not exist, adding that Ryle had called it 'a deep illusion'.

H. then introduced Spinoza, who rejected Descartes' idea that one can start only from subjective experience and substituted the concept of the whole universe consisting of one substance, identifying that with God. Emotions must be overcome. H. observed that what we see is not the whole truth, adding:

This is why we need science, because otherwise we're stuck with sense-impressions.
H. revealed that many artists were attracted to Spinoza. For example, Cezanne was intent on showing 'what there is', believing that we can only observe dispassionately and describe. H. asked students where they stood with regard to Spinoza's ideas. The following exchange took place:

St. A: It has its attractions

H.: The standard objection to Spinoza is that it's a beautiful theory, geometrically built up, but that it's absurd to think of the universe as one substance.

St. B: Isn't that what atomists say? Present-day scientists would agreed that it is one substance

H.: Yes! That's it. Scientists have now come round to that way of thinking ... I'd very, very much like someone to give a talk on the ideas of contemporary science

Week 9

In this final session of the term, H. began by distributing two photocopies. The first was entitled 'Anglo-Saxon Empirical Philosophers against the
Rationalists'. H. defined empiricism as holding that 'understanding is limited to our own experience' and, therefore, that 'knowledge equals experience'. H. said that this was a 'huge generalisation running through the whole of English philosophy'. He then went through the second photocopy, which was a summary of the ideas of Hobbes, Locke, Berkeley and Hume. The group then debated the concepts of cause and effect, scientific determinism, free will, reward and punishment. H. observed:

The statement that everything has a cause becomes 'most things have a cause'. This is backed up by quantum mechanics. Einstein revealed certain unpredictabilities, which cuts across Newtonian determinism.

The group then discussed the notion of freedom. H. asked whether it was possible for the individual to be free from any history or language. For example, 'Can artists be free of the language which surrounds them?: 'Your body is a product of your inheritance, so why not your concepts?'

At the end of the session H. discussed students' possible essay topics (see appendix 6). He said to one student, for example:
Poussin would be a good subject, or the way different people draw and what it says for their worldviews - do they express unity or fragmentalism? ... any language is value-ridden, after all.

The course had begun with formal presentations by the lecturer, H, followed by discussions, during which students made few contributions. By the third week, however, numbers had fallen from an initial 24 to an average of 12 students and, as the course progressed, the atmosphere became gradually more informal. By the fifth week students appeared to have lost their earlier inhibitions and were debating with enthusiasm. H's teaching style became increasingly more conversational and flexible in response to students' questions and interests. Throughout the course H invited students to consider the philosophical ideas encountered in the light of their own personal experience. He also made links between philosophy and art, both from a historical and a conceptual perspective. By the end of this first term of the course several students would afterwards retire to the canteen to continue the day's discussions over coffee. On several occasions H joined them.
9.3 Interviews

Students were interviewed either during the final week of this first term of the course, after the end of term, as the studios were available to students throughout the Easter vacation, or during the following term. Six students volunteered to be interviewed. I interviewed H during the following term.

Students' comments during interviews concerned their perceptions of the effects of the course, the teaching style and the assessment, which some were intending to present as their theses for the final degree.

9.31 Effects of the course

All students interviewed reported having found the course stimulating. Some had found that they could relate the ideas encountered to their own art work, whilst others reported a more general development of ideas. The following quotations from transcripts illustrate the feelings of the group.

I've done a lot of reading since the Philosophy course ... what came out of it is just ... because I hadn't thought about philosophy at all
before that and it's just ... different ways of thinking and looking at things ... ideas that I hadn't come across, but were obviously there and I was thinking about in a different way ... thinking about it and working through it

Now I've gone back to the beginning and I'm reading general books on philosophy, to see how those ideas that I've formed on the course fit in to general philosophical development really.

She gave an example:

Science subjects are not entirely different from art, because everything's got a philosophical basis that links it together somehow ... The things I've been reading about the development of physics and how it changed philosophical thought ... I was just thinking of ... Whitehead's philosophical assumptions about that ... or, before that, Bergson was influenced, I think, by the developments in biology - Darwin and those sorts of things
The following student revealed something of a personal epistemological development taking place as the course progressed:

I think you just ... you have a better understanding of certain thinkers and you can think ... you know, he'll say, "Do you think that's a bit Hegelian, what you've just said?" and at first you thought, "Why do people say these things? They just don't mean anything". I used to think, "That's just rubbish", but now I think, "No. It's something else". I think everyone's got a basic grounding in it now, so we all go away and read and talk to each other about it as well, which is good.

She added:

I think the way I'm thinking now is related to his Philosophy lectures.

The following two students revealed that H's Philosophy course had stimulated them into further intellectual exploration, beyond the topics presented on the course itself.
I've learnt a lot, mainly from my reading. Now I'm reading ecology, anthropology, evolution, geometry, geography—everything!

FA.6

I've become interested in different philosophies now. I've started studying Taoism

FA.9

A direct link was perceived between the course and their own work by two students:

It's definitely relevant to my own work, especially basic questions like cause and effect, which are very much connected with practice, as far as I can see ... I'm still trying to assimilate things, but it probably will affect my painting

FA.3

Art doesn't just reflect (the philosophy of the time). It has an influence as well ... and that's why work like mine ... although, as I say, it doesn't have this direct kind of communication, it does have ... that
communication on a philosophical level. I think philosophers would probably understand

Having heard students' perceptions of the effects of the course, I asked H, at the beginning of our interview, for a definition of the aims of the Philosophy course. He explained:

I suppose I've got two aims ... one is more historical and the other is a bit more critical, or analytical ... One aim is very simple, the historical side, I guess. Art criticism and art theory often mixes in with philosophical language and concepts. So one simple aim is that, after that course, when a student comes across phrases like 'Cartesian dualism' in a piece of criticism, or references to ... other philosophical ideas, then they'll know where they are; they'll know what 'dualism' is, they'll know what 'materialism' is, they'll know what 'idealism' is ... as broad theories ... they'll at least know the major figures and major arguments in philosophy ...
He added:

It's the same in Art History ... you know, you hope that the student will understand what's at stake in the concept of Cubism, or the Baroque ...

He then explained his second aim:

The other, analytical aim is a big aim. I'm not sure if that's quite so achievable, but it's to do with ... asking students to look at the structure of argument and proof and the making of statements and how they can be supported ... that a student may be able to just argue and to recognise arguments a little bit more clearly, perhaps, than they would have done.

I then asked H if the Philosophy course was meant to be linked to students' studio work and was aimed to influence it. He replied:

With a subject like philosophy there can't be, perhaps, a direct bond. You hope that they see that the philosophers are asking questions that they themselves might be asking as artists: 'What is there? How can we describe it? What is
emotion - can it be communicated?' and so on ... I think if it's got an influence at all, it's in the kind of ... thinking that they're doing ... prior to, or after having done the art work here ... I guess what I'm also bearing in mind is that, as students pass through the second year, by and large - big generalisation - they're anyway waking up to all kinds of ideas and debates. So ... it gets easier.

9.32 Teaching style

Three of the six students interviewed expressed appreciation for H's teaching style. The group as a whole were slow to respond during the early discussions, but H's consistent elicitation of their opinions and personal perspectives appeared to foster confidence. The following quotations from student interviews illustrate their views:

H started at the beginning and went right through the history of philosophy until the eighteenth century and then widened it out ... then the student seminars widened it out still further into modern criticism and philosophy.
She added:

There's a case for starting Philosophy at the beginning of the course

FA.3

I've enjoyed it immensely. Before I came here I'd read a little bit. It set out to explain, quite simply, philosophy for beginners, and that was good ... The way H has done it is brilliant. It's his delivery. Everyone who goes to it wants to go. It does start us talking

FA.4

I enjoy Philosophy ... H makes links between philosophy and art

FA.1

H explained his reasons for structuring the course chronologically and for employing a formal teaching style for the first few weeks:

With this subject I like to do more ... I don't know if you'd call them lectures ... I like to call them presentations ... There's more of me talking, particularly in the first half of the course ... It's very conventional, but I tend to
think that if you start off by presenting the ideas of the philosophers, at least at the beginning, from ancient times, you at least give people something to hang on to ... and with any luck they pick up other kinds of information and a historical perspective as you're doing that - as you're doing a little bit on the Greek philosophers, or the mediaeval ones

He then went on to illustrate how the course had developed:

The later ones were far less formal. In the actual classes, technically we only got up to the mid nineteenth century, but in fact by that stage we were shooting into ideas which are much more contemporary, because, effectively, nineteenth century philosophical problems aren't all that remote from our own. In the later part of the course, where it was on a much more informal basis, we were talking about twentieth century philosophers and issues that concern them, which gravitate much more around the question of language and description than the rather grand schemes, or abstract ideas of the older philosophies
The following remark demonstrates that H attached importance to both discussion as a teaching technique and the application of philosophical ideas to the students' own disciplinary studies:

I think the connections are made in the discussions and that's why I keep referring to artists, for example, as well as other things

9.33 Assessment

All students taking the Philosophy course were required to submit an essay as part of their continual coursework assessment. The theoretical studies courses, however, were also intended to provide a broad background framework upon which students could draw for their final year thesis, which represented twenty percent of the final degree. Many of the students taking the Philosophy course were intending to base their theses on their work for this course. Also, H had requested that students should prepare individual seminars to be presented to the group during the following term. Although not for assessment, he had suggested that students might find it useful to write up their seminars in essay form for assessment.
Students' comments about their essays showed that they were making links between the topics they were researching and their own art practice. For example:

I'm doing a seminar on Wittgenstein - systems analysis ... I'm just trying to find out for myself some of the problems of using a system as a method of analysis of problems and I suppose Wittgenstein's a basic example ... He creates a system as an entire language in itself. But, for me, through doing that you create problems ... I don't think you have to get into the situation where you're creating things that you can't answer ... not that there's an answer to everything, but ... for me the basic problem of using systems is that you're going to get into that position ... My dislike of systems came through a very naive dislike of constructivist paintings ... I try and make things come through what I'm doing.

FA.3

The next student had become interested in Eastern philosophies as a result of attending H's Philosophy course. He explained his essay topic, which he was intending to expand for his final year thesis, and then
revealed that he was applying the same philosophy to his studio work.

The title of my thesis is a Taoist quotation: 'My words aren't easy to understand. No-one knows them or understands them' ... Taoism in its simplest form is naturalism, harmony, balances of nature, yin and yang. It's the philosophy of stillness and emptiness. My thesis is very long - 18,000 words. I'm writing about the history of Taoism, why I'm interested in it, the Chinese view of the world, the problems of translation, what Taoism is about ... In my (studio) work I'm taking ordinary objects and trying to evoke an atmosphere of mysticism, using photography, print and drawing.

FA.9

The following student had also related her written work to her art practice:

My essay is on 'memory'. It's not related to H's lectures directly, but H will help me. I've written out the important key words and I'm trying to fill it out ... I got a reading list from H - Roland Barthes, Susan Sontag and ... a student of Freud ... Well, the things I make
prints about are all about personal memories ... little objects of personal worth ... so I thought it would be easier if I did something related to that, then I could learn a lot more about what I'm making prints about at the same time as writing something

FA.4

The following student revealed that her research for her seminar had caused her to speculate on possible relationships between philosophy and art movements:

I'm doing a seminar on Sartre ... He made links between philosophy and art ... I'm wondering what existentialist art would be like

FA.1

Another student revealed that the research she had conducted for her seminar had caused her to re-evaluate her position. Her seminar was entitled, 'How far is personality shaped by external influences?' She said:

Before I researched this seminar I would not have agreed with the idea that we're a product of our environment

FA.7
H had spoken at some length on the subject of assessment. He first explained what he saw as the purpose of the essay and then continued, to give examples of students' work and his own attitude towards it.

(The purpose is) so that you can have some way of registering your degree of success. The other aim for the essay is probably more pragmatic. I mean, in this context, of theoretical studies, the written word is one of the few ways in which we can measure anything that we're doing - so essays are important, I think, in that way.

He then revealed that his flexible teaching style was reflected in his expectations of and demands upon students:

However, I let the side down a little, because I'm fairly free about essays, particularly with a topic like philosophy, where it's so dense and difficult. You know, you can't expect all students to be able to tackle it in ... that way. So what for one student might look like a fairly basic essay ... is probably quite an achievement ...
He then gave examples of the kinds of essay topics students had chosen:

I think about half the students did essay topics of a fairly straightforward philosophical nature - let's say they take a problem in ethics or aesthetics, or ... a comparison between one philosopher and another ... so half of them had a go at a more or less definable philosophical area. The other half did more of a free choice topic. There was a particularly interesting one by a student on sexism in language, which was fine. Strictly, it wasn't philosophical in that it's more to do with language, communication and sociology, but it was philosophical enough for me and for the student who did it ... and she was applying, I think, some of the ideas we were discussing in the seminars ... Yet other students do rather free-flowing essays. You know, 'what I think about life', which I'm terribly dubious about ... but generally they're quite good.

He added:

The thesis is completely open. It can be about art, it can be about philosophy, it can be about
neither of those things. Effectively, it's a long essay on a topic of their choice, agreed with the tutor.

Finally, H gave the history of the course:

I inherited it. I picked it up from the current head of department, who, before he became head of department was the former head of theoretical studies ... He'd been doing a very successful Philosophy course for a long time ... Not all arts schools offer an option in philosophy ... It just so happens that it's been done here for some time ... I think because it represents a tutor's interest ... It's not a CNAA requirement. The CNAA is very, very flexible about what it sets as the kind of conceptual, intellectual, analytical stuff that art students are meant to do ...

9.4 Summary

H's stated aims of the Philosophy course were that students should gain an understanding of the general philosophical terms encountered in their reading and appreciate the structure of argument. He also intended that the course should affect students' thinking and, therefore, approach to their own art work.

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Interviews with students suggested that the first and third of these three aims were meeting with success: the second aim, that students should appreciate the structure of argument, was, perhaps, more long-term and not easily assessed using interview data. Students' written work, to be submitted at a later date, might have yielded data which could be analysed for this purpose.

H's teaching style began formally; a deliberate technique on his part to give students something 'to hang on to'. After the early weeks, however, students became gradually more involved and discussions became livelier and more wide-ranging. Students' reported perceptions of the teaching style were that it made the material easy to understand and was enjoyable.

Students talked enthusiastically about their essays for assessment. Many had found the course stimulating enough to opt to base their final degree theses on the Philosophy course. H's comments on students' essays suggested that he expected students' work to reflect their individual interests and capabilities, rather than an externally fixed standard of attainment. In this respect it lends support to the earlier (chapter six) analyses of teaching style and departmental ethos in the Fine Art department.
Finally, data suggests that the Philosophy course could be seen as explicitly addressing the problem of student epistemology by means of presenting alternative conceptions of knowledge to students - and, thus, a view of knowledge as relative - and by requiring students to engage in discussion, drawing upon their own personal experiences and perceptions. In this way, the course could be said to be implicitly addressing CNAA Clause 3.
CHAPTER TEN

DISCUSSION

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CHAPTER 10: DISCUSSION

10.1 Introduction

This chapter consists of three parts. The first comprises separate discussions of the three phases through which the study travelled, their main findings and theoretical underpinning. The second draws together the three phases and discusses the perceived significance of the resulting synthesis. The third represents the conclusion of the study.

10.2 Student epistemologies

The first phase of the main study, Chapter 5, described the collection and analyses of interviews with students from the four departments studied. Early experience of interviewing, at the pilot study stage, had revealed the desirability of establishing, at the outset of interviews, that it was the students' personal perceptions and experiences of their courses which were being sought, rather than answers to preconceived questions. It had been found that, once this had been done, students appeared to relax and talk more freely. It was, therefore, considered important to impose as little structure as possible on the proceedings. Accordingly, no particular interview schedule was used.
for the main study. Instead, after an initial question of the type, 'How are you finding the course?' students had been encouraged to expand on their concerns as these arose in the interview (see Appendix). Analysis of the resulting data focused upon students' implicit or explicit approaches to knowledge, either disciplinary or more general, in order to address the question:

What different types of student epistemology can be identified in departments of Higher Education?

The concept of 'student epistemology' might be seen to be related to other, similar concepts. Marton's (1981) term 'phenomenography' refers to qualitative research aimed at generating a view of learning described in terms of 'changes in a person's conception of aspects of reality'. Johansson, Marton and Svensson (1985) describe learning in a similar way, as 'change between qualitatively different conceptions', whilst Svensson and Hogfors (1988) define those conceptions as concerning 'our "epistemological" relation to parts of the world: our understanding of what is the nature, or essence, or 'true' meaning of these phenomena'. Thus, learning may be seen as a change in a person's epistemological stance. Perhaps the concept most closely related to that of 'student epistemology' in the present study, however, is that of the 'structure'
through which an individual construes the world, arising from Perry's work (1970) on forms of intellectual and ethical development of American college students. Perry found that students' difficulties in learning were less related to motivation, study skills, or ability than to their views of knowledge. Perry defines 'structure' as referring specifically to 'the formal properties of the assumptions and expectancies a person holds at a given time in regard to the nature and origins of knowledge and value', which he states may be classified in accordance with their formal attributes, such as 'dualistic' or 'relativistic'.

The first two definitions, above, refer to learning as conceptual change, whereas the latter two and the concept of student epistemology in the present study refer to conceptions held at a given time. Moreover, Perry focused upon the forms of thought in which an individual perceives his world, rather than upon the particular content of his concerns, because he believed that findings from such data would remain relevant through time, as opposed to being of transitory interest. The present study also sought to focus upon students' forms of thought to see if, at this level, disciplinary boundaries may be transcended. The concept of 'student epistemology', then, refers to conceptions or forms of thought which might enable the
identification of views of knowledge per se, rather than those of a particular discipline.

The chapter describes the identification of four categories of student epistemology, ranging along a continuum from a fragmented to a relative view of knowledge. The findings could, perhaps, be said to possess two limiting factors. Firstly, data-collection was limited to the number of students volunteering to be interviewed. The fact that the four types of epistemology were found in four very different departments, however, suggests that the categories identified were sufficiently representative of individual student epistemologies for the purposes of the study, even though it is probable that a larger scale study might produce a greater number of categories. Secondly, data was limited by the fact that students were interviewed at one stage only of their courses. As a result of this, perhaps, a question arose for clarification when it was discovered that attribution of membership to one or another of the four categories was not always immediately clear, since some students exhibited a degree of overlap between A/B, B/C or C/D. In such cases it was decided to attribute membership according to the category to which the student could be said to predominantly belong, whilst, at the same time, formulating a model (Model I) which
clearly reflected this lack of rigidity of boundaries. It was not possible, though, to state with any certainty that this implied movement along the continuum from a fragmented toward a more relative view of knowledge. However, such remarks as, 'I used to think they were all separate trees in an orchard. Now I see that they're all branches from the same trunk' (PHY.4) indicated that this was probably true of some students.

The above two points of probability were borne out by Perry. Firstly, he and his team conducted a much larger-scale study, resulting in the identification of nine stages in a developmental scheme. His stages traced a similarly defined continuum, from 'simple dualistic' through to 'relative thinking', but went further, to include an ethical dimension, the development of committed 'qualitative, contextual, relativistic reason' by the time the students reached the third year of their studies. Second, Perry and his team conducted a longitudinal study, over four years, in which many students were clearly seen to move along the continuum. However, Perry also reported the situation in which some students were found to fall partly between stages. This, Perry explained as a property of the concept of 'stages', which comprises relatively stable forms and those less stable forms which mediate between stages and characterise 'transitions' - a finding
dependent upon the opportunities offered by longitudinal observation, which findings from the present study could only suggest.

In retrospect, two questions might be asked which need addressing at this stage. Firstly, it might be suggested that students from the Physics and Fine Art departments, who had been classified as holding epistemologies based upon a view of knowledge as relative, may have chosen those particular courses because of their historical and philosophical dimensions. However, an examination of course descriptions revealed no mention of such content. Also, it was apparent during interviews with students that they had been both surprised and, in most cases, pleased to find such studies included as options within their courses. Secondly, the disciplines of Physics and Fine Art might possibly be viewed as dealing with highly abstract concepts and might be seen by some people to attract more intellectually able students. Although findings revealed a significant difference between the course structures and teaching methods of these two courses compared to that of the Biology and History departments, suggesting that differences were due to factors other than intrinsic disciplinary levels of abstraction, this remains a possibility which cannot
entirely be discounted. It might, therefore, represent an area for future consideration.

Findings suggested that at least four different types of student epistemology could be identified across the four departments. The distribution of these four representative categories was found to be uneven. These findings formed the basis upon which the study progressed, the following two phases representing attempts to discover the reasons behind this uneven distribution.

10.3 **Learning, teaching and departmental ethos**

The second phase of the study, Chapter 6, documented a close analysis of students' and lecturers' interview transcripts within each of the four departments separately, in order to focus down upon possible answers to the question:

What factors seem to influence the incidence of these different types of student epistemology?

At this stage subjects were encouraged to talk freely about their particular concerns and so no specific interview schedule was used. As a result, a wide range of data was gathered, the emphases and
agreements varying greatly between both individuals and departments. Upon completion of an initial analysis, the significant features emerging from each of the four departments were compared. It was found that concerns fell into three interrelated areas: learning, teaching and departmental ethos. Recent empirical literature in these three areas was then consulted and applied to the data in order to aid further analysis and to locate the findings in an appropriate conceptual framework.

10.31 Learning

The body of empirical literature seen to be most relevant to the data on learning is that dealing with students' strategies, styles and approaches to learning, since analysis of data had revealed much information of this nature. In particular, the early work emanating from Gothenburg of Marton and Saljo (1976) and the later follow-up work conducted at Lancaster by Ramsden and Entwistle (1981) was found to add clarification. Firstly, it shares the same focus; that of the perspective of the learner, as opposed to a more traditional focus upon the perspective of the teacher, the psychologist, or the researcher. Secondly, it shares the related methodology, that of 'naturalistic' inquiry, which elicits the perceptions of subjects within their natural, everyday setting and so is
'grounded' in perceived reality, rather than interpreted from the preconceived theories of researchers. Thirdly, together with the work of Pask (1976), it provides conceptual categories which may be readily tested against similarly derived sets of qualitative data.

The concepts 'surface/deep' approach to tasks (Marton and Saljo 1976) and 'comprehension/operation' learning (Pask 1976) were included in an inventory of approaches to studying developed by Entwistle et al (1979). They reported three main contributory factors: orientations towards 'personal meaning' (a deep approach with comprehension learning); 'reproducing' (a surface approach with operation learning); and 'achieving' (organised study techniques with achievement motivation). Ramsden and Entwistle (1981) later added another category, described as 'disorganised and dilatory', which was a further dimension of the 'achieving' orientation, applicable where that student approach had failed.

Marton has since extended his research to include students' work on a variety of tasks apart from that of reading academic texts; such as problem-solving in science and writing assignments in humanities. (Marton, Hounsell and Entwistle, 1984; Ramsden, 1988). As a result, he substituted the term 'approach to learning'
for the earlier terms 'surface/deep', believing it to include intention (what the learner was looking out for) and process (how that intention was carried out), the content and process of learning forming a unified whole. He also felt the new term possessed less mechanistic overtones than those implied by 'surface/deep' processing. However, the concepts 'surface/deep' were found to be useful in the present study as one of the conceptual tools for analysing students' approaches to their work.

The above conceptual categories were applied to the findings on learning of Chapter 6 and found to add useful insights. In brief, students perceived as holding Type A epistemologies were seen as having similarities to the categories 'disorganised and dilatory', adopting a 'surface' approach to tasks and employing an 'operation' learning strategy. Students perceived as holding Type B epistemologies were seen as being primarily concerned with 'reproducing and achieving', whilst also adopting a 'surface' approach to tasks and an 'operation' learning strategy. Students perceived as holding both Type C and Type D epistemologies, however, were seen as primarily concerned to find 'personal meaning', adopting a 'deep' approach to tasks and employing a 'comprehension' learning strategy.
Again, because students were interviewed at one stage only of their courses, it was not possible to say whether students consistently displayed these approaches. Indeed, Laurillard (1979) had suggested that some students vary their approaches according to their perceptions of the nature of the particular task. However, the findings of the sources consulted — that students' approaches to studying affect the quality of learning outcome — was found to be compatible both with the findings on learning of Chapter 6 and with students' epistemological categorisations. Although it is recognised that other researchers might have found alternative patterns emerging from the data, or alternative interpretations of the findings, it is felt that the interpretation outlined above, underpinned by findings from a variety of other empirical research, contributes one version of the possible factors influencing the development of student epistemology.

10.32 Teaching

After analysing data on students' and lecturers' perceptions of teaching, published research into teaching was consulted (for example, Eisner, 1969; Pask, 1976; Schwab, 1978; Fox, 1983; Harrop and Harris, 1984) and the work of Fox (1983) found to be of particular relevance.
Fox offered four basic theories of teaching: the 'transfer' theory, which treats knowledge as a commodity to be transferred from one vessel to another; the 'shaping' theory, which treats teaching as a process of shaping or moulding to a pre-determined pattern; the 'travelling' theory, which treats a discipline as a terrain to be explored, with the teacher as a travelling companion or expert guide; and the 'growing' theory, which puts more emphasis upon the intellectual and emotional development of the learner. Fox further classified his four theories into two, more general descriptions. The 'travelling' and 'growing' theories he referred to as 'developed' theories and the 'transfer' and 'shaping' theories he referred to as 'simple' theories.

In applying Fox's four categories of teaching theory to the data on perceptions of teaching, it was found that, as with the earlier attribution of students to the four epistemological categories, not all four lecturers could be said to fall exclusively into either one of Fox's theories of teaching categories. Three of the lecturers interviewed, displayed strong leanings toward individual theories, whilst Dr. A (Biology) demonstrated a predominant leaning toward a 'shaping' theory, though with some attributes of a 'transfer' theory (both 'simple' theories). Dr. P. (History) was
found to hold a 'growing' theory, whilst both Dr. X
(Physics) and R (Fine Art) displayed a strong leaning
toward the 'travelling' theory (a 'developed' theory).
It was subsequently found that lecturers perceived as
holding the 'travelling' theory of teaching, were those
whose students had been categorised as holding relative
views of knowledge, whilst lecturers perceived as
holding a 'shaping' or 'growing' theory were those whose
students were categorised as holding less developed
views of knowledge. The possibility arises that
students may adapt their approaches to the lecturers'
teaching styles.

Students of the former attributed their success
on those courses, implicitly or explicitly, to a
discussion-based teaching style. Barrett (1975)
produced similar findings in her research into
differentiation among students. She observed:

Higher level thinking, whether it was conceptual
or functional; seemed more related to language
and thinking experience; that is, exposure to
them and opportunity and confidence to practise
them than to age or intelligence per se
(Barrett 1975.73)
Such findings are supported by Brent (1978), who argued that discussion is:

.... the means of unravelling and making explicit that universal framework of judgement with which particular judgements are confronted when men engage in public discourse. The value of discussion is therefore intrinsic

(Brent 1978.216)

Discussion-based techniques reported by students did appear to be more related to the 'travelling' theory of teaching, which, in turn, had been seen to be possibly linked to the more developed student epistemologies.

In retrospect, the section in Chapter 6 on perceptions of teaching contained, possibly, two limitations. The first relates to data-collection: it could be suggested that interviewing one lecturer only from each department could not provide an adequate reflection of departmental teaching philosophy. It is, therefore, felt important to point out that students had often referred to the varying teaching styles within their departments, in the process revealing their own preferences. Also, the lecturers interviewed had frequently used the pronoun 'we' when referring to the aims and teaching methods of their departments,
suggesting that such matters were at least discussed with colleagues. Furthermore, the lecturers interviewed were those conducting the particular courses-within-courses whose students had been interviewed and so could be said to be, to some degree, representative of their departments, even though it would undoubtedly have been preferable to interview more lecturers had the scope of the study allowed. The second point relates to the application of Fox's theories of teaching to data: students perceived as holding Type A epistemologies, or a fragmented view of knowledge, could not be linked to one or another of the teaching theories, since they were to be found as a small minority across the departments and were singularly unforthcoming during interview.

Accepting the above possible limitations, the application of literature on teaching to data tended to suggest that teaching style exerts an influence upon students' approaches to learning. The 'travelling' theories seen to be held by Dr. X (Physics) and R (Fine Art) appeared to stimulate students to explore their subjects and to actively engage in intellectually challenging work. The accompanying discussion-based teaching style, apart from aiding the above effect upon students' work and motivation toward study, could also be seen as a possible further factor in students' ongoing constructions of their epistemologies.
The third aspect of findings from interview data in Chapter 6 concerned the context in which learning takes place. As well as their perceptions on learning and teaching, students and lecturers had revealed their perceptions of their academic environment, suggesting, explicitly or implicitly, that this factor had an influence upon their approaches to learning, teaching and assessment. Accordingly, research on departmental ethos was consulted and applied to data.

Ramsden and Entwistle (1981) studied students from 66 academic departments in 6 contrasting disciplines. Their findings paralleled those of the present analysis in that the departments with the highest mean scores on 'personal meaning' orientation toward learning (here, Physics and Fine Art) were perceived by students as having good teaching and allowing freedom in leaning. In contrast, departments with highest mean scores on a 'reproducing' orientation toward learning (here, Biology and History) were perceived by students to demand a heavy workload and a largely prescribed content and method. Laurillard (1979) gathered data on 30 students' perceptions of their learning environment and concluded that students' styles and strategies of learning are context-dependent.
Perhaps the most interesting factor to emerge from the data-analysis on departmental ethos concerned the way in which students' perceptions of the context in which they worked either matched (Physics and Fine Art) or failed to match (Biology and History) those of their lecturers. In the latter case a degree of confusion was identified among students regarding what they thought was expected of them, particularly with regard to assessment procedures. These perceptions did not match lecturers' statements regarding departmental requirements. Here, the work of Becker (1968) and Miller and Partlett (1974) was found to have relevance. They identified a disjunction between the formal requirements of academic environments, such as 'thought, creativity, competence, independent thinking and critical thinking' and the requirements perceived by students, such as 'memorisation, fact-gathering, conformity and rote learning'.

The main finding from analysis of perceptions of academic environment, or departmental ethos, is that research into theories of learning and teaching should also take into account perceptions of the context in which they take place; that learning is context-dependent.
Summary

This first phase of the main study produced findings on some of the ways in which knowledge could be seen to be transmitted and learned as well as the context in which it appeared to be taking place in the four departments studied. These three areas were seen to be parts of an interrelated set of factors, which could be seen as probably influencing the incidence of the different types of student epistemology.

10.4 The structure of knowledge within departments

The third phase of the study, Chapter 7, described a further stage of inquiry into factors influencing the incidence of the different kinds of student epistemology identified in Chapter 5. Comments made by students and lecturers during the preceding stage of inquiry had suggested that a relationship might be found between knowledge, as structured and presented to students, and students' own perceptions of knowledge; their epistemologies.

Analyses of course descriptions and interview transcripts resulted in the identification of four distinct modes of knowledge and the subsequent formulation of the HOOPA model of course structure.
This model illustrated the findings; that the two areas of Own Work (00), the area of Historical Knowledge (H) and that of Philosophical Knowledge (P) appeared to provide complementary perspectives upon and enhanced learning in Analytical Knowledge (A). It was further intended to illustrate that the two elements H and P, which were found to be present only in the two departments having students perceived as holding mainly Type C and D epistemologies (Physics and Fine Art) might be seen to contribute a dynamic thrust, in time and space, to what, in the remaining two departments (Biology and History), might be seen as a more static model of knowledge. It was, accordingly, suggested that, where course structures contain all elements of the HOOPA model, students may be influenced toward a more dynamic and relative view of knowledge.

Broudy (1981) was concerned by what he termed the 'devaluation of substantive inquiry' as a result of specialisation. Arguing for the inclusion of liberal studies in courses, he states:

The particular rationale for liberal studies rests in a conception of the uses of knowledge - replicative, applicative, interpretive and associative - of which the latter two are central
to building a sense of warranted commitment.

(Broudy 1983.10)

It may be observed that Broudy's 'warranted commitment' bears conceptual similarities to the latter stages of Perry's scheme of intellectual and ethical development. Applied to the HOOPA model, Broudy's definitions of the uses of knowledge could be interpreted as corresponding to Analytical Knowledge (replicative), Own Work (applicative), Historical Knowledge (interpretive) and Philosophical Knowledge (associative). Perhaps lending support to the present findings is Broudy's belief that:

a convincing case can be made for the functionality of formal course work in the associative and interpretive uses of knowledge

(Broudy 1983.137)

He explains his reasons for this belief by drawing upon Polanyi's (1958) work on tacit knowing stating that:

learning acquired explicitly during schooling, become resources used tacitly in life; their details are forgotten, leaving frames or lenses or stencils of interpretation, both of fact and value. Perspective and context are the
It was suggested in Chapter 7 that the historical and philosophical elements of courses explicitly address and give students the opportunity to consider alternative conceptions of knowledge, both disciplinary and more general. In contrast, where such content is absent, students may be implicitly influenced toward a view of knowledge which may be both static, regarding their discipline, and fragmented, regarding knowledge in general.

A further possible implication of the HOOPA model was raised in Chapter 7, when it was suggested that the model has the potential to integrate some dichotomous analyses of educational philosophy, (Lawton, 1973; Gergen, 1982; King and Brownell, 1966), since it might be viewed as incorporating both sides of the romantic/classical, endogenic/exogenic, plural/autonomous and progressive/traditional arguments (see Fig. 11). The HOOPA model implies that, where all four modes of knowledge are offered, the factual learning and formal tasks and teaching associated the A and O0 elements are balanced by H and P studies, which were seen as dealing with relationships between facts, using student-centred methods.
The empirical findings reported in Chapter 7 were found to be compatible both with the theoretical sources consulted and with students' epistemological categorisations. It was, therefore, suggested that a relationship can be found to exist between knowledge, as structured and presented to students, and students' own perceptions of the nature of knowledge. Thus, it is suggested that the structure of knowledge in courses is a probable further factor influencing the development of student epistemologies.

10.41 Addressing student epistemology

Chapters 8 and 9 represented an extension of the previous stage of inquiry into the ways in which knowledge is structured within the four departments. It sought to address the question:

To what extent and in what ways is the question of student epistemology addressed in the teaching provided and learning expected in departments of Higher Education?

Observations and interviews were conducted in two sub-courses seen to be providing historical and philosophical studies; 'From Magic to Science' run by
Drs. X and Z in the Physics department and 'Philosophy' run by H. in the Fine Art department.

Findings from these two case studies served to reinforce the findings of the preceding section and to suggest answers to the above research question. Firstly, the extent of and ways in which the question of student epistemology is addressed were found to be as follows:

a) the history of a discipline's development, its theories and methods, serves to show students the paradigm they are working in within their discipline

b) a study of the philosophical foundations of knowledge allow students to see the discipline itself as a paradigm, as they encounter interpretations of key concepts from other disciplines

Secondly, answers were suggested which clarified the nature of the teaching provided and learning expected within the two courses.

c) Teaching was found to be discussion-based, student-centred and primarily concerned with the
presentation of and subjective consideration of alternative conceptions of knowledge, both disciplinary and more general

d) Students were seen to be re-constructing their views of knowledge in discussions and by researching and presenting topics of personal significance. Assessment procedures primarily required students to demonstrate that they had understood and could apply ideas encountered on the course.

Hirst et al (1983) in addressing educational theorists, complain of specialisation contributing to ideological narrowness, Peters arguing for more philosophical depth and the need to integrate disciplines and Nisbet focusing upon the lack of occasion for the discussion of 'larger issues'.

If more theorists and teacher-educators could be so persuaded, such recommendations and those of CNAA might be considered by those whose task is to design courses for students in Higher Education. Findings here have suggested that the kinds of knowledge included in course structures are a probable further factor influencing the development of student epistemologies and could,
perhaps, be added to factors of learning, teaching and departmental ethos in future research.

10.5 Synthesis

The final model, Model IV, illustrates the thesis of this study: that the development of student epistemology is probably influenced by the forms of knowledge included in course structure, which are both transmitted through and influenced by factors of learning, teaching and departmental ethos.

The study may be seen to be located within the research genre depicting learning as conceptual change, in which the above factors are seen as necessarily interrelated. As Ramsden (1988) illustrates:

Learning should be seen as a qualitative change in a person's way of seeing, experiencing, understanding, conceptualizing something in the real world - rather than as a quantitative change in the amount of knowledge someone possesses. It is logically impossible for learning defined in this way to be content - and context - free. Learning techniques and instructional strategies are inextricably linked to subject-matter and the
student's perceptions

(Ramsden 1988, 271)

The final model, with the addition of the dimension of forms of knowledge, could perhaps be seen to be related to Bernstein's (1975) concept of an 'educational knowledge code'. After stating educational knowledge to be a 'major regulator of the structure of experience', he writes:

Formal educational knowledge can be realized through three message systems: curriculum, pedagogy and evaluation

(Bernstein 1975, 85)

'Curriculum' he defines as what counts as valid knowledge, 'pedagogy' as what counts as a valid transmission of knowledge and 'evaluation' as what counts as a valid realisation of this knowledge on the part of the taught. The above factors may be applied to the present findings and seen as representing, respectively, the modes of knowledge deemed desirable in course structure, theories of teaching and aims of courses and the quality of learning outcome expected of students. Each of the departments studied, however, displayed different approaches to these three factors.
It might aid clarification of Model IV to examine those differences in relation to Bernstein's analysis.

Curriculum

Although lecturers interviewed in the Biology and History departments expressed the hope that their students would develop the skills of critical thinking, this aim was not explicitly addressed in course structures. Analysis culminating in the HOOPA model suggested that the 'curricula' of these two departments were based upon the principle that it is formal, traditional disciplinary knowledge - identified as Analytical and Personal Knowledge - which counts as valid knowledge. The 'curricula' of the Physics and Fine Art departments, however, appeared to be based upon the principle that valid knowledge should also include a dimension which aims to develop a view of knowledge as relative - identified as Historical and Philosophical Knowledge.

Pedagogy

Findings suggest that the success of courses aiming to develop a relative view of knowledge may depend upon the way in which they are taught. Ramsden and Entwistle (1981) found that:
students respond to the context of learning defined by the teaching and assessment methods of academic departments. Some departments and lecturers seemed to facilitate a deep approach, while others used methods of teaching which forced students into surface approaches.

(Ramsden and Entwistle 1981.369)

The two such courses perceived as achieving success - 'From Magic to Science' (Physics) and 'Philosophy' (Fine Art) - were characterised by two features; a student-centred approach and a discussion-based procedure. The importance of the former was emphasised by Gilbert and Osborne (1985) in their discussion of the work of Wittrock, Kelly and Pask. They write:

All three theorists ... emphasise the activity of the learner in constructing knowledge, the significance of pre-knowledge in governing the development of knew knowledge, and hence the particular role of the teachers in channelling those processes.

(Osborne and Gilbert 1985.113)

Both Dr. X in the Physics department and H in the Fine Art department had been observed to make frequent links between the sometimes highly abstract concepts presented
to students and students' existing knowledge, whether
everyday or disciplinary. Such emphasis upon the
importance of the students' pre-knowledge had also been
cited by Gagne (1965), who maintained:

It is ... the existence of prior capabilities
that is slighted or even ignored by most of the
traditional learning prototypes. And it is these
prior capabilities that are of crucial importance
... in determining the conditions required for
subsequent learning

(Gagne 1965.21,22)

An emphasis upon the second feature of the teaching
styles of Dr. X and H - a discussion-based procedure -
was made by Pope and Gilbert (1985) in their application
of the work of Kelly (1955) to theories of learning.
They state that, even though the importance of the
students' constructs to the 'learning event' may be
recognised:

unless the learner's views are articulated, the
teacher cannot devise a strategy whereby the
learner's model can be put to the test. Kelly
noted that change in construing will only take
place if the person experiments with his/her way
of seeing things, construes the implications of
these experiments and sees that it would be fruitful, i.e. result in an elaboration of his/her construct system, to adopt an alternative way of seeing things

(Pope and Gilbert 1985.38)

**Evaluation**

A third feature of the teaching styles of Dr. X and H concerned the method of assessment. In both departments it was seen to be linked to the teaching style, in that it, too, was student-centred (students were given a free choice of essay topics) and discussion-based (students presented their chosen topic to the group for debate). Interviews with both lecturers implied that they both considered process to be more important than end results in their evaluation of students' work.

Where the above learning and teaching criteria were met, allied to all elements of the HOOPA model, forming an interrelated whole, findings tended to suggest that students were developing epistemologies based upon the relativity of knowledge, which was an aim lecturers in all four departments wished their students to achieve.
10.6 Conclusion

This research began with a concern about the possible effects upon student epistemologies of the fragmentation of knowledge within the education system. This fragmentation was seen to be a possible consequence of increasing specialisation, both within and between the arts-science divide. An initial literature survey established the perceived nature of the problem by narrowing discussion down from its manifestation and consequences in the general culture, through the arts-science divide, to the individual in the education system, which was seen to be an appropriate arena for change.

Continuing the process of progressively finer focus, the study evolved through three phases, or alternative frameworks and two supplementary case studies. Within the four departments studied, this process has illuminated:

a) some of the views of knowledge students hold

b) some of the ways in which knowledge is transmitted and learned
c) some of the forms of knowledge presented to students

d) how the problem of student epistemology is addressed in some departments.

Each of these variations on the theme of student epistemology yielded an interim model and each of these models contributed to the formulation of a final model, illustrating the overall findings, that student epistemologies might be influenced by the forms of knowledge included in course structure, which are both transmitted through and influenced by factors of learning, teaching and departmental ethos.

The thesis suggests, therefore, that student epistemology is probably less related to specialisation per se than to factors of course design and teaching style within both arts and science departments. The study offers one description of how these factors might be interrelated, within the environments studied and might represent an area for future research in other institutions and disciplinary areas.

It is perhaps worth noting again that the problems with which this study has dealt have long been
seen. I repeat a quotation from Chapter 2, in which McKeon, in 1937, was arguing:

... a student should emerge (from a general education) with a knowledge of how problems, whether of life or of science or of art, have been treated; and, joined to that knowledge, he should possess an ability to understand positions other than his own

(McKeon 1937. 337)

McKeon's words are almost identical to those in CNAA's Clause 3, written fifty years later which reads:

The student must be encouraged to appreciate the nature of attitudes, modes of thought, practices and disciplines other than those of his or her main studies. He or she must learn to perceive his or her main studies in a broader perspective. As part of this process he or she must be enabled to develop an informed awareness of factors influencing the social and physical environment.

Whilst the National Curriculum is attempting to broaden pupils' educational experience in schools and thus, perhaps, retain some of the more holistic aspects of Primary School education, which provided the starting-
point for this research, the findings of this study suggest that such aims are still more of a recommendation than a requirement at the level of Higher Education.

Where departments in Higher Education were found to be explicitly addressing such aims, however, this study has suggested some of the probable consequences for the development of student epistemologies.
## Chapter Eleven

### Implications

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CHAPTER 11: IMPLICATIONS

11.1 What are the implications of the different epistemologies for the practices of learning and teaching?

Findings have suggested that where all elements of the HOOPA model are present in course structure, students develop epistemologies based on a perception of knowledge as relative. The implication of this finding for departments of Higher Education is that course designers might give explicit attention to the types, or modes of knowledge presented to students, particularly those dealing with alternative conceptions of knowledge. However, three problems of implementation of the HOOPA model are anticipated and discussed below.

a) Learning

It was found that students who had prior experience of this type of learning - the consideration of alternative conceptions of knowledge - took to it more willingly and enthusiastically than those who had not. If implemented across departments, then, such courses might possibly be seen as threatening to students unused to situations in which assumptions are challenged and in which there are no definitive answers.
This suggests that if such activities are to be successfully implemented they might usefully be started at an earlier stage in degree courses. Indeed, the question arises whether they might not be started earlier in the education system: students might then enter Higher Education with the expectation that ideas will be questioned. This has implications for the incorporation of such learning experiences into school curricula. A case could be advanced for investigating how this might be achieved, so that the ready transference of knowledge across boundaries observed in the Primary sector might be built upon, rather than lost, as the pupil moves on through the education system.

b) **Teaching**

It was found that the courses more successfully influencing student epistemologies toward relativity were those in which the lecturers concerned employed student-centred, discussion-based teaching methods. However, teachers too are influenced by the nature of their own prior experiences of education, which are reflected in their approaches to and theories of teaching and learning. This suggests that not all teachers would be comfortable using the above methods, or confident working in areas in which they were not
seen as the final expert. The research, therefore, implies that the education of teachers in Higher Education might include the study of theories of learning and teaching as well as the nature of knowledge, whether pre-service or in-service.

c) **Assessment**

If, as has been suggested, historical and philosophical studies were to be formally incorporated into all Higher Education courses, assessment would perhaps, become externally standardised. In the present study assessment was found to be negotiated between lecturer and student and content selected according to students' individual interests. External standardisation might threaten students' perceptions of freedom in learning and, thus, lower motivation. This suggests implications for the ways in which validating bodies might administer such courses. For example, these studies might best be included in course structures as extra-curricular, non-examined aspects of courses, as in the present study. However, the research suggests that there is, nevertheless, a case to be made for the requirement by validating bodies (here, CNAA) that the broadening aspects of courses should be explicitly addressed, rather than continuing to be left to the discretion of individual departments.
11.2 Implications for future research

This research, apart from answering questions, has in the process raised others, some of which may be seen as possible areas for future inquiry.

a) Further research into student epistemology

i) The number of epistemological categories identified in this research were necessarily limited by the size of the study and the numbers of students volunteering to take part. It is thought that a larger subject-group might result in the identification of more categories, or finer distinctions between those found here. Such a study would provide the opportunity for researchers to identify further factors influencing student epistemologies within departments of Higher Education.

ii) Findings on students categorised as holding Type A epistemologies (though few in number) did not satisfactorily explain their approaches, since they were unforthcoming during interviews and expressed largely unsupported, negative perceptions of their courses. Future research might investigate why such students are so
disenchanted with their academic departments, in order to improve their situation.

b) Course design and student epistemology

The most significant finding of this research has been the establishment of a possible link between the way courses are designed and the development of student epistemologies within departments of Higher Education. This thesis ends with the conviction that much more research of a qualitative nature needs to be conducted into the area of course design, both at the level of Higher Education and in schools.
BIBLIOGRAPHY


- 399 -


- 401 -


Esland, G.M., 1971. Teaching and Learning as the Organisation of Knowledge (in Young 1971)


Fox, D., 1983. Personal Theories of Teaching. Trent Polytechnic paper. Nottingham


Gulbenkian Foundation, 1960. Arts and Science Sides in the Sixth Form. Oxford University Department of Education


Marton, F., 1981. Phenemenography - describing conceptions of the world around us. Instructional Science, 10, 177-200


Rist, R.C., 1977. On the Relations Among Educational Paradigms: From Disdain to Detente. Anthropology and Education Audit, 8, 42-49


Interview technique

The primary purpose when interviewing students was to obtain data which would reveal students' individual perceptions of their academic experience. For this reason it was judged important to impose as little structure as possible upon the proceedings. Accordingly, no particular interview schedule was used. After an initial question of the type, "How are you finding the course?" students were encouraged to expand on their own concerns as they arose during interviews. The following excerpts from interview transcripts illustrate some of the ways in which interviews took differing directions as a result of this technique. A series of three dots represent a short pause, whereas a series of five dots represents a much longer pause, where the student was judged to have come to the end of his or her thoughts on a topic.

First excerpt

Int. How are you finding the course?
St. ... Well ... at school I was quite good at ... the kind of thing ... just learn and regurgitate ... but of course, it's a bit different here, to say the least .....  
Int. Is it? Is it a lot different?
Well, I mean ... from doing 'A' levels and coming
down here; I mean, the first ... for most of the
first year, most of us hadn't got a clue what we
were doing, because it was ... I mean, the things
you were expected to look at and think about were
so completely different from anything else we'd
ever done ... like social theory and, uh ... and
it wasn't until the exams, when we sat down and
were learning it all that it fell into place ...
I don't know, for most of the first year it was
sort of, um ... you didn't know if you were going
to pass or anything, because you didn't really
know what you were doing, or what you were
expected to do. So ... well, it was really
different ....

Do you think that's the same for any student on
any course, coming from 'A' levels?

Um ... I don't know. I wouldn't have thought it
would have been so much for the science subjects,
because it's just a continuation, isn't it, of
... I don't know. I'm not sure, really ... But,
um, down here you've just got to ... I mean,
writing essays ... I mean, I just used to copy
out of books and hand them in, but here you've
got to think about what you're writing and try
not to plagiarise and what have you, and you've
just got to think about what you're doing and
I've never had to think before.

Int. And you found that a bit confusing to start with?

St. Well, I did at first, because I didn't know what I was supposed to be doing. I mean . . . .

Int. How about in the second year?

St. Well, after the first year, um . . . No . . . I mean, the second year just got a lot easier . . . I think, in the first year, it was because we hardly ever came in for lectures and never did any work and it wasn't until the exams that we did the work, that we then sort of got the hang of it, what it was all about, the whole year, and then after that, when we came back, it was . . . we'd got a good basis for the second year, so it was a lot easier . . . .

Int. And what about this year? . . . Are you enjoying this year?

St. . . . Um . . . I don't know about 'enjoying' . . . well, the way I feel, I've just had enough now, basically. Quite a few people have . . .

Int. But you've got to last out until the Summer?

St. Yeah . . . .

Int. You're finding your enthusiasm waning a bit, then?

St. Um . . . it is a bit . . . I don't know, I did have some enthusiasm, because it's . . . it's not that very many hours a week and I know you're supposed
to sit in the library and read loads of books, but ... you've got a lot of time on your hands and, uh ... it gets a bit aimless ... every day, we just sit in the Union and talk about doing some work and then ... never actually getting there. Not much motivation ... so, uh ... I don't know .....  

Int. The exams are the main thing, are they, that'll get you the degree in the Summer?  

St. No. Um ... it's a good point, because I'm not even sure. Essays are part of it, but I'm not sure what percentage.  

Int. Is that essays you've handed in this year?  

St. Well, from the second year ... we had two exams at the end of the second year that are part of our degree ... and the essays that we did last year ... must have counted towards that ... Yes, those counted towards the final thing ... and, um, then they count again this year. Then we've got two short pieces to do. One's tomorrow ...  

Int. Is it?  

St. Yes. [laughs] One's tomorrow.  

Int. How short? I mean, is that in exam conditions?  

St. Yes. Well, they just give you a choice of three extracts from documents, or whatever, and you've just got to analyse them .....  

Int. Is there a lot of analysis ... in History?
St.  Um ... Oh, yes .....  
Int.  There is? ... You take ... what ...?
St.  Different interpretations and that .....  
Int.  What, you look at some document from the past ... and look at different people's interpretations of it?
St.  Uh ... well, it depends. Well ... not so much looking at documents, but, I mean, like in, uh ... a 'special' subject that we're doing this year, that involves looking at quite a few documents ... I mean, we haven't really analysed documents as such before ..... Um ..... I've forgotten what I was going to say .....  
Int.  What sort of documents would they be?
St.  Um ... well, from whatever period that everybody's doing. I mean, I'm doing Witchcraft.
Int.  Are you?
St.  Yes. So mine are, um, quite old.
Int.  That must be quite interesting?
St.  Yeah. I find it is.
Int.  You chose to do that?
St.  Yeah. It sort of makes a break from ... all the other sort of history we've been doing ... nineteenth and twentieth century ... and people usually choose to do those, because they think in some way it's going to help them with the ... actual, you know, course and the exams ... But
... I decided to do Witchcraft because I was just getting fed up with all the other sort of history.

Int. What is the other sort of history?

St. Well, I mean like ... they can do the British Labour Movement and ... there's one on Art - 'special' subject, there's one on, um ... British Society in the Nineteenth Century ... there's one on Asia ... on Asia, is it? ... They're all sort of related to the same sort of thing we're doing in Europe anyway ... so doing Witchcraft ... we all really enjoy it. It's about the only thing we all turn up for on our course.

Int. That's not Twentieth Century Witchcraft, presumably?

St. Oh, no. No ....

Int. Is it the history of witchcraft?

St. Um ... well, it's not so much ... well, I suppose it is the history of witchcraft, but I mean ... What is Witchcraft? How did the ideas come about? How are they used by people? ... the Church and whatever ... and sort of, um ... there's a lot of aspects of it that aren't clear or anything, but it's just interesting to do, because it's just a complete change from anything we've ever done ... plus the fact that the lecturer we have makes it really interesting as
well, and he's really enthusiastic, which I think ...
helps as well.

Int. Who's the lecturer for that?

St. Oh, F ...

Int. That's a special interest of his, is it? He offered that on the timetable?

St. Yeah, yeah. I mean, he's sort of really into it, and just makes it interesting ..... 

Int. Does he relate it to other things ... you said the Church?

St. Oh, yes ... popular culture and all that sort of thing ... society through the centuries, in the world - the Fifteenth and Sixteenth Centuries - but we do that in more detail next term, the popular side of it. We're just sort of doing the basic ideas and everything this term ..... 

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Second excerpt

Int. Are you enjoying the course here?

St. Um ... yes, I am more this year, because it's more what I want to do. The first two years I didn't enjoy the Stats. or the Bio-chemistry very much.

Int. Why are you enjoying it more this year?

St. Uh ... well, the subjects I'm doing are exactly what I'm interested in. It's the ... I'm doing
Cellular and Developmental Biology and, uh ...
Neuro-Biology and ... the Cells and Development especially really interest me ...

Int. ..... Are you doing a project of your own?
St. Um ... we will do, yes, in the weeks ... just after Christmas.

Int. Ah. You haven't started yet.
St. No. Not yet.
Int. Have you chosen yet, though, what you're going to do?
St. Um ... I've ... made a decision, yes, but we haven't actually put it on paper yet. I'm going to do a project into the development of the limb bud in, um ... mice and frogs.

Int. Development of the ...?
St. The limb bud ... in embryos. Because it starts off, you see ... you've got ... it's just a rudimentary structure that becomes the full limb in the, uh ..... 

Int. Oh, I see ..... And do you choose your own supervisor for your project, or does it ...?
St. No. If you pick a project the supervisors tend to go with it, because it's their field ..... 

Int. With your own personal options ... what comes into those ... Cell Development and Neurology?
St. In Cellular and Developmental you do genetics, which is, um ... concerned with, um ... all the
genetic control of all the ... I mean, at the moment I've just written an essay on genetic control of body plan in the fruit fly - wildly exciting! [laughs] and you have to go down to the molecular level in that and say, um ... I mean, you have to know the structure of the DNA molecule, which is what's in the, which is what governs everything, DNA ... the nucleus of the cell. And, um ... you have to know, say, the structure of that, and um ... the fact that it's made up of smaller units, and what those smaller units are made up of and that sort of thing. So you do go into the bio-chemistry of it all ... there. Um ...

Int. And you go into smaller and smaller units?

St. Yes.

Int. And where do you stop?

St. Um ... at the ... the single molecule, really. I mean, a molecule is made up of even smaller units of ... which are atoms. I mean, you don't have to go down to the individual atoms that are in it, you have to know what the basic composition is.....

Int. ..... what's the purpose of it? ... taking a broad, general view?

St. I think you have to study it ... I mean, you have to study systems in order to understand just what
is going on and what's going to happen in the future, I think. Um ... obviously, there's lots and lots of ... I mean, biology was the original life science and it's got lots and lots of offshoots. Um ... such as pharmacy and pharmacology, which is ..... People say, "why study Biology, because it's not as useful as they are?", because ... obviously they've got a practical use, but um ... I think you get a much broader spectrum of things and, uh ... you can go into a lot of different areas with that, whereas, if you do a specific science, like ... they used to do med-lab science here. If you do that, you've got to go into a medical laboratory really, but we can go into quite a few things, because we've got quality of skills in different ... practical skills and we've also got the knowledge to go with a lot of things. Um, I mean, you can do ecology, or cellular, you know, and I just think it's a broader spectrum, it's more interesting ..... We can predict that we're going to be able, one day, to stop cancer and that sort of thing, because we're going to know exactly how the genes work. It's just a matter of time in finding out. Um, I mean, they're almost there now really. They've discovered all these fantastic things. Um, but ...
Int. Are you interested in that line of work?
St. Yes, yes. That's part of my subject. I will do that.
Int. Is it?
St. Yes. Onco-genes. And, um, the fact that they are specific cells that proliferate, and, um, you can use drugs to stop them now, but the thing is that they ...
Int. Those are the genes that cause cancer, are they?
St. That's right, yes. And I mean, we've got drugs now that will stop those proliferating, but they'll also stop your hair sort of proliferating, it'll fall out, so you see you've got bad side-effects. but they're, um, developing now, um, amino-toxins, which are antibodies, which will home in on cancer cells particularly, because they've got specific proteins in their cell membrane, and they'll home in on these and, if you attach a toxin molecule to it, then they'll kill those particular cells and no other cells at all ..... There's some very good articles, actually, in the Scientific American and Nature, about that at the moment ...
Int. Yes?
St. But, um ... obviously they're still in their infancy ..... 
Int. You plan to follow that up, do you, if you can
afterwards?

St. Oh, yes. Definitely.

Int. You seem to see biology, then, as ... helping mankind, if you like?

St. Oh, yes.

Int. Do you see that as its main purpose, or just one of its purposes?

St. I think it's its main purpose. I don't really see that there's any ... I mean, if you, follow a course like this, there's no way that you're going to go away and think, "Oh great, that was marvellous" and just not think about it any more. You're still gong to follow it up afterwards

.....

Int. ..... Do you think it's peculiar to biology, that it's a great help to mankind?

St. No. I think ... with the chemistry. I mean, they ... well, everybody in the life sciences, I mean ... including chemistry, I would have thought and pharmacology and medicine ... they all work together on the same sort of projects ... the chemists are the ones that split things up for us, really. If you haven't got the know-how, you go to a chemist, or you go to a ...

pharmacologist.

Int. So you see the sciences as linked?

St. Oh, yes.