

CHAPTER FOUR

Skill in Learning and Organising Knowledge

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Introduction

In the preceding chapter, the distinction between deep and surface approach was presented. This distinction is used throughout the book as a general framework for describing differences in learning. Within this general framework, differences between people in their ways of organising learning materials are distinguished. It is the aim of the present chapter to pursue further the question of organisation in learning and to specify in greater detail the nature of the relation between the activity of the learner and the outcome of learning. This will be done by use of the concept of skill in learning and by further describing the meaning of approaches to learning. In the present chapter the term skill will be used to refer to the nature or quality of an interaction. The term skill is used in a way similar to that of Bartlett (1951, 1958) and Singleton (1978). Bartlett gives the term skill a very broad meaning and makes the concept a fundamental one in describing all human activity. Singleton summarises the meaning skill has to Bartlett and his colleagues in the following way.

Sir Frederick Bartlett and his colleagues in the Psychology Department were talking and writing about the concept of skill as the fundamental unit of behaviour. This made entire sense to me but not apparently to very many other people because the movement dwindled rapidly with the retirement of Sir Frederick in 1952. It got lost within performance studies which were essentially behaviouristic and stimulus-response in origin, a quite different style of thinking from the gestalt approach of skill psychology. (Singleton, 1978, p. xi)

Instances of reading, listening, writing and problem-solving, which are the kind of interactions dealt with in other chapters of the present book, can be considered to represent skills. Such skills are conditions for and parts of learning, and the quality of learning is dependent upon the quality of the skills deployed. The purpose of this chapter is to discuss the most important general characteristics of skill in learning. An important change which takes place when one moves through the successive levels of the educational system from primary school to higher education concerns the learning tasks dealt with. The knowledge and the phenomena which students are required to deal with increase in scope and complexity. Thus there is an increasing requirement to deal with complexity and to some extent a corresponding development of knowledge and skills. Differences in complexity have important implications for the meaning of skill in learning, and organisation, as we shall see, is the most important element in dealing with complexity.

Organisation is also the aspect of the treatment of the learning material most closely linking the qualities of knowledge and outcome of learning described in

Chapter 2 and the approaches to learning described in Chapter 3. The main differences in knowledge described in Chapter 2 are of an organisational or structural character and they are related to corresponding differences in the approach to the content of the task. Here we shall discuss skill in learning by further exploring the concept of organisation. The centrality of organisation to skill in learning will be examined through a consideration of the learning of different and successively more complex kinds of subject-matter, learning facts, and learning organised wholes.

The main concern in this chapter is with the nature of learning for understanding. Learning for understanding does involve learning facts. However, the learning of facts may involve only very limited understanding. This is why it is so important to consider the learning of larger wholes and the role of organisation in learning for understanding. The concept of deep approach emphasises the thinking about the world of which facts form a part, in contrast to memorising facts as isolated units of information. The concept of holistic approach, which we introduce here, suggests that, in learning for understanding within a deep approach the student forms wholes corresponding to complex phenomena of the world, including facts and their interrelations. It is the skill of forming integrated wholes that constitutes the most central aspect of skill in learning through understanding.

In this skill dealing with facts as parts of larger wholes is crucial. The nature of learning facts within the development of understanding, thus becomes the starting point of this chapter. In dealing with the question of learning in the two subsequent sections, we shall first describe and discuss the skill of understanding and then comment on what learning from understanding might involve.

Learning Facts

Facts refer to parts of the surrounding world. Unlike, for example, nonsense syllables, facts have an inherent meaning; indeed, referential meaning is a basic characteristic of a stated fact. As we shall see, organisation is fundamental in the learning of facts as it is bound up with referential meaning.

Understanding facts

The importance of organisation and of referential meaning to remembering and learning facts will be illustrated by discussing an experiment carried out with adults by Katona (1940) in the USA. In his discussion of two main processes of learning, learning by memorising and learning by organising, Katona used a series of numbers, 581215192226. He instructed a group of adults to group the figures in threes and reproduce them. After a short period most of them could reproduce the series. This illustrates the marked effect brought about by the simple grouping of the numbers compared to memorising the figures as a series of isolated items. When asked one week later if they still remembered the figures, the adults considered the question unfair, as they had not been told that they would be asked to recall the numbers later on.

Another group of subjects in Katona's experiment were merely instructed to learn the series. Some of them then discovered a regularity in the series. They

found that the series could be structured in a series of numbers from lower to higher with alternating differences of 3 and 4 between numbers, as follows:

5	8	12	15	19	22	26
	3	4	3	4	3	4

Those who discovered this principle of organisation returned the material to the experimenter. They did not need to repeat the series and they were able to reproduce it without any faults. One week later they could still reproduce the series and after four weeks had elapsed three out of five still remembered the principle although only one of them could remember that the first figure was 5. (Indeed, this principle can easily be explained to a subject and will be readily remembered, even though the subject has not discovered the principle for himself.)

In Katona's experiment, another group of experimental subjects was given the same figures in the same order, but presented in the form of a factual statement: "The Federal expenditures in the last year amounted to \$5812151922.26". The subjects in this group made rather more errors in recalling the exact figures compared with the earlier groups we described. However, several of them remembered the approximate sum of money a week later (about \$5,810 millions, or 5.8 billions). Where, as here, the series of figures is treated as a part of a fact, skill takes on a different meaning. The series of figures is attended to as a whole, as a sum of money, and moreover as a specific sum related to a part of reality. And in contrast to the case of remembering the figures as such, they are not given equal importance, for although they are still in the same order, there is a gradual decrease in the importance of the exact figures as we move from the beginning to the end of the series. This decrease in importance is determined, of course, by the meaning which the figures now have. Thus we see how organisation and referential meaning together constitute the fact. The organising principle is therefore not, as in the previous case, simply a mnemonic device dependent on grouping the signs or on discovering the alternating differences of 3 and 4. In the learning of facts, we have to consider organisation together with referential meaning.

It is through their combination with words that the figures in the above example are given their referential meaning. However, words may be treated as isolated units, as in research on "free recall", where the subjects have had to learn lists of words or names. In this research, the phenomenon of grouping has been very clearly demonstrated, for although the words in the lists are presented in a random order it is found that the subjects arrange them into groups when learning the lists. The grouping is made on the basis of the meaning of the words. This kind of subjective organisation has been well demonstrated by, for instance, Tulving (1962, 1968) and Marton (1970).

Here, we are mainly concerned with series of related words expressing a fact, as in our example of Federal expenditure above. The example concerned a rather isolated fact. We now turn to another example where the fact is presented together with other facts in a reading text. In other words, the facts are located within a text, and have been organised in a way which reflects the subject-matter of that text. The text is an article by Dahllöf (1968) entitled "New facts about the open

faculties". This article was used in an investigation by Svensson (1976), and parts of the data from the same investigation were analysed by Marton (1975b) and have already been referred to in Chapters 2 and 3. The content of the article has already been summarised in Chapter 2.

In the article, Dahllöf presented statistical tables showing that pass rates differed between different groups of students (e.g. male/female, younger/older students, arts/science students) and that they differed between the traditional and newer universities. He then presented cross-tabulations showing that the more significant differences in pass rates were found amongst particular groups of students and between different kinds of universities — for example, the pass rate was high amongst younger men studying liberal arts at the traditional universities of Uppsala and Lund, but it was low amongst younger male arts students at the newer universities.

If we now compare the problems posed by dealing with the facts about pass rates presented in this article with that given in the Federal expenditure example, we can see that there are very considerable differences. One important difference concerns the degree of specificity with which the facts are remembered. In the Federal expenditure example, the only fact to be remembered is the sum involved, and there may be some differences in the specificity with which this is recalled (e.g. as 5.8 billion or as 5.812 billion dollars). In the case of the article, however, there is at one level the exact pass rates and at another, the fact that there are differences in pass rates in a particular direction. Indeed, the direction of the difference is easier to remember than the precise pass rates or the exact difference. The reason for this stems from the relation between this fact of the direction of difference, on the one hand, and on the other, the rest of the message of the text and the previous knowledge of the learner. It is difficult to find other facts that support the remembering of an exact pass rate. It is much easier to find support in other facts for the direction of the difference.

The supporting facts presented in the text concern a general reference to differences between the universities in terms of the environment in which students study. Two specific differences are mentioned: that there are more job opportunities in the big cities and that group solidarity might be more highly developed at the older universities. A weaker sense of solidarity would mean that students in the large cities do not study quite as hard, while the wealth of job opportunities in the cities might divert them from studying. These supporting facts therefore make it understandable that the pass rate is lower in the big cities. They mirror the direction of differences in the pass rate, and they suggest that perhaps these differences can be seen in terms of a cause-effect relationship. In this case, then, organisation and reference aid the remembering of the direction of difference.

What may also help in remembering the difference is its relation to the overall organisation of the content of the text. The overall organisation is that of 'facts-conclusion' and the differences in pass rates have a direct relation to the conclusion, which is that if any measures are to be taken, they should be selective ones. The basis for this conclusion is the differences between groups of students, some of whom had a satisfying pass rate while others perhaps did not. Here, again, we can note that it is not necessary to remember any specific differences at all (nor

even the correct direction of the difference) when recalling the point being made. The organising principle here — the structure of the text in the form 'facts-conclusion' — is the chief organising principle of the text. If understood, it very strongly supports the recognition that there are differences between groups of students. There was a clear difference in the use of this organising principle between students, and this difference also represented the main variation in understanding the text as a whole: we shall therefore turn to this in the section about learning organised wholes.

Learning from understanding facts

Whether a performance is to be considered skilled or unskilled varies in accordance with the criteria specified. This can be illustrated in relation to the example of Federal expenditure. Let us assume that students are asked a question about the size of the Federal expenditure, and one gives the answer "5.8 billions" while another answers "approximately 6 billions". If the criterion of performance is precise recall of the text, then "5.8 billions" represents a better performance. If, however, the criterion of performance is one in which the fact about Federal expenditure is to be understood as having meaning in the surrounding world, then the definition of skilled performance changes. Here, let us assume that the student answering "5.8 billions" has simply committed the fact to memory without grasping its meaning; and that the student answering "approximately 6 billions" has recognised its referential meaning. With the grasp of the referential meaning as criterion, the more precise answer represents unskilled performance, and the less precise one skilled performance. What has actually been learned through reading the text cannot easily be determined. The referential meaning that facts have is not necessarily fully acknowledged by students in their learning of these facts. The facts may be treated merely as units of information in a learning task. This, of course, means that there is a crucial difference in what might be learned: it might be something about the surrounding world or something about the text.

The description of learning also has to be based on some knowledge about what the students' conception of Federal expenditure was prior to reading the text. Turning to the second example we gave, on differences in the pass rates at Swedish universities, we can examine the role of previous knowledge as a basis for understanding and learning facts. In this example, it is reasonable to assume that the students already know what percentages and differences in percentage are, and that they know the meaning of the groupings of the students. Lack of knowledge in any one respect may cause problems in understanding the fact of the difference. Another problem may be that some students have not previously encountered cross-tabulations, and so fail to grasp their meaning. Although a student might not understand the meaning of the cross tabulations because of a lack of prior experience of them, the student could have overcome this deficiency with the aid of the discussion which accompanied the tabulations. In other words, by grasping the organising principle and the referential meaning according to which the fact of the difference was to be understood, the student would be able to make up for a lack of knowledge of cross-tabulations. Indeed, the most interesting aspect of skill in learning is that students are able to overcome

deficiencies in previous knowledge. To learn to use previous knowledge, to organise and to extend meaning are important aspects of skill in understanding and learning. To develop these qualities is to learn how to learn.

Learning for Understanding

In the preceding section of the discussion, our concern was with the understanding of a fact or facts. In the last example we gave, the differences in pass rates (which constituted the facts we focused upon) appeared within the framework of a more complex unit of meaning — i.e. an article which was structured according to the principle ‘arguments conclusion’. Indeed, we saw that the learning, remembering and understanding of this fact was related to the organisational and referential setting in which the fact was embedded.

In more complex learning, however, the aim underlying a learning task involving material such as an academic text is not the learning of facts, but rather the learning of an organised whole in which certain facts are embedded. This represents a very significant shift. The aim has become the learning of the organised whole, through a grasp of the interrelation between the parts which make up that whole. Within this organisational and referential framework, a specific fact is often of no consequence. It often does not matter whether the fact itself has been remembered or not, and it may not even matter if the fact has not been understood. In this section, we shall be concerned with the learning of organised wholes, defined as units of distinctive parts which are interrelated.

Understanding organised wholes

We shall continue with the earlier example of a text about university pass rates to give a description of qualitative differences in the understanding of the text as a whole. As we saw in Chapter 2, the different understandings which students had of the overall meaning of this text could be seen in terms of four qualitatively different categories of outcome. The four categories were the following:

- A. *Selective measures.* If one wants to increase the pass rate, one should take selective measures, i.e. measures for some groups of students and not for others.
- B. *Differential measures.* If one wants to increase the pass rate, one should take different measures for different groups.
- C. *Measures.* One should take measures.
- D. *Differences.* There are differences in examination pass rates between groups of students.

The four categories represent different treatments of the message of the article. In category D, “Differences”, the students have focused on some of the facts but have merely grouped them together without organising them into a whole. This is also true of the students holding outcome C, “Measures”. They consider a concern for measures as just another unit of meaning. It does not have the character of a conclusion related to certain arguments and, in fact, it is in contradiction to what was argued in the text, since the author’s concern was to question whether any measures were needed at all.

Categories ‘A’ and ‘B’ represent organised wholes with a facts conclusion structure. The specific structure, however, is not the same in each case. Outcome ‘B’ has the quite common structure that there are differences between groups of students and that the groups therefore have to be treated differently. Outcome ‘A’ has a more complex structure and is equivalent to the author’s message. The differences between groups of students mean that in some groups the pass rate is in line with expectations, while for others it is not. Therefore, if any measures are needed, these measures should be directed only towards those groups where pass rates are below expectations. In other words, it is stressed that nothing need be done about certain groups of students, so the measures to be taken should be selective.

The four categories of outcome are thus based on four qualitatively different ways of organising the content of the text when reading and remembering it, i.e. they represent four different skills which each lead to different understandings. At the same time there is a more fundamental difference between the skills embodied in categories A and B and those embodied in C and D. It is the difference between organising the content into an organised whole or merely ordering and grouping parts. In one of the original Gothenburg investigations (Svensson 1976 and 1977), the first way of interacting with the text and organising the content was called a *holistic* approach to and understanding of the text and the second way was called an *atomistic* approach and understanding.

Within that investigation, the difference between a holistic and an atomistic approach was found to be the most crucial difference between interactions with complex learning materials. The difference is one between merely delimiting and ordering parts of the material interacted with, compared to integrating parts by the use of some organising principle. As our earlier discussion implies, there are usually important differences too within these main categories of approach and organisation. Within the atomistic approach, the parts may be differently delimited, internally integrated and ordered. Such differences will also exist within the holistic approach, but here the main difference will concern the principles adopted in organising the parts into a whole.

Several general principles of organisation such as narratives, argument-conclusion, principle-example and cause-effect are often commonly recognised as essential to a given material. It is, in most cases, not common for a learner to use a different principle of organisation from that suggested by the material; for instance, the form argument-conclusion instead of principle-example or narrative instead of cause-effect. The level of agreement amongst individuals about the organising principle of course also reflects the experienced clearness or ambiguity of the material. The relatively high degree of agreement which usually exists creates a situation where the main difference becomes one between those recognizing and using the principle of organisation and those not doing so, i.e. between a holistic and an atomistic approach.

Although the fundamental difference between holistic and atomistic understanding in many cases is the main difference among a group of persons, this may not always be the case. Different learning materials lend themselves more or less readily to the identification and use of a main principle of organisation.

In some cases, everyone in a given group may very well use an atomistic approach while in other cases all will use a holistic approach. This does not exclude the fact that individuals display some degree of consistency in their approach to similar kinds of material; a degree of consistency, however, that varies between individuals.

Another kind of difference to that between a holistic and atomistic approach can be seen in the following example, which does not focus on interaction with a text or message, but on relating to and thinking about a physical phenomenon. The example is taken from an investigation of university engineering students' understanding of physical phenomena (Johansson, 1981; Svensson, 1989). The students were asked to describe and explain a number of different physical events. The present example, which has also been discussed in Chapter 2, concerned what happens when a car is driven in a straight line on a motorway at a high constant speed. The first question put was "What forces act on the car?", and there were further questions concerning the different forces, their interrelation and effects. The most general and fundamental principle used to organise the whole phenomenon was that of cause and effect. An atomistic approach, then, would have meant not using this principle, but giving the "causes" and "effects" as unrelated parts. However, the relevance of a cause-effect relation as the superordinate one is apparent to all of the students in this instance. The difference that does emerge concerns how cause and effect are delimited and related, i.e. it is a difference within the category of holistic approach. It broadly corresponds to the difference between the two holistic categories of "Selective measures" and "Differential measures" in our earlier example. Those two categories represented two different ways of relating arguments and conclusions about university pass rates. As far as the organisation of the present example is concerned, the force or causal aspect is related either to velocity in the sense of motion or to change in velocity, i.e. to acceleration. This difference in the delimitation of the effect (and in the relation between cause and effect) is the most fundamental difference which can be observed in the students' organisation of the phenomenon.

The first mode of organisation, based on motion as effect, represents an Aristotelian conception and the second, based on acceleration as effect, represents a Newtonian conception of motion. The difference is one of the most important ones in the history of the science of physics. The Newtonian conception, although it is more complex, is not more holistic. The complexity involves greater and better distinctions within the description of the whole. Thus, the Newtonian conception not only involves more complexity in terms of differentiation of more aspects or parts (like constant velocity in addition to acceleration as a special case of motion) but also better fidelity to the material organised. (A similar observation can be made concerning the difference between the two corresponding categories in our earlier example about university pass rates.) This combined difference in complexity and fidelity we might call *completeness*. Thus we have emphasised two main differences in the skill of understanding; the difference between a holistic and an atomistic approach and distinct differences in completeness within a holistic approach. While this in no way exhausts the variation in important qualitative differences, these two differences can be considered to be the most important ones.

The quality of the interaction, the skill, is dependent both on the person acting and the material being acted upon; it is a *relational* phenomenon. Moreover, holistic and atomistic approaches are not seen as characteristics of individuals, but as individuals' way of relating to specific materials. It was for this reason that the concept of approach was introduced by Svensson (1976). The concept emphasises the possibilities of openness to and dependence on a given learning material as well as on the past experience of the individual. It was used in preference to the concept of process which emphasises certain given forms or mechanisms by means of which material is processed. It was also used in contrast to the concept of strategy which sometimes seems to emphasise the dependence of interactions on predefined plans — something which is not prejudged but left open when using the concept of approach. This accords with a more general emphasis on the fundamentally creative nature of human activity.

Learning through understanding

The atomistic approach represents a type of skill which is restricted in terms of the learning which it makes possible. This skill means, at best, learning of parts if these are new to the learner. This is a severe restriction since the understanding of the main point or the significant meaning of a message or the fundamental nature of a phenomenon is dependent on holistic organisation. A shift from an atomistic to a holistic approach thus constitutes the most significant of any improvements in understanding and learning. To learn to organise the content into a whole is the main problem of learning to learn. However, we must also consider the fact that there is a great variation within both the atomistic and the holistic approaches.

Within the atomistic approach to complex material, there is a variation in how atomistic the approach is. This variation corresponds to the degree of organisation of parts. The most atomistic approach means a memorisation of very specific details. A less atomistic approach means the integration of details into bigger parts and into main parts. There is also a variation in completeness, i.e. in the complexity and fidelity of the treatment of parts, which has its counterpart, as we have already seen, in the holistic approach. Such variations, of course, make a considerable difference to the understanding of the message or the phenomenon and to what might be learned by means of this understanding.

Such variations within the atomistic approach also mean, in effect, that some learners are holistic in relation to parts of the material while others are atomistic in relation to these same parts. This is important not only to the understanding of these parts but also to learning to learn. The less atomistic the approach is (the more holistic in relation to parts it is), the easier is the shift to a thoroughgoing holistic approach. An important aspect of learning to learn takes place within the atomistic approach when there is understanding and learning of progressively larger parts and an increasing completeness in the understanding of parts. But the biggest stumbling-block occurs when the progression halts and learning becomes fixated to memorising parts of a certain complexity. Learning to learn then becomes equivalent to learning to memorise as opposed to learning to organise.

Within the holistic approach, there are also variations in understanding and learning. We have already discussed differences in completeness. As far as learning to learn is concerned, an improvement in completeness means improved analytical and interpretative skills, which are skills in learning. This is a part of learning to learn within the atomistic approach too, but only in relation to parts of the material. And since learning materials vary in complexity, to be atomistic in relation to a very complex material may involve more organisation, analysis and interpretation, than to be holistic in relation to a rather simple material. This is because the precise meanings of a holistic and an atomistic approach are not fixed but are instead a function of the learning material concerned. The distinction between the two approaches centres upon the main difference in approach to a given learning material. And just as the nature of the learning material may vary, so the meaning of the main difference in approach may vary too.

There is the further problem of the difference between understanding or performance and learning. Learning is equivalent to what is new to understanding. What has been learned may be many very different things, ranging from previously unknown specific facts to an entirely fresh conception of a very complex subject matter or phenomenon. What is new in the latter case cannot be ascertained solely on the basis of what has been understood in a particular instance, but is dependent on the previous understanding of the subject matter or the phenomenon, i.e. to describe learning fully we have to describe qualitative changes within a developmental perspective.

What may also have been learned, in addition to a new understanding, is the skill of learning, i.e. of how to deal with learning materials. Skill in learning is dependent upon sensitivity to the material and the exploration both of the content of the material and of the relevance of organisational principles to the content. In any particular learning situation, there may be a complex interplay between two groups of elements. On the one hand there is the content of the task and its organisation. On the other hand, there is the student's previous knowledge and his or her approach to the task, where the approach encompasses a particular intention, a way of thinking about the treatment of the task, and an attempt to organise the material.

To be skilled in learning, then, means to be deep, holistic and complete in approach and understanding. As we have already suggested, the most important aspect of this is the open exploration and use of the possibilities inherent in the material, allied to a consideration of relevant previous knowledge. It is this kind of exploration of relevant knowledge and of relevant principles of organisation that represents skill in learning in the deepest sense, and it also represents learning to learn in its deepest sense.

Skill in Studying

In this closing section of the chapter, we shall be concerned with the relationship between skill in learning and skill in studying. This relationship is an important one which is often overlooked. The term "study skills" is a common expression which has generally been used to refer to techniques of studying such as notetaking,

underlining, summarising and so on. Interesting though these techniques are, they represent relatively superficial and peripheral aspects of the activity of studying. To see these techniques as skills in themselves is misleading, for this has the effect of isolating them from the student's thinking about the content of the study task of which they form a part. Thus, for example, underlining should be seen as a part of reading a text and notetaking as a part of listening to and making use of a lecture presentation.

On similar grounds, even the skills of reading, listening, writing and problem-solving do not in themselves constitute skill in studying, for they cannot be considered in isolation from the main units of the activity of studying as it takes place in educational settings. In an educational setting, such skills are practised within the framework of a course structure which is also linked to an examination system. And it is these assessed courses which comprise the main units of study activity (Svensson, 1976, 1977, 1981). In its widest sense, then, skill in studying describes the quality of students' performance on a study task which is embedded within a course. Consequently, our focus continues to be that of skill in performing a task, but we are now considering a more extensive task which encompasses, in varying combinations, the kinds of tasks we examined earlier.

What the task and the skill mean depends on the amount of material assigned and read, the time allocated for its study, and the form, conditions and result of the examination. Skill in studying involves the display of understanding of a given material through special skills of performance in examinations. However, examinations are normally very restricted in their form, content and duration. This means that very little of what has been understood by the student can be demonstrated in the examination, and selection is therefore necessary. This creates several problems, especially in higher education where the volume of material which students are expected to study is substantial. Since study success rather than understanding is what matters, and since this is defined as success in examinations, it seems unnecessary to understand more than what is demanded in the examinations. It is thus in the interests of students to be selective and to focus their studying in accordance with the examination. In practice, examination performance may very much depend on students' memory of the material, even in cases where tutors are aware of the shortcomings of examinations and would like performance to be dependent on a broader and deeper understanding.

In being selective, students can, broadly speaking, opt for one of two possibilities. One is to tackle the problem by selecting specific parts of the course material which they consider important and which, by themselves, are not dauntingly large. The students, therefore, see the examination as requiring them to remember and understand accurately and in detail these "correct" parts of the material. The other possibility is not to select *from* the material, but to select *within* it. The students place much more emphasis on overall structures and meanings than on specific details. They see the examination as requiring them to remember and understand details only insofar as these details exemplify or corroborate broader structures and meanings. The first of these possibilities constitutes a surface or atomistic approach and the second a deep or holistic approach.

The problem for the students is that the adoption of a deep or holistic approach is not explicitly required of them. What approach the students adopt is therefore likely to depend upon their previous knowledge and experience. If they are accustomed to taking a deep or holistic approach, they are likely to be able to cope with much larger units of course material. If they are not used to treating course material in this way, their experience of larger units of course material may become steadily less rewarding to them personally and less rewarding in terms of their examination performance.

The reason for this may have less to do with the content of the examinations as such than with the demands of large units of course material. As we noted earlier, it is easier to remember something that is part of a larger organised whole. It is also more efficient and more pleasurable to aim at and achieve deep and holistic understanding. The cumulative nature and increased complexity of course content presents considerable problems, however, if the approach adopted is a surface or atomistic one. Instead of the pleasure of understanding, there is the hard work of memorising increasingly more complex and steadily larger units of material. If students adopting such an approach are fortunate as well as industrious, they will manage to pass their examinations by dint of extensive memorisation while also gradually modifying their approach and learning what is required for understanding. But what often happens is that the students cope initially, when the amount of material to be digested is relatively small, but find that as the volume of material increases, studying becomes increasingly more arduous, tedious and likely to result in failure (Svensson, 1976, 1977). Academic success may be most easily achieved by students whose previous knowledge and experience has already equipped them to cope with the learning of complex organised wholes. These students will select within the material as described above. However, to those students who select from the material there is very little feedback telling them that this approach will be detrimental in the long run. The understanding displayed and accepted in examination performance to a considerable extent represents short-term memorisation. Relatively soon after the examinations are over, most of it will have been forgotten. In the long-term, the retention of understanding will depend upon the integration between what has been learned and previous knowledge and experience — that is, on the degree to which the students' conceptions of the world around them have been transformed by what they have understood. However, integration is not an inevitable part of skill in studying, rather it represents a problem.

The student has to balance two competing requirements: the need to deal with a large body of material in a short time, and what is required in the painstaking construction of integrated wholes. Achieving the latter demands insight, confidence and even independence and stubbornness on the part of the student. This is extremely unlikely to be found among students relying on an atomistic approach and already pressed by the increasing risk of failure. On the other hand, its achievement may in some extreme cases lead to failure if, in allocating study time, the student places integrated understanding above the requirements to learn a specified range of materials, as demanded by the examination system. Here,

the paradox is that although in most cases academic failure results from problems with understanding, in some cases it may result from a devotion to thorough understanding.

To reiterate our main concluding point, skill in studying is not equivalent to skill in learning. Moreover, the benefits of skilled learning go beyond a better knowledge of a specific body of subject-matter and its long-term retention and application to new material. Ultimately, improvements in skill in learning which stem from any particular course unit are not specific to the content of that unit. They are improvements in the skill of understanding and of learning to learn. The student becomes more skilled at extending his or her understanding through an exploration of new and more complex material. Defined in this way, learning requires a relative absence of stress and a confidence in one's own thinking that are not always fostered in educational systems.