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Studaxology: the expertise students need to be effective in higher education

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Abstract. Students in higher education have to develop two types of expertise; the first refers to the mastery they want to acquire within a well defined occupational or disciplinary domain; the second relates to the deep level learning needed to achieve that mastery as an expert student or studax. Research has indicated that in solving a problem any expert simultaneously has to draw on four types of knowledge. Where the personal organisation of these four leads to effectiveness, this brings about the quintessence of expertise – experiencing problem solving behaviour as intrinsically motivating, or rewarding in itself. This intrinsic motivation integrates experiences of competence (through declarative knowledge), causality (through procedural knowledge), creativity (through situational knowledge) and self regulation (through strategic knowledge). The same will then necessarily hold for the student who proves, by experiencing this very same effectiveness, to be the studax or deep level learner higher education needs.
This paper describes a theory – *studaxology* – which explains to the student, on the basis of what is being experienced while studying, how to become organized as a person within the study environment, so as to succeed in the required task. Studaxology's core is a 3 × 3 matrix of study experiences, based on that number of sources of variance, empirically identified by means of factor analysis of Likert-type items in study inventories. Its central experience of intrinsic motivation brings together four pairs of complementary experiences (ability vs. difficulty, effort vs. relevance, intention vs. demand and time perspective vs. discipline), with each pair constituting a basic component of intrinsic motivation, and as such reflecting a specific form of metacognitive knowledge. Adequate interpretation and use of the 3 × 3 scores on a similar study inventory enable the studax effectively to meet deep level learning that optimal functioning in higher education demands. Factor analyses of students evaluations of lecturing behaviours can also be fitted into a 3 × 3 matrix equivalent to that of the studax. It is argued from these analyses that the essential prerequisites for achieving studaxological expertise stem from an appropriate initial vocational choice (which will help to produce an internally well-cohering 3 × 3 matrix of experiences) and are further enhanced by an equivalent matrix of lecturing behaviours designed to support students' own study experiences.

Introduction

Students differ in the ways they experience their everyday study behaviour in higher education. Some enjoy studying and are quite successful at doing it; the Latin language suggests the term 'studax' to describe them. They know quite well what they are doing and how they are doing it. They can interpret their study experiences in a meaningful way, and they have a good metacognitive knowledge about the mental processes involved. At the same time, they work in the way their task ought to be done: they use a good study method, and are able to adjust their 'approach' individually as soon as it turns out to be less than effective. And this, inevitably, leads to success in their examinations. It is as if they are individually working and living on the basis of a sound personal – and thus subjective – 'theory of studying', in which these aspects of their study behaviour constitute a well-integrated behavioural 'whole' which they are able to maintain day after day. Others lack this expertise and seem to remain a novice or non-expert, finding it quite difficult or even impossible to organise their study behaviour; they feel themselves still to be ineffective in what they have taken on by enrolling in higher education.

This paper seeks to combine a number of relevant research findings into a meaningful frame of reference, to be labelled as 'studaxology'. It draws on related research as well as the author's own work (Janssen, 1989, 1991). Its intention is to describe how students individually develop and maintain necessary and sufficient expertise within a framework of their own subjective theory of studying which enables them not only to be successful in examinations, but also to feel intrinsically well motivated in what they intentionally do, or avoid doing, in their everyday study activity. This objective theory may show young people, their counsellors and their teachers, how to (re-)organise daily studying in a (much more) effective way, on the basis of personal study experiences. Most students – possibly with some help, advice or support from counsellors and teachers – may then become the studax or 'deep level learner' demanded by higher education. They may thus not only more effectively understand the content of what they are studying, but also themselves as learners.

The systematic presentation of this set of ideas is organised into four sections. (1) First, the concept of expertise, to which these differences in students' effectiveness have already been attributed, is elaborated to find out whether the concepts involved allow an appropriate operationalisation of the idea of studaxology. As this proves to be the case, it is then possible to explore (2) studaxology's components, and (3) the ways these need to fit together and the prerequisites implied. This perspective continues to look encouraging, and so (4) a start can be made on finding out how individual students may systematically be helped to develop this type of expertise within the available local university infrastructure.

Studaxology: that 'other' expertise students only look at implicitly

Most students enter higher education to prepare themselves for a specific expert role in society – to become an acknowledged 'master' of a well defined occupational domain (e.g. psychologist or accountant). Such mastery has to be demonstrated through formal assessment procedures, by showing that they are able to provide, in a scientific and socially acceptable manner, effective and even creative solutions to problems within that domain. They thus set themselves a double task: becoming a professional expert necessitates, at the same time and as an essential but not sufficient condition, the development of expertise in their own studying. Only 'deep level learners' can transform the person they are at enrolment into the expert who will survive the final examinations at the end of higher education. This 'second' expertise refers to the subjective theory that entering students have to develop about their own studying. Hence, the concepts of problem solving, understanding, effectiveness, intrinsic motivation, experiential learning – all of which have to do with expertise – are also relevant within the theoretical framework of studaxology. This relevance will now be analysed.

Types of knowledge involved within expertise

Glaser (1986) distinguishes novice and expert on the basis of the amount and internal organisation of the knowledge the latter used in problem solving (viewed as the ultimate objective in every profession). This knowledge is of four 'different' kinds. *Declarative knowledge* reflects all the information remembered or which is immediately accessible in reference books and computer files. It involves 'knowing' precisely what is going on within a specific problem solving context. *Strategic knowledge* simultaneously indicates what needs to be done, especially when specific circumstances complicate the most obvious approach in solving the problem as originally conceived. This type of knowledge refers to the ways in which goals and means have to remain mutually well structured within initially rather new and unusual circumstances. Through *procedural knowledge,* the expert is capable of tackling a specific problem and controlling the actions as part of the systematic approach towards its appropriate solution. Last, but not least, *situational knowledge* enables the expert to relate together a variety of 'symptoms' through which a problem may manifest itself (within a unifying interpretation or meaning), so as to discover what really is going on within a specific problem context. A good example is the medical practitioner who constructs a diagnosis of the illness from which a patient may be suffering.

The same analysis can be applied to the studax (who for simplicity of expression will be treated as being masculine). Declarative knowledge indicates the mental operations involved 'when using his head'. Procedural knowledge suggests what to do in order to succeed in a well defined situation. Strategic knowledge guides the regulation needed to prevent what might otherwise be a negative outcome. Situational knowledge provides an interpretation of experiences while studying, enabling him to 'know' what really is going on at a certain moment. Each knowledge 'component' constitutes a 'separate' topic within educational research, described in terms of cognition, learning process, causal attribution, and experiential learning. It is as if a studax has to become able to integrate the 'contents' of these four different aspects (treated here as sections) in order to organise himself effectively within the chosen study environment.

Problem solving through knowledge organisation

An expert's four knowledge components predicate each other in a well organised way, and that integration constitutes, as we shall see, the quintessence (or 'fifth substantial component') of his expertise. The selection of the correct problem solution is made on the basis of an integration of ways of knowing and actions. Medical practitioners can only proceed on the basis of a valid diagnosis, which enables them to apply their procedural knowledge to the provision of an effective treatment. Should these actions prove ineffective, their strategic knowledge will enable them to adapt their treatment at the right moment and in the right direction. Such effective treatment depends on the existence of available declarative knowledge; they can then readily detect which new observed outcomes may contradict the initial prognosis. Should the 'new' treatment prove successful on the other hand, the appropriate knowledge base can be updated by incorporating that experience.

The same argument holds true for the student who, for example, wants to become a medical doctor. He personally has to integrate the four types of knowledge within 'medicine', as well as within his studying. What do these two types of 'organisation' imply ? They refer to the problems these experts have in making sense of their experiences as well of the substantive problem. Both these implications will now be discussed further.

Two types of understanding

In solving a problem, the expert has to understand the problem as a problem and so become capable of solving it. The first understanding refers to what the problem is about. The second understanding refers to the quest for an effective solution to it. Each understanding implies a specific integration of expert knowledge and action. Before integration can occur, knowledge and action have to be specified within the context of expertise required, as Figure 1 indicates.

'Doing' has to be separated into categories of action and reaction. Within the first category of action, 'doing' implies an intervention, causally invoked by the person on the basis of available skill(s) or competence; the same holds true for mental actions. In both cases the person acts within an internal

Knowing x doing -> understanding : *integrating motivations towards and experiences of*	Knowing : What's going on while ... ?	Knowing : How to (re-)act (up)on ... ?
Doing by acting :	declarative knowledge, proving and gaining mastery and skill *Competence* ***EFF-***	procedural knowledge, exercising effort on and getting control of events *Causality* ***ECT -***
Doing by re-acting :	***IVE-*** *Creativity* interpreting new phenomena on the base of one's situational knowledge and expanding one's knowledge object(s)	***NESS*** *Self regulation* (re)defining one's objectives, strategic knowledge as the product and the producer of stability on task

Figure 1. Understanding as *the motivationally induced integration* of knowing and doing in problem solving.

locus and is, by virtue of self-knowledge of appropriate behaviours, in good control of what is being done. When reacting, this same person has to take into account the 'doing' or 'working' of something or someone else in his environment. This second type of 'doing' reflects a person's sense of stability, resulting from previous actions. A reaction that deflects purposeful action has to be countered before a stable condition can be retrieved, in the sense of maintaining an intended course of purposeful activities.

In this sense, 'knowing' refers to the *"what's going on while ... ?"* as well to the *"how to (re-)act to ..."*, each of which comprises action as well as reaction as types of 'doings'; so the four types of knowledge emerge here. In Figure 1, each of these types finds its place with respect to the other three involved in effective expertise. For the expert, the 'knowing-what' forms of declarative and situational knowledge are interrelated, the one infusing the other. The same holds true for procedural and strategic knowledge within the expert's 'know-how'.

Figure 1 shows how these four components have to be mutually integrated in effective problem solving contexts by means of the two types of understanding involved. Identifying the problem implies an integration of a person's 'doings' into his 'ways of knowing'; only in this way is it possible to 'assimilate' the novel features involved. The effective solution itself reflects the expert's 'accommodation'; his 'knowing' has to activate a new 'doing' which constitutes the second type of understanding – that is the 'transformation' the expert was effective in accomplishing.

The studax has to be equally capable of being effective in studying, and in similar ways. This experience of effectiveness merits further attention. It not only completes the solution of every real problem, it turns out to be such an overwhelming experience psychologically, that real experts, once they have experienced that feeling, are eager to experience it again and again. They may even, through the reward it brings, become psychologically dependent on it.

Expert intrinsic motivation

Every time an expert effectively solves a problem, there is a strong reinforcement of intrinsic motivation for what has been accomplished: the optimal functioning of real expertise is thus psychologically rewarding in itself and needs no extrinsic recompense. The psychological explanation of this phenomenon follows directly from Stipek's (1993) work. She has described four important human motivational subsystems (or typical human needs) that simultaneously find their reward in effective problem solving behaviour, namely experiencing competence (humans want to see themselves as capable); causality (see themselves as the source of their behaviour), creativity (see themselves as being curious and eager to identify and create meaning), and self-regulation (see themselves as defining and realising goals throughout the human life span).

As understanding and intrinsic motivation (constituting the psychological quintessence of problem solving) are interconnected, so each of the four knowledge components is psychologically linked to a specific motivational subsystem. So competence and causality refer via declarative and procedural knowledge to a person's actions, while creativity and self-regulation are sustained on the basis of situational and strategic knowledge. Each of these four components also works bi-directionally, thus promoting knowledge on the basis of 'doing' and (re)action on the basis of 'knowing'.

The simultaneous satisfaction of these four motivational subsystems within an experience of effectiveness creates, *ipso facto*, the 'fifth' experience - the intrinsic motivation which transforms a novice into an expert and a student into a studax. This phenomenon is described by Nuttin (1984) as the 'optimal functioning' of the human being. At the same time, an experience of ineffective performance in a task chosen for oneself is the essential trigger which leads to a search for a fundamental change in one's problem-solving approach.

Optimal functioning: deep level learning

Students psychologically and implicitly define what they want to achieve by entering higher education as *becoming an effective expert in a well defined domain.* 'Studying', indeed, has to be distinguished from the very beginning from 'learning'. By means of 'learning' a student masters only competence (referred to here as declarative knowledge) and this is only one of the four components in the development of expertise. The fact that three components remain undeveloped, or at least underdeveloped, renders such competence ineffective as soon as an occupational or other well-defined societal role requires complete understanding for effective problem-solving. 'Studying' implies a continuous transformation of one's 'doing' into 'knowing' (enabling the 'assimilation' of novelty), and of this new 'knowing' into 'doing' (the necessary 'accommodation' to action) in which all four are involved. A similar argument can be applied to Marton's and Säljö's (1976) phenomenographical distinction between 'deep' from 'surface' approaches to learning. Without a thorough understanding, a student only achieves 'surface level learning' (trying to put declarative knowledge into memory without really understanding it), and that prevents real problem solving from taking place. Only a studax can experience his studying as effective, which necessarily means that it is also intrinsically motivating.

Effectiveness – implying 4×2 *other experiences*

One of the consequences of this analysis of the key concepts involved in expertise relates to the number of 'distinct' experiences that experts may have while problem solving. The analysis suggests the existence of competence (implying a balance between personal ability and environmental difficulty), causality (personal effort and familiarity with the environment in which their work has to be done), creativity (personal interest as confronted with the environmental impact of the problem being tackled), and self-regulation (resulting from the personal values and impersonal obligations involved in the problem's task setting). Exactly the same holds true for the studax. This point has to be stressed here because these experiences constitute the only guidelines that the expert, as well as the studax, are able to utilise in order to 'steer' their behaviour towards the goal that both are striving for, namely the effective, or even more effective, solution of the problem encountered, and the rewarding sense of intrinsic motivation which follows. The same holds true for the way in which their expertise develops.

Studaxology and experiential learning

Expert and studax, of course, learn from their positive as well as negative experiences. The way this learning process proceeds is described by Kolb (1984) in terms of experiential learning. By successively doing, reviewing, learning and applying (i.e. repeating it in a more appropriate way), experts both enlarge and refine their expertise. All essential components of the Kolb model can be recognised within Figure 1. Its two dimensions refer to 'doing' (actively as well as passively) and 'knowing' (concretely as well as abstractly). The four types of knowledge involved (situational, declarative, procedural, and strategic) resemble the learning styles (diverger, assimilator, converger and accommodator) that Kolb identified. This parallelism provides a dynamic within Figure 1.

Components of studaxology

The preceding analysis supports the validity of the concept of expertise with respect to studaxology, seen as the understanding involved in 'becoming in order to be'. So, the four components of studaxology, several types of knowledge, as well as motivated actions, have thus been mutually integrated within the studax's expertise. This will be elaborated within the framework of a 3×3 matrix, in which initially nine study experiences, identified within successive stages in empirical research on students' situational knowledge, 'effectively' find their place. This same matrix functions as the interface, which links a student's situational knowledge to the procedural, strategic and declarative knowledge involved in studying, thus enabling him (in line with Figure 1) to find the 'effectiveness' required, as a studax, to be successful in examinations. Within this elementary 3×3-structure each of studaxology's four main components can now successively be presented with their mutual co-ordination being studaxology's core. Its implications within higher education's everyday reality will be described in a later section.

Situational knowledge: interpreting one's study experiences

Students' situational knowledge refers, according to Figure 1, to the 'knowing' of what's going on while reacting. It refers to students' understanding of their study behaviour. This can be analysed in a theoretical, as well as in an empirical manner; within the theory both have to validate each other. The author's theoretical and empirical approaches will be successively described and compared with the main research outcomes in the work of other researchers in the field.

Up to nine sources of variance within a common frame of reference

Within the theoretical approach one can distinguish the determinants of study behaviour (referring to students' 'doings') as starting points of the process involved, and perceived 'causes' (as the 'knowings') to which the product (expert knowledge), whether subsequently obtained or not, will be attributed. At the start one can, on an *a priori* basis, distinguish three behavioural determinants of the 'production process' that follows: the person of the student, the area of study as the chosen study environment, and the task presented

'Studax's I'	to try : the 'what and why ?' of trying : meaning	to be able (equal) to	to try : the 'how hard ?' of trying : working
PERSON	(personal meaning) INTEREST AS INTENTION TO 'WHOLE-NESS'	(personal ability) SELF CONFIDENCE or ABILITY TO DO THINGS INDEPENDENTLY	(personally working) EXERTION 'TO MOVE' ONE SELF AND OR OBJECTS
TASK (over time)	(meaning of task over time) TIME PERSPECTIVE, AGENDA	(ability on task over time) EFFECTIVENESS INTRINSIC MOTIVATION	(effort on task over time) DISCIPLINE (working in efficient regularity)
ENVIRONMENT	(meaning in the 'landscape') KNOWING ONE'S WAY AROUND, RELEVANCE	(ability as implied in the landscape) FAMILIARITY versus DIFFICULTY	(working implied in the landscape) IMPACT, DEMAND

Figure 2. Studax's 3 × 3 interface: understanding study behaviour as the integration of doing (left column; behavioural determinants) and knowing (top row; attributional categories).

(guiding the continuously evolving interaction between person and environment). The result of this same process will then be linked to the combination of 'to be able to' and 'to try', following the ideas of Heider (1958). Within that theory, two sub-components have to be distinguished: these refer respectively to the 'what and why' of trying (or the meaning of what is being attempted) and the 'how hard' of trying (or the effort expended). Combining the three 'objective', *a priori* determinants (as 'doings') with the three 'subjective' *a posteriori* 'explanations' (as 'knowings'), one obtains Figure 2. The 3 × 3 elements (each reflecting the 'knowing' of a specific 'how-to-do-it') describe as many students' experiences while making their 'way-into' (i.e. the etymological meaning of their study 'method') a well defined stage in higher education. The label of each cell can be easily deduced from its co-ordinates; most of these were already proposed by Heider, although not as the matrix structure presented here.

Within the second column in Figure 2, three aspects of 'meaning' have to be distinguished. Personal meaning stems from intention or individual interest (and, by consequence, curiosity), creating unity and wholeness in the diversity of daily activities while studying. The goal put forward as the 'task to be completed' has its own value meaning in referring to the time perspective or agenda involved in its execution. The third source concerning 'meaning' is located in the environment as it is perceived; indeed, knowing one's 'way-to-go' constitutes a specific behavioural factor of environmental relevance. One immediately sees that a lack of orchestration (Meyer,1991), within the three cells presented, creates serious behavioural difficulties in studying; these can be prevented only by making the right vocational choice.

By analogy within the fourth column in Figure 2, three different kinds of 'effort-while-working' can now be distinguished. Someone's 'personal' effort is labelled as exertion. It reflects the amount of personal energy and time to be spent in order to obtain personal control and grip of what one is studying. The effort required by the task itself takes the shape of discipline; in terms of content, it refers not only to what ought to be done (studying), but also how, in terms of efficiency, that behaviour ought to be managed in order to duly achieve one's goals. Last, but not least, the environment (as the study programme involved) has its own impact on what students are expected to work out; students' experience may vary psychologically from a feeling of well-being to one of distress (the latter reflecting, for instance, high study load). In explaining a behavioural outcome with respect to effort, potential conflicts have to be prevented in advance by means of adequate co-ordination within the assembly of the matrix as a whole.

The third column in Figure 2 contains three separable aspects of experiential behavioural capacity or power. Ability reflects feelings of self confidence in succeeding when one has to demonstrate the skill acquired through some form of training. In the case of studying, one's ability is reflected in the expected outcome of assessment. This ability has to be distinguished from the experience of effectiveness in the process of carrying out the task. In answering someone's global *"How do you do it?"* question, this ideally becomes an unspoken feeling of well being – even happiness – in terms of what one is undertaking. As we have already explained, this (positive) experience creates a feeling of intrinsic motivation – experiencing what one is doing as rewarding in itself. Yet the environment may create a serious difficulty when its nature significantly exceeds a person's ability. That is one of the potential problems students have to guard against in putting together their study programme.

Interpreting this same behaviour in terms of an ongoing process, one immediately recognises the need for the 3×3 specific experiences, as a whole, to be well co-ordinated. This requires a sound subjective theory and this will be described more fully in the next section. For the moment, in referring to the four motivational subsystems involved, one can identify up to four important connections across this 3×3 subjective process matrix, namely competence (ability effectively matching difficulty), causality (exertion linked to perceived relevance), creativity (intention effectively incorporating demand), and internal motivation or self-regulation (time perspective linked to management of effort). These four linkages, which all cross the central cell of the matrix, also have to be well integrated; the corresponding firm 'sense of coherence' (Antonovsky, 1987) creates the key experience of effectiveness.

intention S 9-3 (.65) While studying I link up with what is coming up in other courses. (.60) By thinking imaginatively and actively about what is being said in a course, I work out for myself whether or not I can personally agree with it. (.59) I spontaneously think critically about what I am studying.	**ability** S 9-9 (.37) Once I have completely studied a course, I feel that I really own the subject matter (.31) When I have studied a course, I am well able to remember what was presented in it even after a while. (.30) When I have worked my way through a course, I can be asked any kind of question in the examination .	**exertion** S 9-5 *(.70) While studying a course I cover the details rapidly , because for me only the general ideas are important.* (-.59) During exams I am ready to be questioned about details. (-.56) Even the so called less important points in subject are given my full attention. ...
time perspective, agenda (value) S 9-7 (.64) I find it quite useful to represent subject matter schematically for myself (.37) Before starting learning a topic, I work out thoroughly first of all what the essentials and the incidentals are. (.31) Taking account of the exam to be passed, I figure out the best way to study the course content. ...	**effectiveness** S 9-4 (.77) I feel at home in this field of study. (.64) While studying I have the feeling to be facing in the right direction.(.56) The conviction that this domain of study exactly is what I want helps me to do what is necesssary to succeed at the end of this year. ...	**discipline** (ought) S 9-1 (.79) I start studying in good time. 6 (.78) I study regularly instead of putting my work on a back burner. (.75) In the past months I have developed a good study rhythm. ...
relevance S 9-6 *(.64) During this first year we have to work through lots of boring subject matter; whose relevance I can't see (.58) I doubt the significance of certain courses for my later profession as I see it. (.50) As far as I'm concerned, they could leave out most of the course material from the programme...*	**difficulty** S 9-8 (.37) I understand what I am studying. (.33) I feel I now have the capacity to bring my studying to a successful conclusion (.33) I can easily follow the logical train of thought of lecturers...	**demand** (impact as study load) S9-2 *(.62) However hard I try to do my best, I remain uncertain about my knowledge of the subject matter. (.59) When I have to rehearse large amounts of subject matter, I easily confuse one thing with another. (.58) I have trouble in identifying the main ideas in a course...*

Figure 3. Illustrative items (factor loadings in brackets) for each of the nine factors in the study behaviour questionnaire (n = 90), ordered within the studax's 3 × 3 matrix.

The relationships between the components of studaxology have been anticipated in relation to already existing bodies of theory, but now it is necessary to see to what extent these relationships can be justified empirically.

Freshers describing their studying

At the end of their very first semester in higher education, in the academic year 1990/1991, 1526 students completed a 90 item Likert-type study behaviour questionnaire. This was done so as to provide them, a few weeks later, with feedback intended to help them improve their study behaviour. Exam scores, obtained at the beginning of the semester, provided additional feedback. A nine factor solution, after varimax rotation, is presented in Figure 3 in the shape of nine scales which were contiguously constructed to register inter-individual differences concerning each of the nine psychological constructs anticipated. The number of items per scale vary from 12 to 4 (with a mean value of 7), while Cronbach alphas range from 0.68 to 0.91 (with a mean value of 0.75).

Factor S9-1 reflects a student's study discipline or methodical study approach. High loading items on S9-2 make it clear that students who agree with these statements experience environmental demand as distressing. S9-3 reflects the effect of a firm intention, thus creating personal meaning, and consequently unity and individuality in what is being studied. Effectiveness is mirrored in S9-4 with positively loading items showing signs of intrinsic motivation. S9-5 brings together items which show (a lack of) personal effort in thoroughly controlling what is being studied. High loading items on S9-6 reflect a lack of environmental relevance which, as such, inhibits the presence of objective coherence in what is being tackled. S9-7 reflects differences in time perspective and students' agenda – knowing how important it is (in the long run) to make adequate use of schemata in order to consolidate information in a convenient way. Factors S9-8 and S9-9 reflect only relatively low item loadings. This finding may indicate a state of metacognition which has not, as yet, been sufficiently developed: freshers who after only four months in higher education have not yet had sufficient opportunity to test their competence and so to distinguish environmental 'difficulty ' and personal 'ability' from demand.

Other factor solutions within Likert type questionnaires

It took many years and revisions of instruments before this 3 × 3 matrix structure became visible within factor solutions of study behaviour data. In an initial research project, only three out of four factors could easily be interpreted (as 'interest', 'self-confidence', and 'focused study activity'). Shortly afterwards, a fourth factor could be identified as 'stability', referring to a strength of vocational purpose. This initial quartet, as now understood, resembles the latent psychological meaning of the four study orientations of Entwistle and Ramsden (1983). These were described as *meaning orientation* rooted in interest, *reproducing orientation* (with concomitant lack of self-confidence), *achieving orientation* (based on strategic and well-focused study methods), and a non-academic or *apathetic orientation* (suggesting a lack of vocational purpose).

Gradually the number of well-defined factors expanded as the author's theories developed, and these were built into more complex questionnaires. The rationale for the 3 × 3 matrix structure, as presented here, emerged as soon as a 'seventh' dimension was identified which did not fit within the theory then being used – based on a 2 × 3 matrix scheme. Expansion towards the 3 × 3 structure provided a theoretically valid solution. From then on, the 'task' in the study process was seen as 'steering' an interaction in behaviour, considered as a psychologically essential determinant of (study) behaviour – the interaction between 'person' and 'environment'. That theoretical construction implied the presence of two additional unattributed sources of variance. Their latent meanings having thus being inferred, they could immediately be discerned within already existing nine factor solutions of these same questionnaires, which had hitherto remained uninterpretable and neglected.

In the meantime, parallels with factors found by other researchers in the domain of study behaviour became clear. The congruence between our own (earlier) four factor solutions and the work of Entwistle and Ramsden (1983) has already been mentioned. Three factor solutions resemble Biggs' (1979) SPQ-dimensions; they always contain a competence, meaning or creativity, and study regulation or organising factor (This was, in fact, the triad that our own research initially identified). In the case of five factor solutions, the first four factors are always complemented by 'effectiveness' resulting in intrinsic motivation, and thus completing a quintessence in the manner in which study behaviour is experienced.

When one moves to a nine factor solution, it looks as if each of the first four factors divides into two separate ones. Meanwhile, the first unrotated factor now also becomes psychologically meaningful. This (mostly) bipolar factor can be interpreted as overall effectiveness and, as such, it parallels the phenomenographically identified basic contrast between deep and surface level learning (Marton and Säljö, 1976). It can also be understood in terms of the differing experiences of intrinsic motivation and its absence. Rotated two factor solutions can almost always be interpreted latently in terms of (in)efficiency and (a lack of) persistence, reflecting Heider's (1958) basic attribution of any behavioural outcome to the product of 'to be able' and 'to try'.

From the studaxological perspective, one has to doubt the validity of interpretations of 'separate' factors as 'surface' and 'deep' (approaches to learning); indeed, such an interpretation would allow each construct to have the psychological 'status' of an independent source of variance. This would imply that some students can work simultaneously at a 'deep' as well as a 'surface level'. The reality of these students' study behaviour might more validly be described in studaxological terms as the result of 'inefficient trying', or being extrinsically motivated, and so doomed to failure of understanding.

Having examined the situational knowledge component of studaxology, we now begin the process of considering the application of the studaxological matrix to everyday studying. But, first, we need to make clear how this framework can be interpreted in relation to the three other types of knowledge required by the expert.

In finding an effective solution to a problem, the genuine expert apparently makes use of some type of systematic problem-solving approach. This allows him to align himself motivationally towards the solution he is working towards, while, at the same time, keeping the problem and its solution under personal control. That implies focused activity, in which the expert feels that he will succeed, and which transforms itself spontaneously into that rewarding experience of effectiveness. This in turn results in intrinsic motivation that further sustains him in any additional effort needed.

Students themselves may easily recognise all this when passing an exam is the problem they have to solve. They are trying to find out what to do in order to pass in an efficient way. The study counsellor or the lecturer, on being asked for advice, can refer them to one of the many available study guide books which are supposed to guarantee their readers some success. This is not a bad idea, because it keeps them away from simple 'trial and error' and inappropriate rote learning. Consultants, nevertheless, have to ask themselves, whether this is the most effective way to transform a student into a studax, who by definition is an expert in his own studying. Within the principles of action logic, as described by Polya (1973), a studax will recognise particular heuristics as leading to the best possible solution of the variety of procedural problems that may be encountered. A problem is thus attacked from a thorough analysis of the objectives to be achieved and in terms of the resources available (within the linkages in the matrix of self-regulation and competence respectively). The third step implies a creative integration of the resulting elements into the design of what has to be performed, making use of all the information already available within the creativity linkage. If this plan seems likely to be effective, its implementation can be followed through the exertion and relevance linkages within the matrix. The resulting product – evaluation – is the fifth and last step to be taken and has to meet the objectives put forward. If this does not happen strategic knowledge has to be brought into the picture, as we shall see.

The experience of 'ineffectiveness' needs a valid causal attribution. The systematic application of Polya's five steps allows the studax to specify his problem in such a way that it will become clear what type of study technique is needed when consulting study guides. So the student becomes the independent and autonomous studax, pleased (causality pleasure) to have independently discovered what to do. The studax is, furthermore, able to repeat this experience, when real life requires him to solve a variety of new problems. The message is clear: to be and to remain procedurally effective, the student has to keep his 3×3 matrix (and the 4 linkages within it) internally well organised. Every lack of coherence within it will necessarily be experienced as ineffectiveness.

Strategic knowledge: how to counteract ineffectiveness

If a well designed approach to studying does not 'work' as expected, the studax experiences his ineffectiveness as a real disappointment and so needs to find a valid explanation that will enable him to adjust his study behaviour. The process of causal attribution, as elaborated by Weiner (1986), should begin immediately, as it is important not to wait until the negative outcome is objectively recorded in an examination. When it becomes clear that there is a problem in the behavioural system that requires attention, all the information needed to solve that problem is available within the matrix, but only if the studax remains able appropriately to interpret his matrix of evolving experiences. Within this matrix, the ideas of Polya and Weiner now come into play, each supporting the other. The former systematically counteracts ineffectiveness which, if it occurs, can be explained in terms of at least one out of four dimensions of causal attribution. These explanations coincide with the same four matrix linkages, that previously underpinned the 4+1 essential steps in the systematic approach of problem solving. Using the matrix, the student is able to detect, and redirect in time, what otherwise would lead to serious study and examination problems.

In what has been described so far, an essential prerequisite has not yet been mentioned. The implicit idea is that every student enrolling in higher education will possess a coherent matrix of study behaviour, constituting the essential strategic knowledge that he has to start with. This is hardly likely to be true for most students. Indeed, such coherence will depend on the process of vocational choice which, in turn, can now be seen as dependent on systematic matrix construction. But an explanation of the process of vocational choice and adaptation goes beyond the scope of this paper. As it is here, this brief analysis primarily describes a rather mechanical design of self-regulation. To understand the content of specific causal attributions made by a student, one has to know more about actual experiences within each cell of the matrix, and more about the way its internal coherence is organised. This constitutes, in effect, the student's own subjective theory of studying.

The next step is to describe the declarative knowledge of the studax. By means of his strategic knowledge he, as a matter of fact, continuously tries to improve the 'working' of his intellect. Consequently the process of studying has to be defined for him in such a way that the 'working' of up to 3×3 mental operations becomes intelligible in terms of the ways in which students experience their study behaviour.

Declarative knowledge: the studax's mind at work

Declarative knowledge has now to be fitted into the 3×3 studaxological framework as constructed thus far. It has to enable the studax to understand how his intellect is involved in the psychological process of studying, and how the personal experience of ineffectiveness may, at the same time, reflect a type of 'learning pathology'. If present, such a 'pathology' has to be counteracted as soon as possible by means of a more appropriate study approach. Only a sound causal attribution can produce an intellectually appropriate and timely adjustment, leading to the renewed effectiveness that every studax is eager to experience again. This declarative knowledge of studying, in terms of content, has to describe how understanding, as defined in Figure 1, psychologically integrates 'knowing' and 'doing' in each of the four components involved in the intellectual functioning of experts.

It is best to start at the beginning. The child decides, for example, to *become* an engineer in order to *be* an engineer, *"when I grow up"*. This 'to become in order to be' implies development, not only growth. The 'accretion' of an already existing structure is not enough: the tadpole has to change, and so develop, in order to become a frog. According to Rumelhart & Norman (1978), complex learning involves at least three types of 'restructuring' ('tuning', 'patterned generation of schemata', and 'schema induction'). Within that perspective, studying can be described as the integration of learning and thinking. Taking this idea further, Ausubel's (1963) description of learning implies that three successive stages have to be gone through, while Pask's (1976) analysis of thinking reveals three variants to be mutually involved. The integration of these two perspectives suggests 3×3 intellectual operations in action during studying. When the 'doing' of each of these nine operations can be experienced (and 'known') by their specific effects, as already defined within Figure 2, the four knowledge components of expertise also fall into place and so make the studax effective in studying.

The student as learner

Learning, as defined by Ausubel (1963), comprises the stages of assimilation, transformation, and accommodation within a positive feedback loop, as shown in the left hand column of Figure 4. Since effective studying necessarily involves meaningful learning, assimilation implies a sufficient prior knowledge to provide the learner with an adequate initial grasp of the novelty he is presented with. What is understood already has to find an appropriate place in the new cognitive structure to be further developed by the learner himself. His 'old' structure enables him to reach an initial understanding, but having to achieve a well defined accommodation or expertise, the student has

Accommodation problem solving (=doing) - thoughtless - deliberate	**Producing 'a' solution by a personal synthesis** : - intuitively - consciously	**Solving a problem by reproducing a 'skill ' via** : - fluency of memory - reconstruction	**Producing 'the' solution by a stepwise action** : - spontaneously - cautiously
Transformation - process (changing one's 'mind') - product ('doings' to be achieved)	Combining process and product into **the project to be achieved at the time it is due** : planning and time perspective on task.	**Continuously comparing process and product:** evaluating whether both **effectively** meet task requirements.	Carrying out the study process so that it necessarily 'causes' the product sought for : **student's work discipline**
Assimilation of novelty (=knowing)	Understanding novelty by combining previously 'separate' elements.	Understanding by comparing novelty with what is already known	Understanding by analysing the way(s) novelty is operating
Learning x **Thinking** = the 'core' of studying	by means of the **combination scheme** (constructing)	by means of the **comparison scheme** (equating)	by means of the **cause-effect-scheme** ((explaining the) working)

Figure 4. Studying as the integration of Ausubel's theory of learning and Pask's ideas on thinking, resulting in the 3 × 3 intellectual operations involved within the studax's matrix.

to integrate the new information with all he already has learned previously to ensure that these subsequently will schematically and logically fit together. The really appropriate transformation requires that this change (as the process to be gone through) remains directed towards the resulting product (in terms of being accommodated to it) with old and new knowledge becoming permanently co-ordinated. As soon this transformation is completed, the resulting new mental structure has to become well consolidated in memory, enabling the learner to now complete the understanding or accommodation sought after. The use made of this expertise can be thoughtless as well as deliberate. Having completed his studying in this way, the same accommodation enables the student – by means of its inherent positive feedback loop – to assimilate new and even more difficult materials.

The student as thinker

Meaningful learning implies thinking, especially during the stage of transformation. It is only in that way that the best possible new hierarchic structure or scheme can be developed. This thinking while studying can be specified on the basis of Pask's (1976) findings. Having experimentally confronted students with totally new information, he observed two contrasting learning processes – *holist* and *serialist* – both of which have to be applied alternately in a versatile manner to solve problems effectively. Holist thinking involves bringing together all kinds of information, old and new, within a personal, and sometimes quite idiosyncratic, 'whole'. Serialist thinking proceeds in a cautious, step-by-step, logical manner. If both styles are not alternated appropriately, students develop 'pathologies of learning': globetrotting (not 'finding out' in time how a whole can be reconciled with its constituent parts) and improvidence (not 'seeing' the meaning of what one is elaborating). This implies the existence of a third mode of thinking – *planning and deciding* (Das, Kirby and Jarman,1975) – in order to build up a realistic working knowledge. The three can be reinterpreted as making use of a 'combination scheme' in order to construct something new from separate elements, a 'comparison scheme' in order to identify similarities and differences between elements, and a 'cause-effect scheme' enabling a correct use and/or explanation of what is causing which effect. These three find their place on the bottom of the matrix in Figure 4, making visible what is created by the integration of three stages in learning and three variants in thinking.

The student as studax

The resulting nine operations are brought together within Figure 4 by presenting the stage in the study process as the vertical axis and the type of scheme being used in learning as the horizontal axis. Assimilation of novelty can thus take place in three different ways, making use of these three schemes; and each of them is identifiable within the literature on intelligence (Sternberg,1985). Transformation implies three distinct types of behaviour, which result from the ways process and product can be brought together during that stage. By combining them, the necessary time perspective is provided, which allows a detailed planning and agenda to be produced. By comparing the ongoing process with the intended product, the progress of transformation can be evaluated in terms of its effectiveness. Finally, by applying the cause-effect scheme to both, one can see how the process of studying has to take place in order to result in the required product. In this way, the disciplined thinking to be respected in the transformation can be identified. Where real accommodation enables problem-solving to take place, one now immediately sees the three ways a solution can be produced by the expert; and these three ways turn out to be already well known to cognitive psychologists.

The core of studaxology: demonstrating mastery during finals

The 'effective' fitting together of the four essential components of studaxology into the studax's optimal functioning offers an experiential description of what is involved within the development of the expertise or understanding that the studax needs in order to demonstrate mastery. This matrix consequently

STUDYING : *(What and why I try ...*	STUDYING : *(My being able ...*	STUDYING : *(How hard I try ...*
... being interested in the course and eager to understand it; so creating personal meaning, enlarging the knowledge base and condensing that original diversity of new ideas into a well cohering 'Gestalt' of insights... **(intention)**	...developing the study skills necessary to consolidate course content within memory so that self-confidence grows even as the exams are approaching... **(ability)**	...investing effort and time at the right moment so as to move towards a thorough and systematic problem approach (SPA). Only in this way can the necessary control of the course of study be acquired ... **(exertion)**
... always knowing 'what' 'when' and 'where' to achieve: planning undertaken in line with the vocational decision taken previously, integrating in the meantime all kinds of so called extrinsic study motives... **(time perspective, agenda)**	...permanently monitoring the 4x2 ongoing operations in the 'process' to achieve the 'product' wanted: its effectiveness keeps the studax intrinsically motivated to continue building up the expertise required... **(effectiveness)**	studying regularly and 'skilfully' - as it ought to be done - efficiently completing the 1500 to 1800 'standard' study hours each year, expected of the so called 'norm student' ... **(work discipline)**
... knowing one's way 'around' the chosen study 'landscape'. Easily seeing the use and application of the new material taught, and how to transfer already acquired operational and procedural knowledge... **(relevance vs losing the way)**	... feeling oneself at home in the study landscape, and well able to start the 'intake' of new material without having to memorize it from the very beginning... **(comfort vs difficulty)**	... moving, day after day, through an ever expanding study landscape, taking its impact without feeling overwhelmed and 'lost', keeping up well with the pace of the lecturer ... **demand (ease vs distress)**
by making use of the COMBINATION SCHEME)	*by making use of the COMPARISON SCHEME)*	*by making use of the CAUSE EFFECT SCHEME)*

Figure 5. Studax's description of the 3 × 3 actions to be effectively organized while studying.

has to be thoroughly constructed in the first place to make it function effectively, and then requires careful maintenance to keep it working well. The initial stages of vocational choice and development help to form a workable matrix, but it also needs to be supported through the curriculum and the actions of lecturers. The form such support should take can be deduced studaxologically from that same 3 × 3 matrix, this time describing students' evaluations of lecturing behaviours. Both aspects will be elaborated somewhat further in the next section.

The studax's optimal functioning

Now that the studax's expertise has been acquired, one immediately sees the studaxological correspondence between Figures 2 and 4, regarding structure as well as content. This congruence manifests itself in Figure 5, row by row, column by column and even cell by cell. Person, task and environment, constituting the many determinants of behaviour and experiences involved, now respectively refer to the accommodation of that person, the transformation of the task to be carried out, and the assimilation of what is environmentally presented. The attributions in the column headings of Figure 2 now turn out to result from the working of the equivalent cognitive schemes in Figure 4. Cell by cell operation and experience also imply the presence of each of these components within study behaviour. Intention can only create personal integration due to the intuitive or conscious working of synthesis, and vice versa. Ability is based on reproduction and routine, and facilitates both ways of functioning as it builds self confidence. Each stepwise mental action needs exertion, and the reverse is necessary when an action has to be built up. The result of evaluation has to be effectiveness as soon as the matrix of operations as a whole is functioning according to agenda and discipline. The less effective 'working' of understanding by comparison (for whatever reason) creates difficulty. When the student inefficiently analyses incoming novelty, a demand that is too high arises. Relevance supports the combining of separate elements of novelty, and vice versa.

The matrix as a continuing self-organiser

Within the studaxological framework of the matrix, the perspectives developed so far look exciting. The ways students experience themselves while studying can suggest to them up to nine 'different' ways in which their intellect is working. In the case of ineffectiveness, the studax is now able to apply an adequate strategic knowledge in order to find out for himself how to proceed in order to improve his behaviour in the most convenient way. So, students' optimal functioning comes within reach. Figure 5 summarises the findings within a studaxological description of 'deep level learning' (also representing the studaxological essence of effective studying as an ongoing process). Studaxology is thus able to affect a student's personal understanding of studying in terms of his individual 'integration of knowing and doing' as postulated in Figure 1. Now experience and procedure are combined in a way that allows a conscious regulation of operations (as actions as well as reactions), in order to produce, in a quite systematic way, the effectiveness a studax ultimately is aiming at. Then, one may confidently expect him to be successful in his finals.

Studax's 'dashboard', monitoring his progress

The content of Figure 5 also allows the construction of new Likert-type questionnaires, which should show good nomological validity within this studaxological framework. These instruments offer students relevant feedback while organising their study behaviour into their optimal functioning as a student (i.e. while transforming themselves individually into an authentic studax). Figure 6 shows some perspectives which need further consideration. It presents the mean scale scores within the studaxological matrix of five different clusters of freshers in the beginning of their second semester, who had voluntarily completed an earlier version of a nine factor inventory of study behaviour. These clusters are ordered in Figure 6 on the basis of their

Cluster Labeled as ...	7-6 (N=85) "Imminent failures"	7-3 (N=67) "Bitterly regretting choice..."	7-2 (N=624) "Overburdened"	7-5 (N=627) "Taking things too easily ?"	7-4 (N=209) "Really effective students:studax "
	10 9 10	7 11 8	11 9 10	13 12 8	13 12 11
Matrix scores	10 8 7	12 9 9	15 12 11	16 13 11	16 15 14
	11 9 8	12 11 11	12 9 9	12 11 12	13 10 12
Total score	82 / 180	90 / 180	98 / 180	108 / 180	118 / 180
Mean per matrix	9	10	11	12	13
% in 2nd year	28	47	43	65	74
% retaking 1st yr	16	17	21	14	9
% dropped out	56	36	36	21	17

Figure 6. Five clusters of freshmen's subjective theories as identified at the beginning of their second semester: mean scale scores (out of 20) and study results obtained afterwards.

mean matrix score, from left (9) to right (13 on a 20 point scale). A follow up clearly indicates how their study success is related to their study behaviour. Studaxology can now suggest to these students and their counsellors how to improve their study effectiveness.

Before going into the second topic to be described here, a fundamental comment has to be made on the number of factors one may find within groups of experienced students who are approaching the studaxological ideal. One may expect these students to have already attained good integration within each of the linkages within the studaxological matrix, which necessarily reduces the sources of variance one may identify within their answers on a Likert-type study behaviour questionnaire. This fact may explain the differences in the numbers of factors identified by other researchers in the field. From that same perspective the quintessential items themselves (as reflecting intrinsic motivation) may covary with a specific factor. That would explain why they are not yet frequently identified as a fifth factor. As such, these findings do not undermine studaxology's basic 3 × 3 matrix structure of experiences and the deductions derived from it; subsequent analyses may even confirm it.

Teaching: the facilitation of studying

Research into the ways students evaluate lecturing behaviour (again using a Likert-type questionnaire with items that have high content validity towards lecturing) revealed that students judge their lecturers in line with each of the 3 × 3 dimensions implicit in reporting their own study behaviour, as presented in Figure 3. For them, lecturing has to be defined as the facilitation of each of

supporting intention by **INSPIRING BEHAVIOURS** **L 9-1** (.82) This L(ecturer) is able to arouse my interest in his course. (.76) This L chooses examples and applications in such a way that our interest is maintained. (.74) The way this L teaches keeps me alert during the lessons...	**supporting ability by** **POTENTIATING BEHAVIOURS** **L9-8** (.48) This L informs us about the way we will be examined. (.36) This L makes clear his requirements for the elaboration of the subject matter. (.35) This L alerts us to the errors or wrong interpretations that students sometimes make...	**supporting exertion by** **ACTIVATING BEHAVIOURS** **L9-9** (.41) This L warns us of the difficult parts of the course. (.40) The amount of subject matter per lecture is well balanced. (.35) This L takes into account that we are laymen in the domain...
managing agenda by **MOTIVATING BEHAVIOURS** **L 9-7** (.50) This L has pointedly motivated towards us his choice of subject matter. (.49) This L indicates why he has included a specific topic in his course. (.33) The L has justified his course as a contribution towards my general education in university...	**managing effectiveness by** **COMMUNICATING BEHAVIOURS** **L 9-4** (.55) This L takes notice of our reactions. (.51) When we show that we cannot follow, this L takes that into account. (.51) During his lessons this L urges us to ask questions...	**managing discipline by** **DIRECTING BEHAVOURS** **L 9-5** (.55) This L makes clear the essentials and inessentials of his course. (.54) Through his way of lecturing, I'm able to discover what this L finds important in the subject matter. (.38) This L indicates how we have to elaborate on his material...
helping to see the relevance: **RELATING BEHAVIOURS** **L 9-3** (.76) The L demonstrates the relevance of his course by indicating relationships with other courses or themes in the programme. (.73) The L points out that the subject matter he is teaching has aspects in common with other courses. (.55) This L points to applications by referring to other courses, laboratories, practical experiences...	**helping to overcome difficulty** **ANCHORING BEHAVIOURS** **L 9-2** (.73) This L puts a clear structure in his lessons. (.66) This L tackles problems in the subject matter in a systematic way. (.61) The way the content of these lectures is presented provides insight...	**helping to overcome demand** **EXPLAINING BEHAVIOURS** **L 9-6** *(.54) The L intersperses his lessons with jargon which I can hardly understand. (.48) This L moves too quickly through the subject matters. (.35) During his lectures ,it is difficult for me to keep a track of the subject..*

Figure 7. Illustrative items (factor loadings in brackets) for each of the nine factors in the questionaire on the evaluation of lecturing behaviour, as ordered within the studax's matrix.

the nine experiences of studying, as is demonstrated in Figure 7. The factors were labelled by means of verbs, making clear that these facilitations require specific behaviours to contribute towards the optimisation searched for. These nine constructs show quite good congruence with the content of an equivalent number of factors identified by Marsh and Bailey (1993) within a different socio-cultural setting.

Procedurally relevant feedback

Improving each of these 3×3 experiences by means of goal-directed behaviours of the lecturer should lead to the better functioning of each of the 3 × 3 operations involved in studax's process of studying. So, for each of these nine dimensions of lecturing behaviour, scales were constructed in order to measure how a lecturer functions in the eyes of his students. Mean scores provide relevant external feedback (when studied within the frame of the 3 × 3 process matrix). The items were selected on the basis of their good content validity in the eyes of didactic experts, and the model of good lecturing with which they are familiar.

A new matrix was then constructed which contained nine columns (one for each of the dimensions involved) and as many rows as there are didactic components involved (objectives, entering behaviour, preparation, implementation, product evaluation), as proposed by De Neve and Janssen (1982) on the basis of the five dimensions known at that time (Janssen and De Neve, 1988). All items (and their scores) can be located at the intersection of both the validities they possess. In this way, well known lecturing strategies can be identified which enable lecturers to achieve specific objectives while lecturing. Mean sub-scores per cell indicate which lecturing strategies merit the specific attention of the lecturer evaluated. They enable the lecturer to improve, sometimes even dramatically, the effectiveness of his or her own lecturing behaviour in the group of students concerned.

In line with lecturers' subjective theories

The fact that a shortcoming now can be identified as remediable does not automatically guarantee its improvement (De Neve, 1991); the lecturer himself (most of the time implicitly) decides upon that course of action in line with his own subjective theory of teaching. Most of what is outlined here turns out to be immediately transferable into some type of 'didaxology' – an objective theory of the subjective theories of lecturers. Indeed, one may expect striking parallels to appear as far as situational, procedural, strategic and declarative knowledge of lecturing, and their integration, become elaborated by a didax.

Studaxology: back to the starting point

It is studaxology's 'intention' to be acknowledged as a valid objective theory describing the subjective theory every individual student needs to become and to remain effective in higher education. That subjective theory can be compared, in a way, to the idea of the 'knowledge object' (Entwistle and Marton, 1994) students construct for themselves to prepare themselves effectively for the 'demands' of finals. Only in that way can they demonstrate their understanding by effectively integrating their ways of knowing and their actions. For the moment, it is not clear how best to proceed to achieve that goal. If studaxology is accepted as a relevant theory (or 'way of knowing'), one has to translate its content into actions or 'doing', which would enable a fresher to understand the expertise needed to become effective, and as such intrinsically well-motivated. That translation from description to action remains one of the continuing dilemmas for those seeking to improve the effectiveness of studying.

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