An instructional environment for learning to solve legal cases: PROSA

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Chapter 4

Arranging Instruction

4.1 Introduction

This chapter is about arranging instruction for learning legal case solving. There are two requirements involved in learning to solve a legal case. The first requirement is that the legal case solving process must be carried out correctly. Therefore we examined legal case solving in the Chapters 2 and 3. The second requirement is facilitating the process of learning to solve a legal case, which is the subject of this chapter. In Chapter 2 we discussed the legal case solving task. In Chapter 3 we discussed the content and structure of the legal knowledge involved in performing the task. This resulted in conceptualizations of the legal case solving task and the legal knowledge; insight in what it takes to solve a legal case and where and why difficulties and problems arise. We obtained evidence for our hypothesis that difficulties in legal case solving are first of all caused by insufficient mastery of, or insight in, the subject matter. There was also evidence that methods emerge from problem solving, instead of being the driving force. These findings have major consequences for arranging instruction to facilitate the learning of legal case solving. Instead of presenting an explicit method for legal case solving we want to present an instructional environment that offers guided access to the subject matter content. Therefore we now examine how to arrange the instruction. In designing instruction many decisions have to be made. These design decisions involve topics as the learning goal, how to reach that goal, what the students have to do, how things are explained when things go wrong, how to present the subject matter and the problem situations, how to keep track of what the student is doing (monitoring), how to bridge the gap from the analysis of the mistake to the instruction (the reaction), how to react to what the student is doing, how to communicate with the student etc.
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Although many authors stress the importance of designing instruction on the basis of a theory on learning and instruction (see, for example, Gagné, 1965; Ausubel, 1968; Mettes & Pilot, 1980; Merrill, 1983; Gagné, Briggs & Wager, 1992; Warries & Pieters, 1994), (legal) educational practice often lacks this theoretical foundation. The design resulting from such an unfounded approach is based on ad hoc and intuitive decisions and therefore makes it impossible to account for mistakes and difficulties arising from realizing the design. The same is true for the design of computer assisted instruction or intelligent tutoring systems (see, for example, Romiszowski, 1986; Jonassen, 1988; Jones, 1988; Berkum & de Jong, 1991; Reichgelt, Shadbolt, Paskiewicz, Wood & Wood, 1993; Kamsteeg, 1994; Kuyper, 1998).

Clearly, one of the most important design decisions in the implementation of an Intelligent Tutoring System is the choice of the teaching strategy according to which the system tutors. Unfortunately, most of the work in Intelligent Tutoring Systems has ignored the psychological literature on effective instruction. (Reichgelt et al., 1993, p. 239).

To make and justify decisions we argue that the instructional design decisions should be based on instructional theory, where a proper instructional theory, in turn, should be based on a theory of learning. Adopting global, but related, theories on learning and instruction may offer prescriptions for arranging practical instruction resulting in a coherent and consistent instructional model.

We first describe the general principle that an instructional theory should be based on a theory of learning. This is followed by introducing the selected learning theory and a view on learning problem solving.

We then discuss what approach to take in arranging practical instruction for learning legal case solving. Motivational factors must be taken into account as well, therefore the approach selected to account for the relation between motivational issues and learning and to account for evoking and sustaining motivation within instruction is described as well. The selected prescriptions are then applied to arranging instruction for learning legal case solving resulting in an instructional model for learning to solve legal cases.
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4.2 Arranging Instruction

Ausubel (see, for example, 1967, 1968) is one of the first researchers who connects cognitive psychological theories about learning with prescriptions for teaching.

There is, [...], a very close relationship between knowing how a pupil learns and the manipulable variables influencing learning, on the one hand, and knowing what to do to help him learn better on the other. [...]. It would seem reasonable, therefore, to suppose that the discovery of the most effective methods of teaching would be inherently dependent upon and related to the status of the learning theory. (Ausubel, 1968, p. 11).

Instruction is designed to teach a certain subject and/or skill, however, teaching is not an end in itself. As Ausubel puts it:

By teaching is essentially meant the deliberate manipulation of learning processes by some external agency for the purpose of enhancing learning outcomes (Ausubel, 1967, p. 212).

.....the facilitation of learning is the only proper end of teaching (Ausubel, 1968, p. 12).

In short: teaching should aim at facilitating learning. Although this may seem rather obvious, even a truism, it claims a close relation between a model of learning and an instructional model. A theory of learning as basis and guideline has relevance for the design of the instruction. To understand the learning processes enables the discovery of the most effective methods of manipulating these learning processes. Therefore, to be able to arrange practical instruction on the basis of relations between learning processes and instructional activities it is necessary to select a theoretical framework that describes these relations as explicitly as possible. However, learning theories differ with regard to their view on learning processes, and instructional theories differ with regard to prescriptions on arranging instruction. In designing our instructional model for learning legal case solving we therefore formulated the following criteria for selecting our theoretical basis.
In our opinion our theoretical basis should indicate:

- an explicit description of learning [4.2.1; 4.2.2]
- an explicit description of the relation between learning and instruction [4.2.3]
- an explicit description of how to arrange instruction to enhance and support learning [4.2.4]
- an explicit description of the relation between motivational issues and learning [4.2.5]
- an explicit description of how to arrange conditions in the instruction in such a way that motivational issues are taken into account [4.2.5]

We will now introduce and discuss these items in the order as listed.

4.2.1 Learning

There are two major theoretical approaches to learning. These are behaviorism\(^1\) (see, for example, Watson, 1930; Skinner, 1938) and the cognitive approach\(^2\). Within the cognitive approach the information-processing framework is the dominant paradigm.

It attempts to analyze cognition into a set of steps in which an abstract entity, called information, is processed (Anderson, 1995a, p. 12).

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\(^1\) Behaviorism is entirely concerned with the study of external behavior. The workings of the mind that underlie these behaviors is not studied, all uses of mental constructs in explaining behavior are rejected. See also Chapter 2.

\(^2\) Cognitivism studies the complex mental processes that are stated to play an important role in determining human behavior.
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Two other approaches to learning within the cognitive approach are connectionism\textsuperscript{3} (see, for example, McClelland & Rumelhart, 1986) and the situated cognition approach\textsuperscript{4} (see, for example, Brown, Collins & Duguid, 1989; de Corte, 1996). To summarize:

- behaviorism
- cognitivism
- information processing
  - symbol manipulation theory
- connectionism
- situated cognition

We select the cognitive approach to learning and within this approach we opt for the information processing framework. We do so because this approach offers the most explicit and transparent description of learning and learning processes and explicitly describes the relation between internal processes and external behavior being most important for arranging instruction. The information processing approach sees the mind as a system that constructs and manipulates symbols. Learning is defined as changes in the way information is represented and processed.

Within the framework of cognitive psychology learning is the study of how symbolic representations and processes change and how these changes affect observable actions (Vosniadou, 1996, p. 23).

\textsuperscript{3} Connectionism is set opposite to the symbol manipulation theory dominant within the information processing view. “The symbol manipulation theories explain cognition in terms of abstract symbols ignoring issues of the neural realization of these symbols. (…) connectionism, holds that cognition should be explained in terms of the interactions between connected neural-like elements.” (Anderson, 1995a, p. 17).

\textsuperscript{4} Situated cognition emphasizes the importance of the social environment in explaining human cognition. Researchers in this field argue that there is no need to postulate mental processes because behavior is a direct response to the situation in the environment (Suchman, 1987).
There are basically two areas where changes can occur as a result of learning. One is the change in the representations that underlie human cognitive activity. Learning then involves the acquisition of new knowledge structures and the revision of existing ones. The other area is the changes in the strategies the cognitive system uses to process information. Learning then involves the acquisition of new procedures for processing information and the revision of existing procedures. To summarize the two main areas where changes can occur as a result of learning are:

1. changes in the representations that underlie human cognitive activity. Learning involves the acquisition of new knowledge structures and the revision of existing ones.
2. changes in the strategies the cognitive system uses to process information. Learning involves the acquisition of new procedures for processing information and the revision of existing procedures.

4.2.2 Learning Problem Solving

In Chapter 2 we defined legal case solving as domain specific problem solving. As reviewed in Chapter 2, Newell & Simon (1972) produced an influential framework for understanding human problem solving. The key concepts in this framework are states, goals, operators and search. There seem to be three essential features in problem solving: goal directness, subgoal decomposition and operator application. Problem solving activity is characterized as search for a sequence of operators that will transform the current state into the goal state (Anderson, 1995b). To be able to arrange instruction for learning legal case solving we have to find out in what way people learn to solve problems. How do we become skilled problem solvers? Solving a problem, or as in our case solving a legal case, involves the application of specific domain content to a specific problem to construct a solution. The more we are able to apply this knowledge the better problem solvers we are. In problem solving research a distinction is made between two types of knowledge that play a role in learning to become skilled problem solvers: declarative knowledge and procedural knowledge. Declarative knowledge is the static domain content knowledge, the knowledge about the world.
The application of that knowledge to a specific problem situation, that is the knowledge about how to perform cognitive activities, is referred to as procedural knowledge (see, for example, Anderson 1981, 1982, 1983, 1995a, 1995b; Singley & Anderson, 1989). Procedural knowledge originates in problem solving in which a goal is decomposed into subgoals for which the problem solver possesses operators. Such procedural knowledge is often referred to as skill. Under the name of ACT* theory Anderson describes in a very explicit way what is known about the acquisition of skills and their relationship to declarative knowledge.

To develop expertise in legal case solving, that is to become a skilled case solver, one has to acquire strategies for dealing with complexity. Anderson states that one dimension of learning to cope with the complexity and in turn become a skilled problem solver is the acquisition of better and better strategies for coping with complexity. One way to deal with complexity is to automate more and more of the skill. The parts of the skill that are automated no longer require cognitive involvement so the problem solver can focus on the more problematic aspects of the skill. The major requirement for acquiring these strategies for coping with complexity is practice.

Based on many examples of skill acquisition, for example, Singley & Anderson (1989) studied the beginning stages of acquiring text-editing skills, it is concluded that skill acquisition starts out with a large cognitive component that decreases with practice.

As a skill becomes more practiced, the skill undergoes dramatic changes, including great reductions in its cognitive involvement. (Anderson, 1995b, p. 316).

Fitts (1964) and Anderson (1982) proposed that skills go through three characteristic stages as they develop. Fitts called the first stage the cognitive stage.

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5 The term skill refers to both motor skills (swimming, cycling) and cognitive skills (solving a legal case, solving a geometry proof problem). However, we focus on the development of cognitive skills (or in terms of Gagné intellectual skills).

4.2.2.1 The cognitive stage

In this stage of novel problem solving the problem solver develops a declarative encoding of the skill. This means that she commits to memory a set of facts relevant to the skill. Learners typically rehearse these facts as they first perform the skill (e.g. “Let’s see, interested party is defined in the GALA”). Because the knowledge is still in declarative form the use of the knowledge is very slow, because specific facts have to be retrieved from memory and interpreted to solve the problem at hand.

4.2.2.2 The associative stage

In this stage two essential changes take place. The errors in the initial understanding are detected and eliminated, and the connections between the various elements required for successful performance are strengthened. This results in a successful procedure for performing the skill. Although it does not have to be the case that the declarative representation is replaced by the procedural representation, from now on the procedural representation governs the skilled performance.

4.2.2.3 The autonomous stage

In this stage the procedure developed in the previous stage becomes more and more automated and rapid. The procedure comes to apply more rapidly and more appropriately. Speed and accuracy are the two dimensions of improvement with practice.

4.2.2.4 Developing expertise

Examining the nature of expertise in a variety of fields have brought more insight into the phenomena associated with skill acquisition.
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Since the mid-70s researchers started looking at experts in a large variety of domains (for example, composing, chess, physics, mathematics, computer programming). This resulted in the identification of some of the ways in which problem solving becomes more effective with experience being: proceduralization, tactical learning, strategic learning, problem representation, pattern learning and improving long term memory storage and retrieval. With developing expertise a change occurs in the degree to which subjects rely on declarative knowledge. With practicing problem solving comes the conversion of the declarative knowledge into procedural knowledge being the process of proceduralization (Anderson, 1982). As students practice, for example, legal case solving, components of problems reoccur and they remember the solutions to these components. This is referred to as tactical learning being the process by which one learns specific rules for specific problems (Greeno, 1974). Besides learning these tactics, or sequences of moves to solve subproblems, changes also occur in how to organize a solution to the overall problem. This is referred to as strategic learning (Larkin, 1981). Developing expertise in a domain involves the discovery of those strategies that are optimal for this particular domain. Problem solvers also learn to represent key aspects of problems that enable the application of more effective problem solving procedures (see, for instance, Chi, Feltovich & Glaser, 1981; Lesgold, Rubinson, Feltovich, Glaser, Klopfer & Wang, 1988). De Groot (1946, 1965) first discovered that experts seem to display a special enhanced memory for meaningful problems in their domain of expertise. Experts recognize chunks in problems being patterns of elements that reoccur in problems (Chase & Simon, 1973). Experts’ pattern learning and better memory is part of tactical learning. There is also evidence that expertise involves the ability to remember more patterns as well as larger patterns (Chase & Ericsson, 1982), developing expertise therefore also involves improvement in storage and retrieval of problem information.

4.2.3 Learning and Instruction

We want to arrange instruction for learning legal case solving. The theory on skill acquisition by Anderson presents an elaborate information processing theory of learning problem solving with implications for arranging instruction.
The difference between novice and expert problem solving may indicate a potential learning route from novice to expert. However, novices solve problems in a different way than experts do. A novice can solve a problem, although in a different but more verifiable way than experts do. As is also shown in Chapter 2, novices do not have disposal of domain specific methods, because their knowledge is not structured enough yet to make it available for these domain specific methods. During problem solving a novice learns what knowledge is relevant or not. Skill acquisition as described by Anderson (1982, 1995a, 1995b) states that a novice will go through three different stages of skill acquisition. To become a skilled problem solver it is therefore necessary to present the learner with problems to solve to actually transit through these stages. Therefore the way in which experts solve problems is not the right way to teach novices. However, in what way do we apply these research findings on skill acquisition to instructional practice? We need to relate the learning theory to an instructional theory. Anderson provides us with a very detailed and explicit theory on learning problem solving that is also applied to arranging problem solving instruction (see, for example, Anderson, Farrell & Sauers, 1984). Anderson’s focus is on training the skill by having the student perform parts of the skill that have to be mastered before she may proceed. Mistakes are repaired immediately. However, the instruction arranged on the basis of his theory is restricted to cognitive aspects, whereas arranging instruction also involves affective and organizational aspects. Therefore we turn to theories that incorporate a broader view on instruction. Learning legal case solving involves complex learning processes. The main theories available that describe these more complex learning processes from a cognitivist point of view and relate them to instruction are Ausubel (1967, 1968), Gagné (1965, 1985) and Gal’perin (1978).

In his *Educational Psychology. A Cognitive View* (1968) Ausubel presents his educational psychology involving general principles of facilitating school learning. The applied aspects derived from these principles would in turn constitute a theory of instruction.
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In defining his cognitive structure theory of meaningful verbal learning Ausubel adopts the approach of Gagné (1965\textsuperscript{7}) regarding the distinction among principal kinds of learning. However, the focus of Ausubel’s theory is on the acquisition of domain knowledge, not on learning problem solving.

In his *The Conditions of Learning* Gagné (1965, 1985) also states that the purpose of instruction is to support effective and efficient learning. Gagné (1985) selects the information-processing model of learning.

> The information-processing model of learning and memory is of great significance for the planning and design of instruction in educational programs (Gagné, 1985, p. 69).

This model postulates a number of internal structures and corresponding processes (attending, storage in short-term memory, encoding, storage in long term memory, retrieval, response, and performance), where external events influence the internal processing. According to Gagné learning is largely dependent on events in the environment with which the individual interacts. The change in performance is what leads to the conclusion that learning has occurred.

> ...there are several varieties of performance types that imply different categories of learned capabilities (Gagné, 1985, p. 20).

These varieties of performance may also be differentiated in terms of the conditions of their learning. These conditions under which learning takes place can be observed and described. In searching for and identifying these conditions a distinction is made between the capabilities internal to the learner and the stimulus situation outside the learner. The internal conditions see to the cognitive processing required and the presence of required prerequisite knowledge and skills. The external conditions are the environmental stimuli that support the learners cognitive processing.

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\textsuperscript{7} In the first edition of *The Conditions of Learning* Gagné’s view on learning is largely based on behaviorism. In the later editions however, Gagné embraces the cognitive approach.
The content of external conditions depends on the desired learning outcome and the internal conditions. The learning of each type of new capability starts from a different point of prior learning and is likely also to demand a different external situation. This also indicates an intimate relation between the model of learning and the model of instruction. Gagné describes this relationship as follows.

Instruction may be thought of as the institution and arrangement of the external conditions of learning in ways which will optimally interact with the internal capabilities of the learner so as to bring about a change in these capabilities (Gagné, 1967, p. 295).

Learning outcomes or learned capabilities are varieties of what is learned. Depending on the learning outcome the conditions of learning vary. For learning a specific capability specific learning conditions, both internal and external, are required. Outcomes of learning are considered as performance categories. A learned capability can be observed by a type of performance that implies the learning of a specific capability. From these performances inferences can be made about the learned capabilities which make them possible. Gagné distinguishes five types of human performances that have common characteristics, being:

- verbal information
- intellectual skills
- motor skills
- attitudes
- cognitive strategies

Each category implies that a different kind of capability has been learned. Gagné states that in the end learning is concerned with five different kinds of things you have to know or that you must be able to do (capabilities). These categories of learned capabilities differ in the human performances they make possible and the internal and external conditions favorable for their learning. Different types of information processing are required for each of the learning outcomes, and each learning outcome differs with regard to the external conditions required.
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The conditions of learning [...] are concerned with the external events that support the different types of learned capabilities, as well as the internal events (processes) these external events influence. These conditions provide a basis for the design of effective instruction (Gagné, 1985, p. 70).

When designing instruction both types of conditions should be specified as complete as possible to produce the desired learning outcome(s).

Proper usage of principles of learning to achieve effectiveness of outcomes requires first that the class of learning outcome be identified for any specific learning task that the learner undertakes. Once this is done, steps can be taken to discover what internal conditions are applicable to the learning task, and further to arrange the external conditions so that the expected outcome will be achieved (Gagné, 1985, p. 258).

Knowledge about conditions of learning should therefore be applied to the design of instruction (systematic instructional planning).

Gal’perin (1978) in turn states that learning is the formation of mental actions. Meaning can only be acquired by action. Gal’perin distinguishes three levels of action:

- material action, concrete manipulation of objects
- verbal action, manipulation of words
- mental action, manipulation of mental representations

Effective learning consists of the planned progressive internalization of external action. Therefore instruction should emphasize knowledge of what to do, how to do it and when to do it. Instruction based on the learning theoretical approach of Gal’perin is in essence learning by doing. To thoughtfully execute an action repeatedly is supposed to account for learning. Instructing a new mental action takes place following an orientation stage, a material practice stage, an overt verbal practice stage, a silent verbal practice stage and a mental action stage. Within each of the stages one or more aspects as the level, the extensiveness, the generality and the mastery of the action changes.
The theory of Gagné and the theory of Gal’perin both give global prescriptions for arranging instruction. To be able to arrange practical instruction, more specific prescriptions are necessary, although the global theory may offer something to go by. The theory of Gagné has been extended and refined by Merrill (1983), whereas the theory of Gal’perin has been extended and refined by Mettes & Pilot (1980).

### 4.2.3.1 Component Display Theory

The Component Display Theory (CDT) by Merrill (1983) provides a level of detail for arranging instruction that is lacking in Gagné’s approach. The Component Display Theory (CDT) offers a set of detailed prescriptions for the design of instruction. The CDT, like Gagné’s work, assumes that learned capabilities can be categorized into a limited number of categories.

CDT is founded on the same assumptions as Gagné’s work - namely that there are different categories of outcomes and that these categories require a different procedure for assessing achievement and a different procedure for promoting the capability represented by the category (Merrill, 1983, p. 284).

Gagné attempts to describe the conditions necessary for the acquisition of each outcome category in terms of traditional learning psychology variables and classifies outcomes on one dimension: performance. Merrill (1983) attempts to formulate a more presentation oriented description. Objectives are classified on two dimensions: performance and content.

CDT defines several categories of objectives using a two dimensional classification system with performance level as one dimension and content type as the other dimension. CDT also defines a set of primary and secondary presentation forms. The theory postulates that for each type of objective there is a unique combination of primary and secondary presentation forms that will most effectively promote acquisition of that type of objective (Merrill, 1983, p. 283).

Outcome categories are specified by the two dimensional performance-content classification scheme.
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The CDT assumes that for each performance - content category there is a combination of primary and secondary presentation forms that will result in a more effective, efficient and appealing acquisition than will any other combination of displays. The CDT offers a set of prescriptions that indicates what instructional strategy is most likely to optimize the achievement of the desired outcomes under the specified conditions.

4.2.3.2 Program of actions and methods

The approach of Gal’perin has been the inspiration for developing an instructional method for learning problem solving, the Program of Actions and Methods (PAM)\(^8\). This instructional method is based on a combination of theories of learning being Gal’perin (1978), Landa (1976) and Talyzina (1973).

Mettes & Pilot (1980) have designed instruction for learning to solve physics problems with an application of their instructional method to thermodynamics problem solving. The emphasis is on a systematic way of solving problems by explicitly teaching a domain specific Program of Actions and Methods for problem solving. The goal of the instruction is that a student is able to solve a problem in a systematic way. The information given to student in the process of solving a problem is a list of basic relations and a hierarchical set of domain specific heuristic guidelines named a Program of Actions and Methods. Problem solving steps in PAM are:

- orientation on the problem
- formation of a complete representation of the problem
- formalization of the problem representation
- solving the problem
- evaluation of the solution

In actual instruction the PAM is presented to the student as a Systematic Problem Approach (SPA) worksheet where the problem solving steps are indicated.

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\(^8\) In Dutch: Gewenst Handelings Verloop (GHV).
4.2.3.3 Our preference

With these refinements based on two different global theories on instruction the implications for arranging practical instruction become clearer. Mettes & Pilot (1980) present an instructional model for learning problem solving where the emphasis is upon learning an explicit method. To be able to make a decision about our theoretical framework for arranging instruction we now have to ask ourselves

Does instructing a method help the student learn to solve legal cases?

The research by Mettes & Pilot (1980) indicates that using an explicit method in instruction may support learning. They state that instructing a domain specific problem solving method will facilitate the process of learning to solve these domain specific problems. Using a method for instruction has the advantage that a method is explicit, can be taught and learned and supports progression such that a student improves her problem solving capabilities using the method.

The instructional model proposed by Mettes & Pilot (1980) promotes the use of a method being a fixed set of actions to realize a certain goal. Their findings are that instructing a method helps to learn Thermodynamics problem solving (Mettes & Pilot, 1980).

However, there are a number of reasons why these findings from the domain of physics cannot be generalized to the domain of law, because physics knowledge is not the same as legal knowledge. For one, legal rules do not offer a systematic description of the legal domain; legal norms only present an ideal world. Legal knowledge is inconsistent, and there are hardly any principles and theories to fall back upon.

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9 However, research by Bruner (1973) states that in instruction learning a method for problem solving must only be used for average or poor performing students, but not for good performers.

10 The interpretation of a problem situation in physics may be the same as a legal problem situation (“This is a balloon ...” compared to “This is an administrative authority”). However, the application of rules in physics is totally different than in law. In physics rules are complete descriptions of the world, abstract and predictable, where legal rules are not.
Because there is no theory, exceptions are also not predictable. As we made clear in Chapter 2, to solve a legal problem a great deal of legal knowledge is needed besides a method. Knowledge and method cannot interact on the basis of a good theory, because in the legal domain such a theory is non-existent (or too implicit and controversial). This lack of a theory may be inherent to the legal domain. Instead of instructing the connecting theory both the knowledge and the method have to be instructed.

We do not use the instructional model of Mettes & Pilot to arrange instruction for learning legal case solving, because it is too restricted. The major problem for students in learning to solve legal cases is to acquire a conceptual structure of the legal knowledge (see Chapter 3). Although some systematic guidance may help to prevent the students to ‘jump to conclusions’ and to keep track. As we showed in Chapter 2 and Chapter 3 you must have domain knowledge available to understand the method, its operation and its effects. Using a method, or having a method available, can be useful to prevent jumping to conclusions. Using a method may also result in a proper conceptualization of the problem and the process of solving the problem. However, explicit instruction of a method may result in a lack of understanding, because as we think, a method should flow from the structure of the knowledge. Given the analysis of skill acquisition Anderson (1995a, 1995b) states that in arranging instruction for acquiring a skill the underlying knowledge elements have to be identified and students should be brought to mastery on all these elements. The term used by Anderson (1995a, 1995b) for analyzing the materials into the underlying components, which are the basic facts and rules, is componential analysis.

For arranging instruction on skills, Anderson (1995b) explicitly refers to the instructional approach of Gagné.

[.....] complex skills can be decomposed into a large number of production rules and how the learning of the skills can be analyzed as the learning of the component rules. This approach implies that the key step in teaching a particular skill is a cognitive analysis into the component rules and that a Gagné-like program should be applied to the instruction of these target rules. (Anderson, 1995b, p. 398).

Componential analysis relates to one of the main principles in the theory of Gagné being prerequisite learning.
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We do not adopt the approach by Gal’perin (1978) and Mettes & Pilot (1980), but opt for the approach by Gagné (1965, 1985) refined and extended by Merrill (1983). In our view this approach presents better support for learning legal case solving, because of the prerequisite learning principle, the explicit relation between content and performance in defining a learning outcome and the emphasis on the presentation forms. In this way both the knowledge necessary to be able to solve the legal case, as some systematic guidance in solving a legal case are taken into account in the instructional model. The student will not be presented with an explicit method that she has to learn, but is presented with the task components and task characteristics. She will learn to solve a legal case in a systematic way not by learning the series of steps explicitly, but through actual task performance. She will have to perform the task in an environment that presents her with the basic task components and task characteristics to support systematic legal case solving while at the same time guided access to the subject matter content is offered.

4.2.4 Arranging practical instruction

We decided to arrange practical instruction for learning legal case solving using the instructional approach by Merrill (1983). We set of with describing the performance - content classification scheme and the presentation forms in more detail. This is followed by a description of the relation between the performance - content classification scheme of learning outcomes and the different types of primary and secondary presentation forms.

4.2.4.1 The performance - content classification scheme

Merrill (1983) distinguishes three performance levels and four content levels. The performance levels see to what the student has to do, or what is demanded from the student. The content levels see to what kind of learning should take place. The performance categories are derived on the basis of assumptions about the nature of human memory and learning processes.
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These performance categories are:

1. remember (Gagné: verbal information), requires the student to search memory in order to reproduce or recognize some item of information that was previously stored.
2. use (Gagné: intellectual skill), requires the student to apply some abstraction to a specific case.
3. find (Gagné: cognitive strategy), requires the student to derive or invent a new abstraction.

The content categories are derived on the basis of some assumptions about the nature of subject matter. These content categories are:

1. fact (Gagné: verbal information), arbitrarily associated pieces of information such as a proper name, a date or an event, the name of a place or the symbol used to name particular objects or events.
2. concept (Gagné: concrete concept and defined concept), groups of objects and events, or symbols that share some common characteristics and that are identified by the same name.
3. procedure (Gagné: rule), ordered sequence of steps necessary to accomplish some goal, solve a particular class of problems or produce some product.
4. principle (Gagné: higher order rule), explanations or predictions of why things happen in the world, those cause - effect or correlation relationships that are used to interpret events or circumstances.

<table>
<thead>
<tr>
<th>levels of performance</th>
<th>types of content</th>
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<tbody>
<tr>
<td></td>
<td>fact</td>
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<tr>
<td>remember</td>
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<td>use</td>
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Table 4.1: The Performance - Content Matrix.
The combinations depicted in Table 4.1 are the possible objectives that can be specified (for example, remember fact). Each type of objective requires a unique set of conditions to promote optimal acquisition of the capabilities specified by the objective. Given certain conditions related to a certain objective the student will be able to demonstrate certain behavior. The behavior is an indication of the availability of competence defined by the learning objective.

4.2.4.2 Presentation forms

The CDT postulates that all instructional presentations consist of a sequence of separate displays or presentation forms. Every presentation of instruction can be described as a sequence of these presentation forms. There are four types of presentation forms. The primary presentation forms, the secondary presentation forms, the process displays and the procedural displays. Primary presentation forms are the major vehicles of the instruction. Merrill (1983) postulates that all cognitive subject matter can be represented on two dimensions being the specificity of subject matter and the responsive expectation for the student. To summarize:

- the specificity of subject matter
  - general level, a generality
  - particular level, instances
- the responsive expectation for the student
  - an expository way, which entails merely telling, illustrating or showing the student
  - an inquisitory way, in which the student is expected to respond by completing the statement or applying a generality to a specific case

Secondary presentation forms are those methods that are used to facilitate the students processing of the information or to provide items of interest such as contextual background. These supportive and facilitating methods are related to the particular primary presentation form that is being used.

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11 Facts have no general or abstract representation so there is no use - fact and find - fact cell in the matrix.
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For the most part these secondary presentation forms are elaborations of the primary presentations.
Process displays consist of instructions or directions presented to the student suggesting how she should consciously process the information that is presented (how to think about or how to process information, for example, close your eyes and try to say the generality in your own words). Procedural displays are directions to the student indicating how to operate the equipment being used to present the material (examples: turn the page, turn on the audio recorder).

4.2.4.3 An instructional model

There is a relation between the performance - content classification scheme of learning outcomes and the different types of primary and secondary presentation forms. The CDT assumes that for each performance - content category there is a combination of primary and secondary presentation forms that will result in more effective, efficient and appealing acquisition than will any other combination of displays. Relating the performance - content classification scheme of learning outcomes with the different types of primary and secondary presentation forms represents a model of instruction. Merrill (1983) also describes a set of propositions concerned with consistency.

• the consistency between the performance classification and the primary presentation forms used to present this information. The consistency hypothesis is based on Gagné’s (1965, 1985) assumption that there are different kinds of outcomes and that each of these different kinds of outcomes requires a different set of conditions to promote its acquisition.

• the consistency between the content classification and the primary presentation forms used to present this information. The characteristic of the presentation forms should differ from one content type to another.

• the consistency between the primary presentation forms and the secondary presentation forms that should be added to the primary presentation forms. Even when a presentation is consistent there are still additional strategy considerations that will result in improved performance. The addition of secondary presentation forms increases the probability of an increment in the students’ performance.
4.2.5 Motivation and Learning

The information-processing model of learning and memory describes internal structures and corresponding processes that they carry out\(^\text{12}\). During the course of an act of learning a number of different processes are at work. These processes can be analyzed into phases. Gagné recognizes motivation as an important stage in learning being the first phase of learning in this model. However, Gagné does not offer an explicit description of motivation. The role of motivation in learning remains somewhat undistinguished and shallow. In the approach of Merrill (1983) knowledge about the motivational design of instruction is not systematically integrated either.

4.2.5.1 The ARCS model

Keller & Suzuki (1988) developed the ARCS model. This model is based on the model of learning and instruction of Gagné (1965, 1985). The research by Keller & Suzuki (1988) incorporates motivational issues into Gagné’s approach. They state that motivation can influence both the quantity and the quality of learning. Therefore attention should be paid to implementing motivation in the design of instruction for supporting learning. They describe a systematic approach to designing motivational aspects of instructional computer programs to make the instruction appealing, efficient and instructionally effective. The ARCS model postulates that there are four factors in the motivation to learn. These four factors are:

**A** attention: arouse and sustain curiosity and attention.  
**R** relevance: connect instruction to important needs and motives.  
**C** confidence: develop confidence in success, generate positive expectancies.  
**S** satisfaction: manage reinforcement.

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\(^{12}\) Motivation always played a major role within behaviorist theories (reinforcement). However, in the cognitive approach motivation for a long time disappeared from sight. The relation between cognition and motivation was taken up again within the field of psychonomics at the end of the eighties (Frijda, 1986).
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External events influence internal processing and can have the effect of promoting or hindering learning. The arrangement of external events (instruction) in an appropriate way supports the operation of internal processes. How to arrange conditions in the instruction in such a way that motivational issues are taken into account? The task for the instructional designer with regard to motivation is to identify the available motives of students and to channel these motives into activities that accomplish the objectives. The instructional designer has to identify the motives of students and should use these motives. Gagné distinguishes three types of motivation: incentive motivation, task motivation and achievement motivation. Keller & Suzuki (1988) describe a systematic approach to designing motivational aspects of instructional computer programs. The model, the ARCS model, specifies attention, relevance, confidence and satisfaction as the major factors in motivation.

Attention is directed to salient elements of the learning task or the performance conditions.
The motivational concern is with getting and sustaining attention. Things that are novel, surprising, incongruous and uncertain raise attention.
Perceiving the relevance of the instruction is an important factor in motivating the student. The student is likely to wonder why she should study the presented material, how this relates to her interests or goals. The relevance of the instruction should be established.
The student has to believe that there is an acceptable probability of success. The challenge should be within acceptable boundaries.
The students' confidence should be build or maintained. To master new skills and knowledge the student needs freedom to make mistakes without embarrassments. Features in instruction that promote feelings of personal control over outcomes will help develop confidence and persistence. It is also important to provide students with options to choose from and have them consider the consequences of each choice.
If outcomes of learners efforts are consistent with their expectations and if they feel good about the outcomes they are likely to remain motivated. Factors that influence satisfaction are, for example, reinforcement, feedback and intrinsic rewards. Satisfying consequences should be provided.
4.3  Our Instructional Model for Learning Legal Case Solving

In this paragraph we describe our instructional model. This model is the outcome of the application of the theory on learning and instruction by Gagné (1965, 1985), with a specification of learning problem solving by Anderson (1982, 1995a, 1995b), prescriptions for arranging practical instruction by Merrill (1983) and extended with the ARCS model by Keller & Suzuki (1988) for arranging motivating instruction. We adopted global, but related, theories on learning and instruction that offered prescriptions for arranging practical instruction for effectively learning to solve legal cases. The application of these prescriptions should result in a coherent and consistent instructional model for learning legal case solving. We want the students to become skilled legal case solvers. The theories we adopted state that in this case it is important to offer the opportunity to practice the skill to be acquired (Anderson, 1982, 1995a, 1995b; Gagné, 1965, 1985). Our instructional model therefore presents the student the possibility to practice legal case solving. The (cognitive or intellectual) skill to be acquired is legal case solving, and to acquire the skill the student has to practice legal case solving. The learning outcome is specified by the two dimensional performance - content classification scheme (Merrill, 1983).

<table>
<thead>
<tr>
<th>Performance</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>fact</td>
<td>concept</td>
</tr>
<tr>
<td>remember</td>
<td></td>
</tr>
<tr>
<td>use</td>
<td></td>
</tr>
<tr>
<td>find</td>
<td></td>
</tr>
</tbody>
</table>

Table 4.2: Learning outcome.
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The performance category defines what a student has to do. In our case we want the student to apply some abstraction to a specific case, being the performance category use. The content level sees to what kind of learning should take place. We want the student to solve a legal case, that is, to construct a legal solution. This involves proceduralization, tactic learning, strategic learning, problem representation and pattern learning. The content category procedure is related to solving a particular class of problems.

Having categorized the learning outcome, the next is to find the related instructional presentations. These instructional presentations are the forms used to present the subject matter in such a way that learning is facilitated. A major distinction is made between primary presentation forms and secondary presentation forms. The primary presentation forms represent the subject matter on two dimensions: specificity of subject matter and responsive expectation for the student. For learning to solve legal cases the subject matter is represented using a particular level being specific legal cases. The responsive expectation for the student is an inquisitory way, that is, she has to apply a generality to the specific case presented. The secondary presentation forms are the supportive and facilitating methods related to the particular primary presentation forms being used. In our case these secondary presentation forms are elaborations of the primary presentations (prerequisites) and feedback.

<table>
<thead>
<tr>
<th>Specificity of subject matter</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>generality</td>
<td>instance</td>
</tr>
<tr>
<td>Responsive expectation</td>
<td></td>
</tr>
<tr>
<td>expository</td>
<td></td>
</tr>
<tr>
<td>inquisitory</td>
<td>X</td>
</tr>
</tbody>
</table>

Table 4.3: Presentation forms.
The strategies for gaining and maintaining attention, relevance, confidence and satisfaction (the ARCS model by Keller & Suzuki, 1988) are incorporated into both types of presentation forms. Attention is gained and maintained by presenting different problems to solve. Relevance is gained and maintained by presenting goals for accomplishment, where students can choose among goals of varying difficulty level and by providing feedback on performance. Confidence is gained and maintained by providing personal control, providing challenge levels and providing practice with feedback. Satisfaction is gained and maintained by using meaningful exercises and using positive feedback.

![Figure 4.1: Instructional model](image)

### 4.4 Conclusion

In designing and implementing instruction for training legal case solving to improve students legal case solving performance requires both a task to perform and the facilitation of the learning process. The first issue requires that the legal case solving task must be carried out correctly. Therefore we examined both the task of legal case solving and the content and structure of the legal knowledge involved in solving a legal case.
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Our findings that difficulties in legal case solving are first of all caused by insufficient mastery of, or insight in, the subject matter and that methods emerge from problem solving rather than being the driving force have major consequences for the second issue the facilitation of learning. Instead of instructing an explicit method for legal case solving we state that presenting the student guided access to the subject matter may be more beneficial. However, this still leaves us with the problem of arranging practical instruction. We took a top down approach to define our instructional model for learning to solve legal cases. A theory of learning is the basis for a theory on instruction, where a theory on instruction is the basis for an instructional model. Such a principled approach results in a coherent and consistent instructional model. Our instructional model reflects the learning outcome specified and distinguishes between instructional presentations and the supportive presentations.

We now have determined the basic requirements for the instructional environment for learning legal case solving. We will realize our instructional environment as a coaching system. However, before we discuss the design and implementation of our instructional environment we describe the characteristics of coaching systems and we review a selection of legal coaching systems to be able to refine and justify our decisions made so far in the next chapter (Chapter 5).