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PROSA an instructional environment for learning legal case solving

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Abstract

The computer program PROSA is an instructional environment for learning legal case solving. PROSA stands for PROblem Situations in Administrative law. PROSA enables the student to engage in legal case solving while supporting, guiding and evaluating the student on both the method of legal case solving and the knowledge of the specific legal domain. In this paper the design of the instructional model based on theories on learning and instruction is described. This is followed by a description of the application of the instructional model in the computer program PROSA.

Keywords instructional design, computer assisted instruction, legal case solving instruction

Introduction

In legal education legal case solving is a basic means of teaching law students both the law and legal problem solving. Many authors stress the importance of legal case solving in legal education (see, for instance, Crombag & Tuyll van Serooskerken van, 1970; Crombag, Wijkerslooth de & Tuyll van Serooskerken van, 1971; Gunsteren van, 1974; Scholten, 1974; Franken, 1979; Abas, 1985b; Bos, 1986; Teich, 1986; Fernhout, Otto, Span & Rijthoven van, 1988; Henket & Hoven van den, 1990; Algra, Berge ten & Sleurink, 1991; Tunkel, 1992; Wessels, 1992).

> Solving legal cases is a central skill of legal practitioners, training students in solving legal cases is a main task for legal education (Crombag *et al.*, 1971, p. 1).

> One of the most important activities of legal practitioners or jurists is solving problems, or legal cases. The law study in which this skill is not dealt with fails. Exactly at the beginning of the studies it is important that students are confronted with this aspect of the activities of legal practitioners. Later during the studies the student may benefit from the fact that she has learned to solve a legal problem taking a systematic approach (Abas, 1985b, p.6, 7).

However, both teachers and students experience difficulties with legal case solving. Teachers have difficulties teaching legal case solving and students have difficulties learning to solve legal cases. According to many authors (see, for instance, Crombag & Tuyll van Serooskerken van, 1970; Crombag, Wijkerslooth de & Tuyll van Serooskerken van, 1972; Abas, Broekers-Knol, Hasselt-Pino van & Loenhoud-de Wolf van, 1985a; Abas, 1985b; Crombag, Wijkerslooth de & Cohen, 1977; Henket & Hoven van den, 1990; Tunkel, 1992) the main reason for these difficulties is the lack of systematic instruction.

Tunkel (1992) describes it as follows.

> If you ask experienced practitioners how they learned to tackle legal problems and to find the appropriate law, the chances are they will say 'trial and error', 'hit and miss', 'jumping in at the deep end', or similar vague expressions. The probability is that they never actually 'learned' it at all, in the sense of being taught. (............) very few law students get much systematic instruction or testing in the ability to use the daily, routine, apparatus of the law; and in the technique of problem solving (Tunkel, 1992, introduction).

These observations demand the design of systematic instruction for supporting the learning of legal case solving. Therefor a principled approach for designing instruction to support the learning of legal case solving is suggested. Such a principled approach may result in a coherent and consistent instructional model. Choices made in the instructional design process are well founded and difficulties and mistakes can be accounted for (Warries & Pieters, 1994). Criteria were formulated to be able to select a theoretical basis for the design of the instructional model. The first criterion reads that an instructional model should be based on an explicit description of learning. The learning theoretical approach that has been selected is described first. This is followed by the description of the approach selected to account for the relation between learning and instruction. Then the approach that accounts for arranging the actual instruction is described. Motivational factors must be taken into account as well, therefor 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. The theoretical approaches described are applied to the design of the instructional computer program PROSA for supporting the learning of legal case solving. To become an experienced legal case solver the student should be able to practice legal case solving over and over again. During practicing legal case solving the student should be able to ask for immediate support and to be able to receive immediate feedback. The ideal situation is that a teacher is available for every student, monitoring the student during practicing and providing support where necessary. However, this being not feasible, the second best situation is to offer the student computer assisted support. Projects in computer assisted legal instruction on legal case solving are, for instance, Fernhout**,** Cohen, Crombag, Pinckaers & Temme (1987), Fernhout, Otto, Span, Rijthoven van (1988), Temme & Willigenburg van (1988) and Span (1992). A project in computer assisted instruction on case based argumentation is that of Aleven (1997). The main difference between these projects and PROSA is that in PROSA the design of computer assisted instruction for legal case solving is regarded as mainly instructional design. A principled design approach is described in detail. A computer program as the instructional environment should meet the requirements of individualized instruction and practice, immediate support and feedback, adaptivity, interactivity and information management support.

Learning theoretical background

Instruction is designed to teach, however, teaching is not an end in itself. As Ausubel (1969) puts it

> .....the facilitation of learning is the only proper end of teaching (Ausubel, 1969, p. 212).

There are two major theoretical approaches to learning. These are behaviorism (see, for example, Watson, 1930; Skinner, 1938) and the cognitive approach. Behaviorism is entirely concerned with the study of external behavior. The workings of the mind that underly these behaviors are not studied, all uses of mental constructs in explaining behavior are rejected. Cognitivism studies the complex mental processes that are stated to play an important role in determining human behavior. There are three approaches to learning within the cognitive approach.

These approaches are connectionism (see, for example, McClelland & Rumelhart, 1986), the situated cognition approach (see, for example, Brown, Collins & Duguid, 1989; De Corte, 1996) and the information processing approach. Connectionism is set opposite to the symbol manipulation theories 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, 1995, p. 17).

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). 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, 1995, p. 12).

The cognitive approach, more specific the information processing framework, has been chosen as the approach to learning. 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. There are basically two areas where changes can occur as a result of learning. One area is the changes 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 (Vosniadou, 1996).

Learning and instruction

Gagné (1985) selects the information processing model of learning and links his instructional approach to it.

> 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).

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). Gagné distinguishes five types of learned capabilities: verbal information, intellectual skills, motor skills, attitudes and cognitive strategies. These categories of learned capabilities differ in the human performances they make possible and the internal and external conditions favorable for their learning. 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. The content of external conditions depends on the desired learning outcome and the internal conditions.

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).

The first question to address now is "What is it you want the students to know or be able to do?". The initial step to take when an instructional plan for learning is made is to conduct a learning analysis or learning task analysis of the particular learning outcome expected (Gagné, 1985). The purpose of the learning task analysis is to make a detailed specification of what must be learned. The learning task analysis results in the identification of prerequisites and the identification of the critical external conditions. The learning task analysis for legal case solving was carried out in the following way. An analysis of theories and models of legal case solving described in literature on (a) human legal case solving (see, for instance, Polak, 1953; Wiarda, 1963; Cardozo, 1967; Esser, 1970; Crombag *et al.*, 1971; Crombag *et al.*, 1972; Scholten, (1931) 1974; Giltay Veth, 1974; Crombag *et al.*, 1977; MacCormick, 1978; Gijssels & Hoecke van, 1982; Golding, 1984; Abas *et al.*, 1985a; Wessels, 1985; Franken, 1987; Pontier, 1988; Fernhout *et al.*, 1988; Henket & Hoven van den, 1990; Jue, 1990; Lange de, 1991; Franken, 1991; Bruggink, 1992) and (b) artificial legal case solving (see, for instance, Gardner, 1987; Ashley, 1990; Gordon, 1993; Prakken, 1993; Valente, 1995; Haan den, 1996) was carried out. To study the differences between expert and novice (or expert beginners) legal case solving capabilities data were gathered in an empirical study in which legal experts and law students were asked to solve legal cases while thinking aloud. A detailed task description of an activity does not tell us all we need to know about how to arrange optimal conditions for learning. The task must be categorized as a learning outcome in one of the five categories. This classification is necessary in order to plan the internal and external conditions of learning differentially for each type of learning. The learning outcome must be inferred from the kind of mental processing required and the external events to be used to activate and to support internal processes of learning. Some of the external conditions for effective learning are common to all kinds of expected learning outcomes, for example, external provisions made to stimulate the learners attention. Others differ within the learning outcome expected, for example, stimulating the recall of prerequisites and providing learning guidance. Stimulating recall is common to all kinds of learning outcomes, however, the nature of what must be retrieved from memory differs. Differences in encoding most clearly distinguish the five kinds of learned capabilities. Learning to solve legal cases is learning to solve domain specific problems.

> Problem solving, or discovery is only the final step in a sequence of learning that extends back through the many prerequisite learnings that must have preceded it. To be successful problem solving must be based on the prior attainment and recall of the rules that are combined in the achievement of the solution, the higher order rule. Problem solving involves the combining of previously learned rules into a new higher order rule. Problem solving occurs when the instructions provided to the learner do not include a verbally stated "solution", but require the construction of such a solution "on one own" (Gagné, 1985, p. 164).

Learning to solve legal cases is learning to solve a specific kind of problems using specific knowledge in a specific way to arrive at a specific correct solution. To be capable of solving a legal case, students have to select and use a certain number of rules in a sequence that will make it possible to arrive at a correct solution. In practicing legal case solving students learn the rules applicable to those problems and they learn general ways of accomplishing problem solving, they learn to exercise control over their own thought processes. This incorporates learning how to seek relevant features in the problem situation and how to keep track of the problem solving process. There are two primary sources of human capability that can contribute to problem solving being intellectual skills, concepts and rules that form the fundamental structure of the individuals competence, and cognitive strategies. A student has learned to solve legal cases when she is capable of identifying concepts, classifying concepts, combining concepts and combining rules. To be able to infer that a student has all these capabilities, that is has learned how to solve legal cases, it is necessary to ask the student to demonstrate these capabilities. However, problem solving is not only simply a matter of applying previously learned rules.

In the process of solving problems the student also learns higher order rules and ways of solving problems in general, cognitive strategies governing the individuals own thinking processes. The function of cognitive strategies is to determine or choose a particular kind of information processing for accomplishing particular kinds of learning tasks. Cognitive strategies are internal processes of executive control. Internally directed skills with which learners regulate or modulate their internal processes of attending and selective perception, coding for long term storage and retrieval from memory (Gagné, 1985).

The instructional model

Gagné (1985) attempts to describe the conditions necessary for the acquisition of each outcome category in terms of traditional learning psychology variables. Merrill (1983) presents a refinement of the theory of Gagné in his Component Display theory (CDT).

> CDT is founded on the same assumptions as Gagnés 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 (1985) classifies outcomes on one dimension: performance. Merrill (1983) attempts to formulate a more presentation oriented description. The CDT classifies objectives 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 combinations of primary and secondary presentation forms that will most effectively promote acquisition of that type of objective (Merrill, 1983, p. 283).

The primary presentation forms are the vehicles of instruction. All subject matter can be represented on two dimensions: level of specificity and level of responsive expectation for the student. On the level of specificity dimension, subject matter content is presented at a general level (generality) or at a particular level (instances).

On the level of responsive expectations for the student the subject matter is either presented by telling, illustrating or showing it to the student, or the subject matter content is presented in such a way that the student needs to respond by completing a statement or applying a given generality to a specific case. The secondary presentation forms can be characterized as elaborations of the primary presentation forms. Secondary presentation forms support and facilitate the students processing of information. 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.

Relating the performance - content classification scheme with the different types of primary and secondary presentation forms and applying consistency and adequacy rules results in an instructional model for learning legal case solving. For law students to learn how to solve legal cases the instructional model takes the form of practicing legal case solving.

Motivational aspects in learning and instruction

Gagné (1985) 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. Theories on motivation based on the information processing model of learning and memory (see, for instance, Lepper, 1983, Lepper & Malone, 1987, Keller & Suzuki, 1988; Pintrich & Schunk, 1996) see motivational processes from a cognitive perspective. Motivation is defined as the process whereby goal-directed behavior is instigated and sustained. Motivation, as with learning, is not observed directly, but inferred from verbalizations, task choices, effort expenditure and persistence. Motivation can be extrinsic or intrinsic. When people are intrinsically motivated they engage in an activity as an end in itself. Intrinsic reasons for working on the task are internal to the task. The reward comes from working on the task. The task is both the means and the end. Rewards for intrinsic motivation may be feelings of competence and control, self-satisfaction, task success and pride in ones work. Intrinsic motivation is to engage in an activity for its own sake, work on a task because the task is enjoyable, task participation is its own reward, does not depend on external constraints or explicit rewards. Extrinsic motivation involves an activity for reasons external to the task. The activity is means to some end (an object, a grade, feedback or praise, or being able to engage in an other activity). Motivation plays an important role in learning in the sense that a motivated student engages in activities that facilitate learning, activities such as attending, rehearsing, relating information to previously acquired knowledge, and asking questions. Keller & Suzuki (1988) describe a systematic approach to designing motivational aspects of instructional computer programs to make the instruction appealing, efficient and instructionally effective. The model they developed is called the ARCS model, this model is based on the model of learning and instruction of Gagné (1985). The ARCS model (a) postulates that there are four factors in the motivation to learn (b) includes subcategories of motivational characteristics (issues) (c) includes examples of motivational strategies (d) is used in conjunction with a systematic instructional design process. The four factors of the ARCS model are (1) attention: arouse and sustain curiosity and attention (2) relevance: connect instruction to important needs and motives (3) confidence: develop confidence in success and generate positive expectancies (4) satisfaction: manage reinforcement. The issues to consider in relation with the nature of motivation, the conditions that influence it and its influence on learning and performance are (1) the specification of motivational objectives. What kind or type of motivational effect is desired. Types of motivational effects that are distinguished are a general affective reaction, improved learning performance, increased persistence, more consistent levels of persistence, improved confidence, increase in perceived relevance, the level of excitement, voluntary engagement in the task (continuing motivation). (2) entry characteristics of the audience. (3) motivation effects in strategy selection. The motivation to learn is enhanced by features that relate directly to the instructional content and the methods of teaching. Keller & Suzuki (1988) describe a set of motivational strategies to enhance and maintain motivation in an instructional setting. In the instructional setting for supporting the learning of legal case solving the motivational aspects described by Keller & Suzuki (1988) were applied. Some of these aspects in the instructional environment are (1) information seeking behavior is stimulated by presenting a problem to solve. (2) the instructional environment has a recognizable structure. (3) the instructional environment uses the students' name, keeps an individual record and refers back to the individual students' history. (4) the instructional environment provides statements and examples that present objectives and utility of the instruction. by clearly presenting the objective and overall structure of the lesson, by explaining the evaluative criteria, by providing opportunities for practice with feedback, by mentioning prerequisite knowledge, skills or attitudes that will help the student succeed at the task. (5) evaluation and feedback methods are used that provide feedback on performance. (6) personal control over program features is offered. (7) the instructional environment provides opportunities for the student to use newly acquired knowledge and skill in a meaningful way by using an instructional setting that requires the application of previously learned skills. (8) the instructional environment uses positive motivational feedback. Feedback is provided after a series of responses in practice exercises. (9) the instructional environment maintains consistent standards and consequences for task accomplishment, expectations are clearly stated at the beginning of the learning activity by formally stating the objectives and using an informal description of what the student can be expected to achieve.

PROSA

The instructional model has been applied to the construction of a computer program as the instructional environment. At the primary presentation level in PROSA (the upper part of the screen, the first layer) the stimulus materials are presented to elicit the required performance. These materials are the legal cases, the legal rules (the tools for problem solving) and the question related to the legal case that sets the problem solving goal. The learning hierarchy, being the ordered set of rules and concepts the student needs to learn in order to achieve an understanding of the topic to be acquired is combined with an ordered set of cases as instances for demonstrating the necessary capabilities to be able to infer that learning has occurred. The secondary presentation level in PROSA (the lower part of the screen, the second layer) provides learner guidance and feedback related to the legal case, the legal rules and the legal solution construction.

A legal case solving session in PROSA

To understand the way in which PROSA supports the student, a legal case solving session with PROSA is described in more detail. In PROSA the student has to carry out a series of activities to solve the legal case. The student has to use the output of the activities to construct the legal solution. There is one series of activities that is classified as the most recommended route, there is some variation possible in the sequence of activities, these routes are classified as possible routes. Variations of activities that are not desired are not possible in PROSA. This description of a session in PROSA is based on the most recommended route. When running PROSA the first screen is the startup screen. Here the student can select from three options (1) an explanation of how to work with PROSA (help), (2) working with PROSA (start) or finish working with PROSA (stop).

When starting to work with PROSA the student is confronted with the standard PROSA screen (see figure 1) in which there are two layers, the first layer and the second layer, and three parts within each layer, the legal case part, the construct legal solution part and the legal rules part.

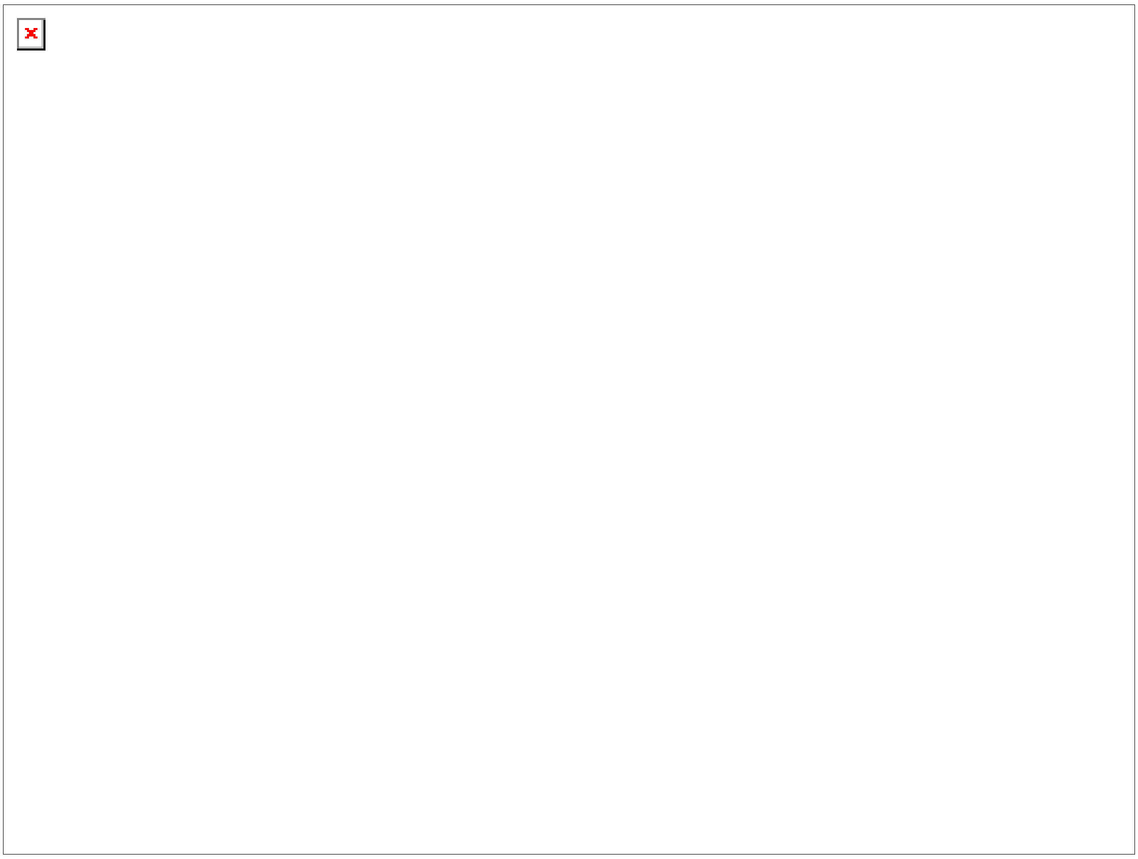

figure 1: the instructional environment PROSA

First layer

The first thing to do is to select a legal case from the set of available legal cases using the menu button legal case. The legal cases in PROSA are arranged on the basis of their topic, and within each topic the legal cases are arranged on the basis of level of difficulty. The selected legal case is presented in the upper layer in the legal case part of the screen. At the same time the question that belongs to the case is presented in the upper layer in the legal solution part of the screen. The selection of a legal case is an activity for the student to carry out, however, in situations that a student keeps on selecting legal cases from topics and difficulty levels she already masters or in *situations she keeps on selecting legal cases from topics and difficulty levels that are to far fetched, the system will advice a certain legal case for the student to select.*

The second thing for the student to do is to select the menu button process in the upper layer in the construct legal solution part of the screen. The menu button process shows two activities that can be chosen: select and match. At this point in the process the student has to choose the select option, because after being presented with a legal case the next thing to do is to select either a legal rule or a fact from the legal case. After choosing the select button option a change occurs in the construct legal solution screen. A distinction is made between selecting a legal rule from the set of available legal rules and selecting a fact from the legal case. There also appears a specific part in the construct legal solution screen that is titled legal solution.

Now the student has to select a legal rule by choosing the legal rules button in the upper layer in the legal rules part of the screen. This button shows three different source categories of legal rules: statutes, other regulations and precedents. Within the statute option a further classification of statutes is made based on the area of law the statutes belong to. The student selects the option statutes from the legal rules button and then selects the statute that is applicable given the specific legal case and question to be answered. The selected statute is presented in the legal rules part of the screen. Then the student has to select an applicable article. This article has to be copied to the construct legal solution part of the screen, in the specific sub part select rules. The student can copy this article to the legal solution as well. The next thing the student has to do is to select an article component followed by the selection of a fact from the legal case that can be related to the article component. The student then has to choose the menu button process and choose the option match to relate the article component with the selected fact from the legal case. This relation is copied to the legal solution. The select activity has to be repeated until there are no statutes, articles, article components and facts left. The match activity has to be repeated until there are no more article components or facts. At that stage the student has to formulate the final answer to the question. She has to select the menu button product and choose the option formulate answer. The product button that is available in the upper layer construct legal solution part of the screen offers edit facilities as well. Options within this product button are: copy and paste to legal solution, cut, up, down, large screen and formulate answer. The option large screen is offered to enlarge the work space. The student can use the assess button to ask for an assessment of her activities (the process) and her legal solution (the product).

Second layer

The bottom part of the screen is the part where the support is presented. The student may request support at any moment in the legal solution construction process. Each part in the bottom layer has a support button. There are two levels of support, general support being support independent of the specific legal case or legal rule selected, and specific support, support related to the specific legal case or legal rule selected. The legal case support button offers three types of support. Support on legal cases, support related to structuring a legal case and support related to translating terms in a legal case. The construct legal solution support button offers four types of support. There is support available related to the question, the process, the product and the model of legal case solving. The legal rules support button offers three types of support. There is support available on legal rules, on searching a legal rule or article within a legal rule and support on reading articles within a statute.

Implementation of PROSA

The program Authorware is used for implementing the specification of the design of the instructional program. Authorware is an authoring environment for creating and publishing interactive information and can be used for the construction of interactive learning and training applications. Authorware has many evaluation functions that make it possible to handle all kinds of input. Authorware makes it possible to incorporate digital movies, sound, animation, graphics and text in *the application to be constructed. The program Authorware has been chosen for the realization of PROSA on the basis of these specific Authorware aspects: interactivity and evaluation of input.*

As Authorware is an icon-based authoring tool, a program is made by assembling icons on a flow line. Different types of icons contain different types of objects like text, graphics or a set of instructions and herewith the content of a program. The way in which these icons are arranged on the flow line forms the architecture.

In figure 2 the top level of the architecture of PROSA is shown. The icons on the main flow line are visible at this level.

figure 2: the top level of the PROSA architecture

When PROSA is run, Authorware executes the icons from top to bottom along the flow line. The first icon that is executed is the *map icon* 'initialize'. This map icon contains a number of *display icons* that contain the first screen, the so called startup screen. Furthermore the variables used in PROSA are defined and initialized in a *calculation icon*. These variables are used to keep track of the students' actions and to store and use general PROSA information like available items for the menu buttons. And finally the 'initialize' icon contains *display icons* which contain the standard PROSA screen with the two layers and three parts (see figure 1). This 'initialize' icon is executed only once per session.

The second icon 'perpetual interactions' (see figure 2) contains two kinds of so called *perpetual interactions*. An interaction is an *interaction icon* with different types of response type symbols attached to it. These response type symbols tell the interaction icon whether to display a button, a menu, a text-field or some other element. An interaction monitors the actions of the student and sends that information to the response type symbols attached to it. If Authorware encounters a perpetual interaction it activates the interaction and immediately continues down the flow line. This is used in PROSA because the student is given personal control in learning to solve legal cases. The first perpetual interaction displays the menu buttons available for the six different parts and defines the reaction of PROSA when the student uses the buttons. The student throughout the whole session of solving a legal case can use these buttons. The second perpetual interaction defines the responses of PROSA to the students activities regarding the construction of a legal solution in the sub parts select rule, select fact and legal solution part in the construct legal solution part of the screen. An example of such a student activity is pasting an article in the 'select rule' sub part of the construct legal solution part.

After the perpetual interactions the main loop of the program occurs, the so called *decision icon* 'legal case' with *map icons* for every case topic attached to it. Within each case topic map a similar *decision icon* for the different levels of difficulty is used. When Authorware encounters a decision icon it branches to a path according to certain criteria. In PROSA these criteria are the choices the student makes.

The student uses the menu button legal case and the choices she makes are stored in two variables caseTopic and caseDifficultylevel.

On the basis of these variables Authorware first branches to the *map icon* of the chosen case topic and then to the *map icon* of the chosen difficulty level. A difficulty level *map icon* contains (1) *display icons* which contain the legal case text and the accessory question (2) a *calculation icon* in which the correct legal solution is stored in a variable (3) an *interaction icon* to monitor the students activities specific to the chosen case. In the architecture a specific legal case and the accessory question are considered to be the basic element, because it is the current problem to be solved by the student and in this way PROSA is able to give case- and student specific feedback. Also many student characteristics can be recorded per case, like, for instance, the sequence of the students activities in solving the legal case, the legal solution the student constructs and the cases the student selects. These student characteristics are an example of characteristics that are recorded and maintained during all sessions of the student working with PROSA. In this way a student history is built to be able to adapt to the individual students activities and to evaluate the individual student.

The last icon at the top level flow line is the *map icon* 'subroutines' and Authorware never automatically encounters it. This icon contains a number of subroutines implemented as *map icons* attached to *framework icons*. These subroutines appear only once in PROSA, but are called many times by various parts of the program. An example of a subroutine is adding a student activity to the list that is used to keep track of the series of activities the student carries out to construct a legal case solution.

Because of the way the main loop in PROSA is structured, new legal cases of the existing topics and difficulty levels can be added easily. Furthermore, legal cases of new topics and difficulty levels can be added. For each new case topic and difficulty level a new *map icon* containing the case specific *display, calculation* and *interaction* icons has to be added. The same structure can also easily be used for a different domain if the problems to be solved can be divided in a hierarchy of topics and difficulty levels.

Summary and further work

The paper described the principled design of an instructional environment for supporting the learning of legal case solving. The theoretical basis for the design of the instructional environment involved the selection of a learning model and from that the selection of an instructional model. The instructional model has been implemented in the computer program PROSA for supporting the learning of legal case solving in the domain of administrative law.

At the moment PROSA contains twenty five cases on different topics, with different difficulty levels. A small test of PROSA will be carried out by having students work with the program and comment on it. PROSA is designed in such a way that it is possible to reuse parts of the program for other legal domains. This reusability will be tested.

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