Chapter 11
Design and Development of an Expert System Shell Program and Evaluation of Its Effectiveness

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ABSTRACT

In recent years, the amount of software developed to be used in the fields of computer-assisted teaching, e-learning, and distance education, and their quality levels have greatly varied. In order to meet the increasing demand for effective and suitable coursewares at an optimum level, the most convenient method is believed to be that these coursewares should be developed by teachers themselves, and a considerable number of quality studies focusing on these coursewares should be conducted to improve educational processes in general. At this point, the studies and projects benefitting from the advantages of artificial intelligence-based approaches are becoming frequently available in the related literature as an innovative trend. The current chapter deals with the design and development of an “expert system shell program” on the basis of certain specific goals and needs mentioned in the literature. The main objective of the study is to assist teachers in developing their own courseware by using this particular program. The shell program developed within the scope of this study was tested on a group of people that consists of teachers from different fields of teaching and education levels, and its effectiveness was evaluated through certain methods.

INTRODUCTION

Educational technology is a discipline focusing on the techniques and methods used to achieve the educational objectives and values determined by educational philosophies. After answering the questions “what” and “why”, the concept particularly deals with “how” this particular situation can be realized. In other words, educational technology conceptualizes learning and teaching processes in a functional way by using related knowledge and skills in order to manage these processes effectively (Alkan, 1995).
Speaking in modern terms, educational technology develops, applies, evaluates and manages various designs by making use of all available factors (human power, knowledge, methods and techniques, tools and equipment and necessary arrangements) in order to analyze human learning systematically and scientifically in detail and to find appropriate solutions accordingly. In other words, educational technology is a specific discipline dealing with learning-teaching processes (Alkan et al., 1995).

In today’s world, the detailed examination of technological advances and innovations in terms of the solutions they might offer to solve the current problems encountered in the field of education and making use of these innovations as effectively as possible in the related processes are highly likely to increase the quality of the education provided. Therefore, it is necessary to initiate certain attempts to improve the processes provided within the framework of computer-assisted teaching and distance education and e-learning approaches. Thanks to these attempts, the related literature can be enriched by supporting these processes through more innovative and facilitating approaches. At this point, it is crucial to evaluate the recent common trends and techniques mentioned in the related literature. When considered from this point of view, it is possible to see that artificial intelligence-based approaches are among the most popular ones covered in the related literature. Providing valuable opportunities to conduct studies focusing on imitating human thinking process, artificial intelligence techniques are considered significant supplementary tools in educational processes, in which human factor plays a considerably important role.

The current study deals with the design and development processes of an “expert system shell program” on the basis of the needs and goals mentioned in the related literature. The main aim is to enable teachers to develop their own courseware by using this program. Developed within the scope of the study, the shell program was applied to a group of teachers from different fields of teaching and different levels of education, and its effectiveness was evaluated. At the end of this process, it was found that the shell program was suitable for the determined purposes.

The next section mainly deals with “artificial intelligence technique-approach”, which forms the basis for the application, and aims at providing the readers with basic information about expert systems. The following section provides information about the design criteria and working principles of the shell program developed for the purposes of the current study. The evaluation process, which focuses on the effectiveness of the program and its suitability for the predetermined goals, is available under the next section and finally, the last section of the study is devoted to the results and the further studies planned within the framework of this process.

**EXPERT SYSTEMS**

This section specifically deals with the definition and working principles as well as the components of expert systems.

**Definition of Expert System**

In a broader sense, “expert system” is one of the most common applications of artificial intelligence technology, and it is a way of enabling a machine to perform a task that is normally expected to be performed by a human being. The related literature presents a lot of definitions that complement each other. For instance, Turban (1982) defines expert systems as follows: “It is a system using human knowledge stored in a computer to solve the problems that require a certain level of expertise. These systems might either be used by non-experts to solve such problems, or as intelligent assistants by experts”. Similarly, according to Bonnet (1988), expert system is “computer software that stores and processes a wide range of information about