Knowledge Transfer From Expert Systems vs. Traditional Instruction: Do Personality Traits Make a Difference?

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The recent interest in the development and use of expert systems and computer-assisted instruction as pedagogical tools has resulted in a need for research into the effectiveness of such instructional methods. This study reports on the extension of an experiment in which one of three teaching methods, (instruction, expert system, or a combination of the two), were used to teach a subject domain (Odom and Murphy, 1992). The personality traits of the individual subjects, measured using the Myers-Briggs Type Indicator, affect on knowledge development, both separately and in cohort with a teaching method were examined. The development of both declarative knowledge and procedural knowledge of the subjects was measured. The findings demonstrate that both methods of instruction and personality traits do affect the development of declarative and procedural knowledge. The development of declarative knowledge was significantly affected by teaching method and one personality trait, thinking/feeling, as well as by the interaction of the two. The results for the procedural knowledge also show a significant main effect for teaching methods and for one personality trait, sensing/intuitive. The interaction of these two was also significant.

Expert systems are computer programs that are designed to emulate the analysis (thinking) process an expert uses in reaching a judgment regarding a particular problem. Expert systems may be used for (1) retention and preservation of expertise, (2) distribution of expertise to others, (3) assistance in quality control, and (4) education or training (Barbera, 1987). Research on the use of expert systems as pedagogical tools is limited.

Odom and Murphy (1992) evaluated the pedagogical use of expert systems by measuring the development of declarative and procedural knowledge in groups of students that learned a task by, 1) using an expert system only, 2) having instruction only or 3) having a combination of instruction and an expert system. They suggest that the way in which the teaching material was presented resulted in the development of different amounts of declarative (factual) and procedural (how-to-do) knowledge. They found that, on average, using the expert system facilitated the development of procedural knowledge, but not declarative knowledge. However, their results (or lack thereof in the case of declarative knowledge) are limited because the study did not consider the possible effects of personality traits and the interaction between personality traits and teaching method employed. This interaction can be theoretically linked to learning ability and needs to be considered.

In any decision-making process the problem-solving and information processing behavior of individual decision makers play an important role. When considering individual decision makers, each individual’s habits and strategies are categorized at a fairly broad level and, essentially, problem-solving behavior is viewed as a personality trait (for example, Davis, 1982). The evidence emerging from experimental studies suggests that both the problem and the problem-solver’s characteristics, or personality traits, influence problem-solving strategies. These two set of characteristics may also interact in exerting such influence on the final decision.
(Benbasat and Taylor, 1978). Based on this human affect on the final decision, the decision-maker’s personality traits must be included in any complete analysis of the effect of an instructional method. Though personality traits differ among individuals, the degree of difference varies; One individual may have traits that are similar (though not identical) to those of another, but differ completely from a third individual. Psychologists have tried to group people based on different personality traits. This research introduces the students’ personality traits as a variable that may have an impact on the learning.

The following section, literature review, provides a background for expert system, different types of knowledge, and an explanation of the personality traits which form the basis for the research hypotheses presented. The research design is discussed in section three, followed by a presentation of the empirical results in section four. The conclusion contains a summary and suggestions for future research.

Literature Review

A panel of the American Society for Information Science identified that information science schools frequently are slow to adopt innovations and change curricula. The panel also indicated that students with humanities backgrounds may lack basic competencies in the use of computers, logic, and mathematical techniques (Hurd, 1988). Expert systems technology will make it possible to expand the use of computers to broader based knowledge/judgment areas than have historically been possible. The systems, used as training devices, will offer a highly flexible and realistic environment to the learner, as well as a high degree of individualization in the training process in terms of speed, location, and trainee approach.

Before deciding whether to use an expert system, a potential user should understand the capabilities of an expert system, as well as those problems for which an expert system is best suited. Expert systems enhance, a) the preservation and distribution of expertise, b) the improvement of personnel productivity, c) the enhancement of quality control, d) the facilitation of complex analyses, and e) the facilitation of education. Problems with characteristics such as, 1) a complex and lengthy set of rules, 2) a set of rules that can be readily divided into small segments, 3) routines that need practice to be mastered fully, and 4) an ordering of the set of rules in the decision process, appear to be relevant for designing an expert system. Potential accounting applications of expert systems include: audit and tax planning, internal control and accounts attribute analyses, quality reviews, decision making, management consulting, and teaching. One such subject in managerial accounting is transfer pricing (Boer and Livnat, 1990). This study compares the performance of students that are provided instruction on transfer pricing either from the traditional approach or with the aid of an expert system.

The purpose of an educational system is to facilitate the process of learning. Knowledge, which is obtained through the presentation of new information (data), is stored in long-term memory using the human information processing system. Gagne (1985) defines two types of knowledge—declarative knowledge and procedural knowledge. Declarative knowledge is factual knowledge, and procedural knowledge is the knowledge of how to do something. The educational process should be designed such that learning at both levels is facilitated. A change in instructional method may affect acquiring both types of knowledge, therefore, this study measures the effect of using different teaching methods on both types of knowledge.

Given that people have measurable differences in personality, it is highly possible that these differences will also affect their learning processes. Waner and Echternacht (1993) found that the personality types and the preferences of those who teach office occupations and those who work as office professionals were significantly different. The ones who teach the subject are more comfortable with factual (declarative) knowledge than how-to-do (procedural) knowledge. These findings suggest a relationship between personality and teaching that may affect the educational process and the types of educational tools teachers select. Ott, Mann, and Moores (1990) also found that personality traits affect exam performance when students use computer-assisted instruction.

Booth and Winzar (1993) surveyed a sample of accounting majors in three Australian universities. They found that while significant diversity is still evident, there is a bias in personality profiles of accounting students towards preferences for sensation over intuition, thinking over feeling, and judgment over perception (all defined in the following paragraphs). Their outcomes suggest that accounting educators should cater to the variety of personality types among their students by adopting a diversified teaching approach. This diversity may be accomplished through the use of expert systems.

One widely used instrument for grouping people is the Myers-Briggs Type Indicator (MBTI) (Briggs and Myers, 1990). The MBTI, based on Jung’s (1923) theory of psychological types, reports one’s preferences on four basic scales. Individuals with different MBTI scores are interested in different things, drawn to different fields, and often find it difficult to understand each other.

Myers and McCaulley (1989) discuss the four aspects of an individual’s personality which are measured by the MBTI indicator as, (1) how one prefers to take in information, (2) how one likes to make decisions, (3) how one is oriented toward the outside world, and (4) how quickly one comes to a decision. Each of these aspects has two extremes as outlined by Myers (1987) and discussed below.

Using the MBTI, individuals are classified as either "extroverted" or "introverted" based on how one is oriented toward the outside world. Extraverted (E) types tend to use the outer world as a source of concepts and ideas. They tend to be more comfortable working with people. Introverted (I) types look for the source of their concepts and ideas in their inner world. They tend to be more comfortable when the work
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