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ABSTRACT

Summarized are two reports of a federally funded project on the use of artificial intelligence in special education. The first report, "Artificial Intelligence Applications in Special Education: How Feasible?," by Alan Hofmeister and Joseph Ferrara, provides information on the development and evaluation of a series of prototype systems in special education administration, training, diagnosis, and instruction. The second report, "Assessing the Accuracy of a Knowledge-Based System: Special Education Regulations and Procedures," by Alan Hofmeister, discusses procedures used to develop and evaluate one of these systems. The project evaluated a range of expert-system software and hardware, including computers of all sizes, to determine their potential usefulness in addressing special education problems. Prototype systems were then designed, including four systems designed to give a second opinion on classification decisions, a system to advise teachers dealing with behavior problems, and a system called "Mandate Consultant" which considers the appropriateness of the decision-making process used to develop an individualized education program. "Mandate Consultant" was selected for full development by the project and received extensive field-testing. Data on the prototype systems' validity, user acceptance, and administrative support suggest that expert systems are potentially effective in the areas of diagnosis, planning, and instruction, and are valuable for training purposes. (JDD)

ERIC CLEARINGHOUSE ON HANDICAPPED AND GIFTED CHILDREN

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RESEARCH & RESOURCES ON SPECIAL EDUCATION

ABSTRACT XI
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CURRENT USES OF ARTIFICIAL INTELLIGENCE IN SPECIAL EDUCATION

"Artificial intelligence" is a term describing the use of computers to perform operations that we associate with intelligence in human behavior, such as learning and decision making. Expert systems are a development of artificial intelligence that combines the computer's capacity for storing specialized knowledge with a general set of rules intended to replicate the decision-making process of a human expert. On the basis of these rules, the computer decides which items of information are needed and continues requesting them until sufficient information is obtained on which to base a conclusion. These systems include a knowledge base that is organized and synthesized, so that appropriate questions, tailored to the discussion with the user, can be asked in an appropriate sequence. The potential applications of such systems in special education administration and practice are numerous, and several state education agencies (SEAs) have entered into cooperative efforts for the development of such systems.

Artificial Intelligence Applications in Special Education: How Feasible? is a report providing a clear introduction to artificial intelligence and expert systems as well as information on the development and evaluation of a series of prototype systems in special education administration, training, diagnosis, and instruction. A companion report, *Assessing the Accuracy of a Knowledge-Based System: Special Education Regulations and Procedures* provides an in-depth discussion of the procedures used to develop and evaluate one of these systems. Both reports result from a project funded by the Office of Special Education Programs in the U.S. Department of Education.

METHOD

The project conducted three activities: (1) an evaluation of the software needed to develop expert systems ("authoring tools") and the hardware on which it is used, (2) the design of several small prototype systems in order to assess the appropriateness of currently available authoring tools for problems in special education, and (3) the development and evaluation of a practical expert system that deals with a specific problem area in special education.

A range of software and hardware tools were evaluated to determine their potential usefulness in addressing special education problems. For personal computers, the following software was evaluated: Expert-Ease, Human Edge, Insight II, and M.1. For medium-sized machines, Rulemaster was evaluated, and for large computers, Expert, Rosie, and S.1 were evaluated. Major advances have allowed expert systems of a practical size to be developed and run on powerful, yet modestly priced microcomputers. These new authoring systems require much less training to use than the software previously available. In fact, most of the project's prototype systems were developed by special educators with little or no computer programming background.

The prototype systems developed by the project include four systems designed to give a second opinion on classification decisions, addressing the classification of students as learning disabled (LD), behaviorally disturbed (BD), intellectually handicapped (IH), or as having articulation problems requiring special education. A fifth system, Behavior Consultant, is instructionally oriented; it was designed to give advice to teachers planning specific procedures to deal with behavior problems. The final system, Mandate Consultant, provides a second opinion of the appropriateness of the decision-making process used in the development of an IEP.

Mandate Consultant was selected for full development by the project. Its purpose is to reduce the need for hearings to resolve conflicts between parents and the school. Because of the extensive interest shown in this prototype by state and local special education administrators, additional resources were obtained to take the system through extensive field testing. Data on user reliability, decision validity, and user and administrative acceptance were collected.

The Council for Exceptional Children operates the ERIC Clearinghouse on Handicapped and Gifted Children under a contract with the Office of Educational Research and Improvement, U.S. Department of Education.

RESULTS

The review of tools for developing expert systems provided information that suggests that the technology can be adapted to selected, important problems in special education. The project found that the hardware and software available to develop expert systems are capable of producing professional expert systems that address substantive special education problems. The authors believe that existing tools have all the power needed for first class expert systems in the areas of diagnosis, planning, and instruction, and they are possible today at reasonable cost.

Data on the prototype systems' validity, user acceptance, and administrative support convinced the authors that expert systems are potentially effective and acceptable in special education. Several of these systems were considered to have such high potential usefulness by SEAs that they contributed resources to the further development and adaptation of the systems. For example, the Utah SEA is involved in a cooperative effort to further develop the classification program for behaviorally disturbed students. It is hoped that the system will improve field decision making, provide an inservice training tool, and through its knowledge base, help the SEA to refine state regulations related to the classification of students as BD.

IMPLICATIONS

In addition to the potential usefulness of expert systems in offering consultation, the authors discovered that the secondary benefits of expert systems were greater than anticipated. One secondary benefit is the value of building the knowledge base for an expert system: to build a knowledge base, it is necessary to collect existing knowledge in a specific area and organize it in a way that allows it to be applied to the solution of pressing field problems. This analysis and synthesis of existing knowledge is, in itself, a substantive contribution to special education.

Another secondary benefit of expert systems is their value for training. An expert system models the decision-making process of an expert, and makes both the decision-making process and the associated rationale overt. This modeling and overt reasoning combine to form an effective training function in areas where training is difficult and expensive. Advanced clinical training is one such area, and administrative decision making is another. The authors suggest that expert systems could probably be justified for their training value alone.

Artificial Intelligence Applications in Special Education: How Feasible? Alan M. Hofmeister and Joseph M. Ferrara, Utah State University. June 1986. 148 pp. U.S. Department of Education Grant No. G008400650. Available in early 1988 for $.78 (microfiche) or $11.10 (hard copy), plus postage, from ERIC Document Reproduction Service, 3900 Wheeler Avenue, Alexandria, VA 22304 (1-800-227-3742). Order EC number 200 220.

Assessing the Accuracy of a Knowledge-Based System. Special Education Regulations and Procedures. Alan M. Hofmeister, Utah State University. 240 pp. U.S. Department of Education Grant No. G008530236. 1986. Available in early 1988 for $.78 (microfiche) or $18.50 (hard copy), plus postage, from ERIC Document Reproduction Service, 3900 Wheeler Avenue, Alexandria, VA 22304 (1-800-227-3742). Order EC number 200 221.

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RESEARCH & RESOURCES ON SPECIAL EDUCATION
THE COUNCIL FOR EXCEPTIONAL CHILDREN
1920 ASSOCIATION DRIVE, RESTON, VA 22091