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ABSTRACT

With the assistance of East Central University in Ada, Oklahoma, the Indianola Public Schools in Oklahoma developed a computerized curriculum management system (CMS) to aid in curricular planning and evaluation. Using CMS, teachers can implement findings associate with the effective schools research by delineating and communicating the goals and objectives of instruction, by encouraging high expectations for student achievement, by emphasizing basic skills, and by continuously monitoring student progress. CMS uses the Annehurst Curricular Classification System (ACCS) which contains approximately 60,000 learning outcomes in mathematics, science, language arts and social studies. Materials designed to teach the curricular content were entered into CMS data banks. Activities can also be coded by learning modalities. Students are placed in the scope and sequence of the curriculum based on the results of criterion referenced tests. CMS generates a 2-week individualized plan of study for each student, detailing the objectives and the activities. At the end of the 2-week period, the students are tested, and CMS produces a report to teachers and parents. The system is also designed to evaluate learning activities based on teacher rating and student performance. CMS enables public school and university faculty to collaborate through shared data banks which can be monitored at university sites. This facilitates remediating curricular problems, as well as conducting research. During the 1988-89 academic year, CMS was field-tested using 120 students in the mathematics curriculum. A pretest-posttest study of composite mathematics achievement scores found a gain of 14 percentile points. (KS)

Technology and Collaboration: Strategies for Improving Educational Delivery Systems in Rural Schools

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Introduction

While the needs of rural students in American schools are as acute as their urban counterparts, often rural schools do not have the resources available to do the curricular planning, development and evaluation necessary to meet their students' needs. Most urban school districts have a cadre of curriculum specialist to lead in the development, implementation and evaluation of courses of instruction. Often, rural schools' curricular study is one of the many responsibilities of the districts' principals and teachers.

To provide an educational program that meets the needs of students, both rural and urban districts must examine alternatives to currently used educational practices. This is evidenced by recent research which has evaluated American schools.

American students are not learning basic skills at an acceptable level. According to a survey conducted by the National Science Foundation and the United States Department of Education, American teenagers scored in last place when compared to similar students from five other industrialized nations. The United States cannot afford the consequences of becoming a second-rate economic power because of ineffective educational programs. Institutions of education must find ways to assist all students in mastering basic skills at an acceptable level.

Many American educators were pessimistic in the sixties and seventies about the potential of American schools to influence student achievement. The Coleman Report (1966) and Inequality: A Reassessment of Family and Schooling in America by Christopher Jencks (1972), both indicated that factors such as family background, socioeconomic status, peer group influences and location of schools were more significant in determining school achievement than factors such as instructional strategies. These studies were followed by other equally pessimistic findings such as the Averch, Carroll, Donaldson, Kiesting and Pincus study (1974) which reviewed the effects of a variety of programs designed to improve academic achievement. This review indicated that none of the intervention strategies examined were so successful that they could be used to guide national policy for improving the academic achievement of the nation's students.

Most educators would not deny that factors identified in the Coleman Report and other similar studies do influence school achievement. However, many other researchers have conducted studies which support the contention that factors such as teaching practices do affect school achievement dramatically.

Researchers such as Bickel (1983), Brookover (1981), and Clark and McCarthy (1983) have supported this belief. These researchers found that when schools with similar demographics were compared some of those schools were effective in assisting students in improving their academic achievement while others were not.

These findings tend to negate the belief that schools cannot modify the impact of societal factors in determining academic achievement.

These researchers have found several school factors which influence student achievement including but not limited to:

1. Clear school goals that are understood by all school personnel and students;
2. High expectation for student achievement;
3. Basic skills being emphasized; and
4. Student progress being continuously monitored.

Since these factors have been indentified, it seems reasonable that teachers should be provided assistance in implementing these characteristics in the teaching/learning process.

Technology can provide assistance to teachers in their attempt to implement these effective schooling characteristics in the classroom. The Curriculum Management System (CMS) is one method of using technology to assist teachers in this quest. The CMS is a computer managed curriculum system that can assist schools in helping students improve their academic performance.

History

Nine years ago the Indianola Public Schools (IPS) of Indianola, Oklahoma became interested in developing a curriculum management system. At that time IPS contacted East Central University (ECU) in Ada, Oklahoma to provide assistance for this project. Specifically, personnel of the IPS were concerned with finding an innovative way of managing the curriculum. Specifically, IPS wanted to develop a curriculum management system that would do the following:

1. assist teachers in determining the appropriate placement of students in a curricular area;
2. build individual plans of study for students in the curricular sequence;
3. identify or develop teaching materials for students to use as they progress through the curriculum;
4. evaluate the effectiveness of those teaching materials based upon teacher rating and student performance;
5. build detailed reports to parents of student progress at frequent intervals;
6. identify those elements of the curriculum that are being effectively mastered by students and those elements of the curriculum that are not being adequately mastered; and
7. provide a means by which the curriculum can be analyzed for the purpose of improvement.

During the past nine years CMS was developed and the goals of the school district were reached. Additionally, several useful and powerful by-products were developed in the process. These other features of CMS will be described later.

The process began with a recognition that education is undergoing changes at an ever increasing rate. Therefore, the developers of CMS attempted to create a curriculum management system that can be altered with speed and ease. Programming of CMS reflects this goal. Any aspect of CMS can be altered to meet the changing conditions within a school system, or to be used in many districts that have differing curricula and differing preferred materials of instruction.

The Indianola Public School adopted as its curricular base the Annehurst Curricular Classification System (ACCS). This system was an excellent choice for it is extensive, containing approximately 60,000 learning outcomes in the curricular areas of mathematics, science, language arts and social studies. Materials designed to teach the curricular content were selected, classified and entered into CMS data banks. Initial sequencing entries were limited to the Goals-Based Educational Management System (GEMS), a federally funded and validated project. Thus, every element of the content in the selected curriculum and corresponding activities are contained in CMS. Further, the activities can be coded to include learning modalities, using the ACCS system, thus allowing activities to be selected for a student's plan of study which address the student's individual learning styles. The learning modality component is operational from a programming standpoint, but as of yet many of the materials have not been classified on this basis.

Current status

CMS is operational in grades K-8 for the curricular areas of mathematics and reading. Students are tested using criterion referenced tests to determine their placement in the scope and sequence of the curriculum. Test results for each student are then entered into CMS. Based upon these test results, CMS will generate an individualized plan of study for each student at the student's developmental level. The plans of study, detailing the objectives to be met and the activities to be encountered, are provided to teachers and parents by CMS.

Plans of study are generated for two-week intervals of study. At the end of each two-week interval, students are tested again using criterion referenced tests and test results are entered into CMS. CMS will produce reports to teachers and parents detailing student performance on each activity attempted. The test results also provide the basis for each student's next plan of study.

Additionally, test results provide a mechanism by which learning activities may be evaluated. CMS will evaluate the effectiveness of all learning activities used in the program from the following two perspectives:

1. teacher rating; and
2. student performance on the criterion referenced tests.

As learning activities are classified by learning modality, CMS has the ability to evaluate the effectiveness of those activities in addressing students' specific learning styles. Based upon this information, educators will be able to determine which activities to maintain in general CMS files and which to maintain under a specific learning modality classification.

A powerful subroutine of CMS is the evaluation of student achievement based upon objective attainment. CMS will analyze student achievement and build reports detailing which objectives have and have not been mastered at an acceptable level. This report can be generated for one student, one grade, or for an entire school or according to any demographic factor entered into the system. Analysis of the report provides the basis for determining inservice needs of one or a group of the school's faculty. Additionally, the report indicates problem areas of the curriculum which might be remediated by altering the activities contained in CMS files.

The structure and capabilities of CMS enable public school and university faculty to collaborate in increasing the knowledge base of content areas and pedagogy. Upon the request of public school teachers, CMS allows for data files of student performance, both individually and collectively, to be monitored at university sites. Confidentiality of individual teachers and students is maintained by modem transmission of data that includes teachers' and students' identification numbers rather than names. By using shared data banks, university and public school faculty can collaborate in the remediation of any curricular problems.

Further, the shared data banks also facilitate research undertaken by university and/or public school faculty. Research on altered sequencing of mathematics, for example, can be conducted to determine the optimum sequencing of mathematics content. The results of such research can then be used to alter the scope and sequence of the mathematics curriculum contained in CMS.

Using CMS, school personnel can compare the curriculum in any subject area to tables of specifications from commercial standardized achievement tests. This subroutine of CMS will render the degree of concurrence between any achievement test and the curriculum contained in CMS files. This feature of CMS allows school personnel to select achievement tests which best fits the school's curriculum.

Additionally, CMS can assist in the determination of expectancy levels for school achievement considering a wide array of demographic factors which might influence students achievement. For example, CMS can factor in variables such as socioeconomics into an expectancy level of school achievement using this subroutine of CMS.

Initial results of the project are very encouraging. During the 1988-89 academic year, CMS was field tested using 120 students in the mathematics curriculum. Using a pretest-post test study comparing composite mathematics achievement scores, a gain of .4 percentile point was achieved.

During the current academic year the test group has been expanded to include all students in grades K-8 for the curricular areas of mathematics and reading from one school. Achievement levels as evidenced by standardized achievement tests are not available at this time but will be closely monitored.

During the current year the activities contained in the files will be evaluated to determine their effectiveness using the subroutine previously described. When this is accomplished, the CMS and its curricula will be significantly improved.

One other major task to be undertaken as the CMS is further implemented involves using the information contained in the CMS data files to conduct research. CMS data files will have massive amounts of information which can be used to improve curricula and pedagogy. As computer links are created between participating schools and universities, significant research will be possible.

Conclusion

Student performance can be improved with the use of the CMS due to factors found to be associated with effective schools. Specifically, the goals and objectives of instruction are clearly delineated and effectively communicated to students and their parents. Each student, teacher and parent receives a computer generated plan of study every two weeks which specifies the goals, objectives and learning activities to be used with each student. Each plan of study is individualized to accommodate the student's developmental level as determined by criterion referenced tests. As the scores of the criterion referenced tests are entered into the CMS, the system will automatically build a plan of study.

The CMS encourages high expectations for student achievement and makes it reasonable to have high expectations for student achievement because each student is working on mastering content which is at the appropriate level. As parents understand the individualization of the project and as they receive highly detailed reports every two weeks which are computer generated, they are enabled to encourage their children to apply themselves in their academic pursuits.

The scope of the curriculum used in the CMS emphasizes basic skills. The scope and sequence of each curriculum used in the CMS are based upon the Annehurst Curriculum Classification System (ACCS) which has made provisions to insure the inclusion of basic skills in the curriculum.

Student achievement is continuously monitored by the CMS. Powerful subroutines of the CMS can allow teachers to identify which objectives have been mastered at an acceptable level as evidenced by student performance on criterion referenced tests. Conversely, the program will identify which objectives have not been mastered at an acceptable level. The CMS can generate, upon command, such reports for an individual student, a class or an entire school.

The technology developed and used in the CMS has the potential to significantly improve student achievement. CMS can assist teachers to implement the findings associated with the effective schooling research by delineating and communicating the goals and objectives of instruction, by encouraging high expectations for student achievement, by emphasizing basic skills, and by continuously monitoring student progress.

The CMS is an innovative way of monitoring and managing the curricula and has the potential to significantly improve the achievement of students. By using the technology represented by the CMS, teachers can spend more time doing what they do best. They can teach children.

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