

AN AUTOMATED SYSTEM FOR SUPPORTING CURRICULUM ASSESSMENT IN THE COLLEGE OF BUSINESS

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ABSTRACT

This paper describes an automated assessment system currently deployed at Eastern Michigan University's College of Business. The system presented involves components for building assessment tests, allowing students to take the tests online and performing trend analysis on student performance. This system represents a solution to curriculum assessment that makes use of decision support and expert systems technology. The software used for the assessment system had previously been used for several business- and educational applications. Based on the successes of the previous applications, the system was then adapted to provide a mechanism for curriculum assessment.

Keywords: decision support systems, curriculum assessment, multi-attribute utility models, expert systems

INTRODUCTION: THE NEED FOR CURRICULUM ASSESSMENT

Curriculum assessment is becoming vitally important for higher education institutions that wish to earn and maintain accreditation through such agencies as AACSB and NCA. Traditionally, such agencies have required colleges to perform rigorous self-studies on a ten-year cycle in order to renew accreditation status. Recently, however, accrediting associations are responding to institutional representatives who complain that the traditional 10-year self-study approach to re-accreditation is too time consuming and provides minimal benefit to the educational institution beyond the accreditation process. This response manifests as a focus toward implementing assessment systems that facilitate both the accreditation process and a quality-improvement cycle for the school on a continuous basis. For example, the NCA is currently working with several institutions to develop Baldrige-based re-accrediting self studies, and has obtained outside grants to help revamp its accreditation process in this direction (2).

In addition to providing feedback that can assist institutions to improve the quality of their educational offerings, a good assessment system can provide students with information about their own performance and a vehicle to voice their opinions about the quality of the education they receive in a systematic, highly structured environment.

Assessment procedures typically include student examinations, capstone courses, student- and employer-surveys, and focus group interviews. For some of these procedures, computerized methods can be used to maximize efficiency and standardization of outcomes.

Several authors have introduced software systems to assist in this endeavor (1,8). These systems, used in both industry and education, vary in effectiveness, and have received mixed reviews. Although the technology seems promising, it clearly must evolve and mature before it becomes fully functional and capable of integrating into an overall curriculum-planning process.

Such systems can also be used to maintain a portfolio database where students can store their work and track their progress over time, and instructors can easily manage the assignments turned in by large classes of students (7)

THE CANDIDATE EVALUATION METHOD

The assessment system developed at Eastern Michigan University is based upon a decision support technique called Candidate Evaluation (3). This DSS approach has been used to develop several other educational and business-related applications (4, 5, 6).

The CEVAL architecture is composed of the following components:

- **Evaluation criteria:** A hierarchy of criteria, weighted by importance, and containing ratings and threshold scores.
- **Evaluative questions:** These are multiple choice questions that score candidates in their performance of the criteria.
- **Contextual Questions:** These are multiple choice questions that refine criteria weights. These are not relevant for the assessment system.
- **Interpretation Fragments:** These are text paragraphs based on criteria ratings that combine to form a report of recommendations to the user.
- **Plans:** A plan is a decision alternative for a particular candidate. Plans are ranked from most to least promising. These are currently not used in the assessment system, although they may be used in future releases.
- **Hypertext Tutorials:** These are tutorials that can help students insight into the topics covered in the assessment examinations. After a student has taken an assessment examination, the feedback includes these topics.

THE EMU COLLEGE OF BUSINESS ASSESSMENT SYSTEM

The College of Business Assessment System is comprised of the following components:

- 1) **CEVED** – this is a program used by faculty to create the tests that students take. It is basically an authoring tool for generating Candidate Evaluation decision support modules.
- 2) **ASSESS** – this is a program that students run in order to take tests in their disciplines. There are tests for each of the Core business courses in the College of Business (including two accounting courses, two management courses, a finance course, a decision science course, an information systems course, a marketing course, a production course, and a law course). Business students are required to take these tests online at the College of Business computer lab when they take their first business course and again when they take their final capstone business policy course.
- 3) **COBSTAT** – this is a program that gathers statistics regarding student demographics and test performance. These statistics provide the basis for analysis of the effectiveness of the business curriculum.

CEVED

CEVED (for Candidate Evaluation Editor) is a program for constructing decision support systems that utilize a multiple-criterion utility method of evaluation and selection. Modules constructed via CEVED are composed of the components described above (see The Candidate Evaluation Method). In the context of COB assessment, the evaluation criteria are test sections, the evaluative questions are the multiple-choice questions of the test, and the interpretation fragments compose a verbal report that is presented to the student identifying his or her strengths and weaknesses base on the test results.

Using CEVED, instructors create test sections (evaluation criteria) together with possible ratings and weights of importance, as shown in figure 1.

Once the evaluation criteria have been constructed, faculty create multiple-choice questions that will be associated with each test section, as shown in figure 2. During the testing process, students' answers to these questions will trigger a scoring process where a question's weight and the answer's score are combined to impact the score of a test section, using a linear model typical to multi-attribute utility equations.

Finally, instructors can create interpretation fragments, which are paragraphs that will appear (conditionally) in a final report to the student. For example, consider the fragment in figure 3. This interpretation fragment will appear if the student performed poorly in the test section Operation Environment of Financial Mgmt. The final report submitted to the student is the full list of all interpretation fragments whose conditions have been met. In this way, the assessment system performs somewhat like a rule-based expert system.

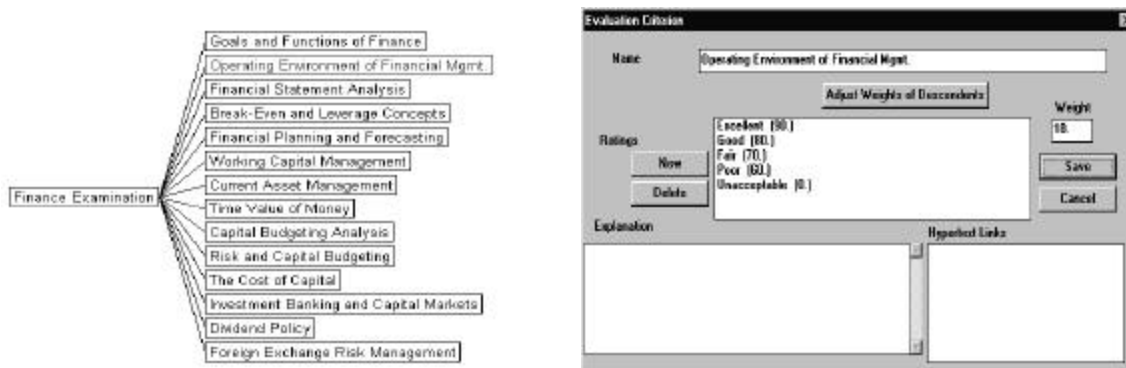


Figure 1: The hierarchy of criteria in the Candidate Evaluation model represent test sections in the assessment tests. Each test section has a weight of importance and a set of ratings with associated threshold scores.

ASSESS

Students take the assessment exams by going to the computer lab and logging in to one of ten tests. These tests relate to the core business courses required for all business majors, including managerial and financial accounting, decision science, finance, information systems, business law, business communications, organizational behavior, marketing, and production. When

students first log in to take a test, they are taken through a series of demographic questions related to their major, class level, and the class they are taking the test for.

Figure 2: The evaluative questions in the Candidate Evaluation model represent test questions in the assessment tests. Each test question is associated with a test section, has a weight of importance with respect to that section and a set of answers with associated scores.

Figure 3: The interpretation fragments in the Candidate Evaluation model represent verbal feedback to students in the assessment tests. Each interpretation fragment is triggered by a condition related to student performance in a test section.

After the demographic questions have been answered, students are presented with the test sections (evaluation criteria) and are allowed to begin answering questions of the test. As figure 4 shows, they can select any section of the exam to begin with, or they can simply answer the questions in sequence. Questions are in multiple-choice format, and each answer has an associated score that will be included in the overall score for the test. A typical question looks like figure 5, which shows that student can obtain further explanations regarding a question.

After a student has completed the assessment test, he or she can immediately view the results, as shown in figure 6. One of the nice features of the Candidate Evaluation method is the ability to map quantitative scores to qualitative ratings and verbal reports. Thus, students are also able to obtain interpretations of the results and recommendations for future study, as shown in figure 7.

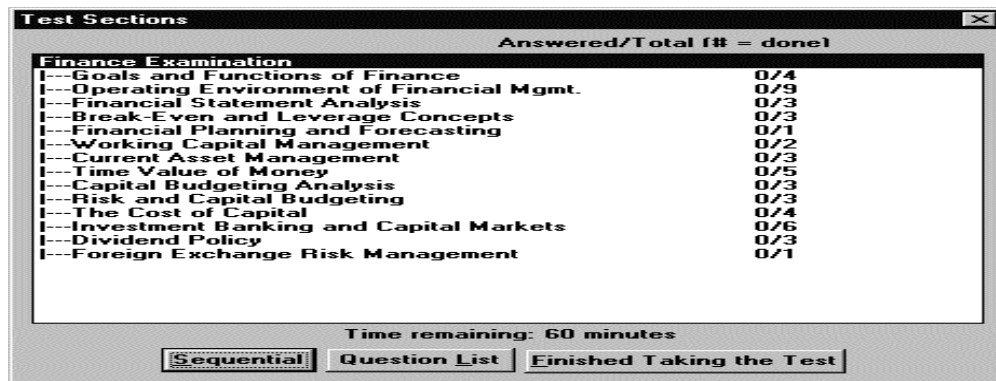


Figure 4: Students using the ASSESS program can see the test sections, and view how many questions are in each section, and which of these questions have been answered.

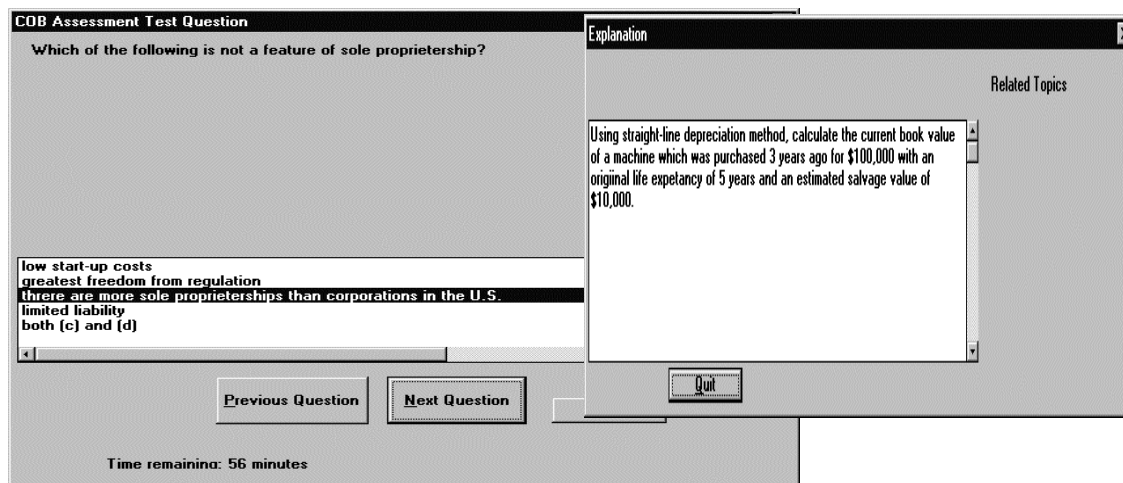


Figure 5: A multiple-choice question in ASSESS, with a pop-up explanation dialog.

Topic	Correct/Total	% correct
Goals and Functions of Finance	0/4	0%
Operating Environment of Financial Mgmt.	2/9	22%
Financial Statement Analysis	0/3	0%
Break-Even and Leverage Concepts	2/3	67%
Financial Planning and Forecasting	0/1	0%
Working Capital Management	1/2	50%
Current Asset Management	0/3	0%
Time Value of Money	1/5	20%
Capital Budgeting Analysis	0/3	0%
Risk and Capital Budgeting	0/3	0%
The Cost of Capital	0/4	0%
Investment Banking and Capital Markets	1/6	16%
Dividend Policy	0/3	0%
Foreign Exchange Risk Management	0/1	0%

Figure 6: Students can view the final results of their test immediately.

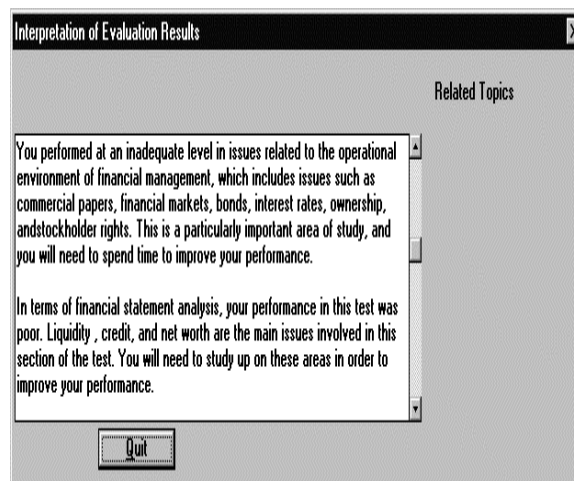


Figure 7: Students can obtain recommendations for further study immediately.

COBSTAT

All the student data, including demographics, answers to questions, and scores are stored in a database for analysis and review by faculty. This analysis is conducted through a program called COBSTAT (for College of Business Statistical Analysis Package) which uses the data generated by the ASSESS program. Faculty can run the COBSTAT program and query the statistical data using a variety of methods (by focusing on classes, class levels, and/or majors) and can see results for any part of the test, as shown in figure 8. A query comparing student performance for students in the capstone course (posttest) vs. students in the introductory course (pretest) may result in the graph of figure 9. Here, the x-axis shows the score range for the test and the y-axis shows the percentage of students in each class obtaining that score range. Fortunately, posttests tend to score higher than pretests, indicating some level of learning. Alternatively, faculty can look at a breakdown of which students gave which answers to a particular question, such a query would result in a graph that looks like Figure 10. This graph compares finance majors against all others and shows clearly that finance major are more likely to get the correct answer (in this case Ans4) than non-finance majors. The assessment tests consistently have shown higher performance for majors than non-majors on a test, as would be expected.

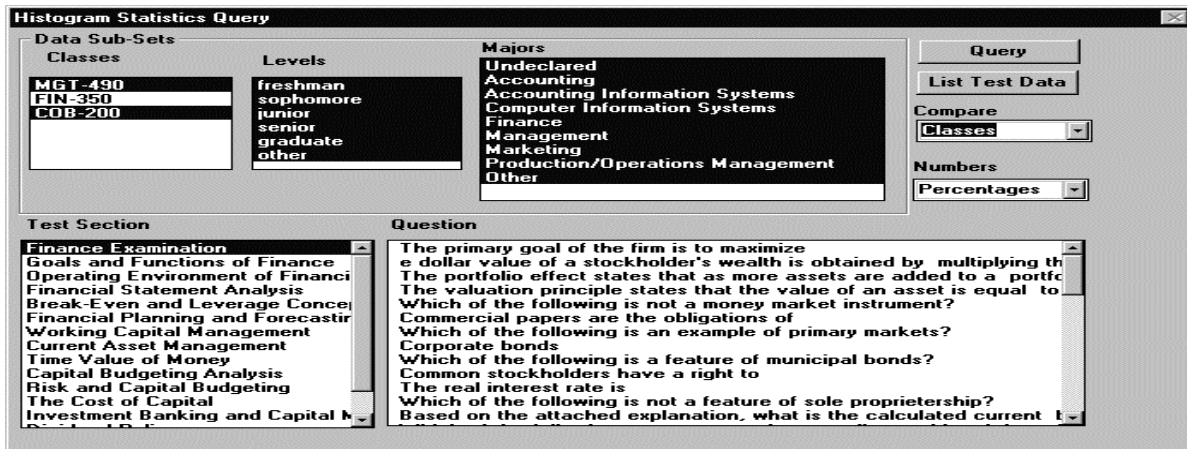


Figure 8: The COBSTAT query screen offers many options for instructors to view test results.

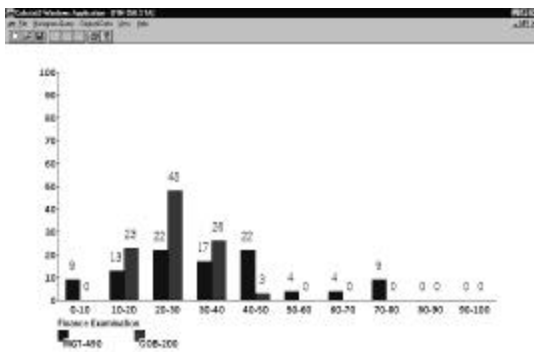


Figure 9: COBSTAT graph showing score ranges for pre-test vs. post-test students.

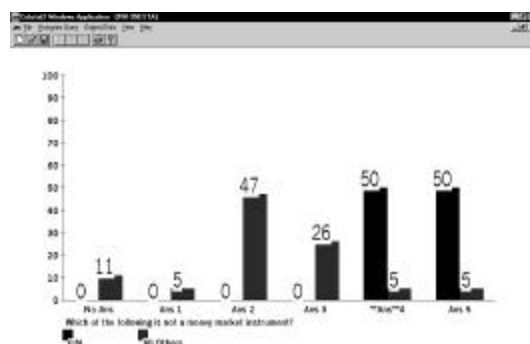


Figure 10: COBSTAT graph showing distribution of answers for a question for majors vs. non-majors.

CONCLUSION AND FUTURE DIRECTIONS

The College of Business Assessment System has been in place at EMU for the last three years. During that time a considerable amount of student performance data has been accumulated, tracked, and analyzed. The results of the assessment process has been used to make decisions regarding changes to curricula in many of the business disciplines taught in the college.

Development is currently underway to improve on the assessment process. Specifically, the system will evolve, over the next several months, into a computerized system for maintaining and tracking student performance in all school project work and exam results. It will serve multiple purposes, including: serve as a locus for students to collect and review their schoolwork throughout their collegiate careers; provide a means for students and instructors to communicate with one another; allow instructors to view student performance results on both individual and aggregate levels; and provide a basis for the university's ongoing curriculum assessment efforts. Most importantly, the system will be available over the internet, so that students can take exams, run through tutorials, and store project work from anywhere at any time. Likewise, instructors will be able to create tests, construct tutorials, and analyze student performance via the WWW at any time and from any place.

REFERENCES

1. Jaffe, B. (1997). Checking up, *Computerworld*, (31:23),72-76
2. Jasinski, J. (1999). Connecting quality improvement practices to reaccreditation, *Quality Progress*, (32:9), 90-98
3. Mitri, M. (1991). A Task-Specific Problem Solving Architecture for Candidate Evaluation, *AI Magazine*, pp95-109.
4. Mitri, M. (1995). MAPS: A Planning System for International Market Entry, *International Journal of Intelligent Systems in Accounting, Finance, and Management*, (5), 57-72.
5. Mitri, M., Karimalis, G., Cannon, H., Yaprak, A. (1998) The Market Access Planning System (MAPS): A Computer-Based Decision Support System for Facilitating Experiential Learning in International Business, *Proceedings of the 25th annual conference of the Association for Business Simulation and Experiential Learning*, Maui, HI.
6. Mitri, M. (1999) A DSS for Teaching Application Portfolio Management Decisions in an Information Systems Class, *Journal of Computer Information Systems*, (39:4), 48-56.
7. O'Donovan, E. (1998), Electronic portfolios bring work together, *Technology & Learning*, (19:2), 63.
8. Trepper, C. (1999) Evaluating training vendors and courseware, *Informationweek*, (738), 3.