

**A MULTIMEDIA COMPUTER-BASED COLLOQUIUM  
FOR ACTUARIAL SCIENCE INSTRUCTION**

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**ABSTRACT**

The Penn State Smeal College of Business Administration is sponsoring an instructional technology project. The goal of the project is to accelerate the introduction of state-of-the-art computer technology into actuarial science instruction. The general computing strategy is to provide a multimedia computer-based environment in which actuarial science faculty and students can interact. The project is under my direction.

This paper (1) describes the nature of a multimedia computer-based colloquium (2) demonstrates how the technology can be used within a actuarial science instruction setting; and (3) describes the steps we have taken to ease the transition into this environment.



## A MULTIMEDIA COMPUTER-BASED COLLOQUIUM FOR ACTUARIAL SCIENCE INSTRUCTION

### INTRODUCTION

The Penn State Smeal College of Business Administration is sponsoring an instructional technology project called "A MultiMedia Computer-based Colloquium for Actuarial science" (MCC-AS). The goal of the project is to accelerate the introduction of state-of-the-art computer technology into actuarial science instruction.

The general computing strategy is to provide a multimedia computer-based environment in which actuarial science faculty and students can interact. A key component of the strategy is to develop ways to: (1) ease the transition into this environment; and (2) simplify transferability of the technology. The measure of the success of the project is the extent to which this technology is integrated into the curriculum.

The specific technical approach can be summarized as follows. The project is multimedia in the sense that one of its integral components is an audio-visual interface, which incorporates sounds and pictures into an exposition. It is computer-based inasmuch as it incorporates: (1) a software construction set, which facilitates the construction of random-access pedagogical modules; and (2) Microsoft Windows-based applications, which enhance the users ability to respond dynamically to queries and to investigate suppositions.

Sponsorship of the project is through a partnership involving IBM, the William Elliott Chair of Insurance, and the Smeal College of Business Administration. The project is under my direction.

### DESCRIPTION OF THE PROJECT PLATFORM

The elements of our MultiMedia Computer-based Actuarial Science Colloquium are shown in the following figure:

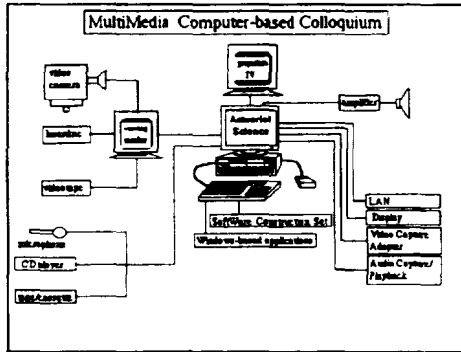


Figure 1: An MCC for Actuarial Science

The core of the system is an IBM PS/2 processor, or compatible, operating within a Microsoft Windows-based environment, and equipped with a software construction set.

As indicated (on the left side of the figure), a wide variety of standard sources of audio and visual input can be used to enhance the learning experience. The source of video can be a video camera, videodisc, or videotape, while audio input can be from a microphone, CD-ROM player, or tape/cassette unit.

The devices which integrate the audio and visual effects into the instructional material is shown at the bottom right of the figure. The video capture device and the audio capture/playback work in conjunction with a software product that mixes and coordinates the incoming signals. The attraction of this arrangement is that it greatly simplifies the blending of image and audio capture with software production, authoring and presentation capabilities. Consequently, even a novice can produce professional results.

Finally, a Local Area Network (LAN) can be used to provide a dynamic interactive connection between the instructor and the students.

Of course, not all of these devices are needed to develop this type of computer-based colloquium for actuarial science instruction. However, the minimum configuration required is an IBM PS/2 processor, or compatible, operating within a Microsoft Windows-based environment, and a software construction set.

## INNOVATIVE AND UNIQUE FEATURES

The discovery of innovative and unique features of a MCC-AS is an ongoing process, and we are constantly finding new, potentially fruitful areas to explore. Having said this, I will limit my discussion to four representative features. The four features are: the interactive data base; the coordination of the dimensions of a topic; bringing the "real world"

into the classroom; and examination and quizzes.

### Interactive Data Bases

Interactive data bases are an integral part of our MCC-AS, since they are used to explain, enhance, and dynamically analyze concepts during a classroom presentation. A number of different data bases can be developed. These include:

1. Decrement data, involving such things as mortality and morbidity statistics;
2. Historical data, such as information about notable figures like Benjamin Gompertz, a prominent early actuary, and Elizur Wright, a prominent early insurance commissioner;
3. Dynamic data, such as the San Francisco earthquake;
4. Mathematical equations, such as those used to compute the present value of insurance and annuities, and those used to compute risk factors; and
5. Industry data bases, such as time series data underlying loss ratios and expense ratios, company ratings, and other insurance statistics.

Thus, the system gives an instructor the means to link associated ideas using a customized data base. This means, for example, that, during a classroom presentation, you can link the discussion of insurance company charters to a copy of the 1758 letter confirming the granting of the Charter of America's first life insurance company. A portion of the screen which exhibits that document is shown in the following figure:

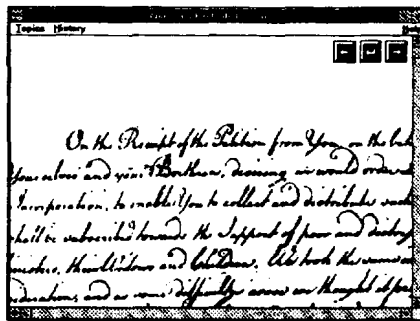


Figure 2: Linking Associated Ideas.

This linking ability is an extremely helpful device. It opens up the classroom to an environment where conceptual time travel, and the exploration of distant enterprises and

abstract concepts, is a common occurrence. By so doing, it helps to hold the interest of the students, promote interaction, and, all-in-all, enhance the learning experience.

### Coordination of the Dimensions of a Topic

One of the strength of our system lies in the fact that it allows the instructor to coordinate the different dimensions of a topic. This is exemplified by the following figure, which shows two electronic pages of one of the lectures from our Life Contingencies I course.

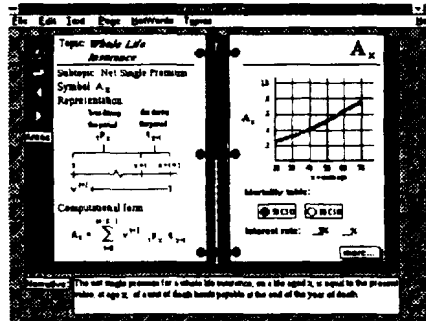


Figure 3: Coordinating Dimensions.

In this instance, the topic is whole life insurance, and the subtopic is net single premiums. The goal of the session is to convey the underlying concept, discuss the computational form, and analyze the dynamics of the function.

The underlying concept and the computational form are discussed on the left-side of the screen. A succinct narrative is given at the bottom of the screen. On the right-side of the screen, the dynamics of the function are investigated. Here, the impact of using different mortality tables and/or different interest rates is tested. As indicated by the "more....," further information on this topic is given on a subsequent screen.

A further item of note is that the menu at the top of the screen include the items "HotWords" and "Topics." By clicking "HotWords," the Reader can highlight special words on the page, which can, themselves, be clicked to obtain further information or clarification, or to activate an audio/video interface. In this instance, for example, "Net" is a hotword, as is the symbol. Clicking "Topics" will display all the topics in this particular book.

While packages of this type were created for classroom presentation, they also lends themselves to independent learning. In response to student requests, portions of the packages can be accessed from public terminals at the College. Students can use the packages for independent study and to reinforce class presentations.

## The "Real World" Comes to the Classroom

One of the shortcomings practitioners invariably attribute to universities, is that the "real world" is not reflected in the classroom. Students, they claim, cannot get a feel for an occupation or a sense of the workplace.

Full motion video can help overcome this problem. In fact, the resolution of this issue is one of the important features that makes the multimedia environment unique. Using this facility, your computer can receive and display full-motion video images from videodiscs, video cameras, closed circuit television or VCRs. By the same token, video stills can be captured and stored on the computer's hard disk for subsequent integration into the presentation. Thus, full motion videos and stills of the "real world" can be brought into the class room.

The following figure shows an example of the application of full motion video. In this instance, the person depicted is discussing the role of underwriting in insurance.

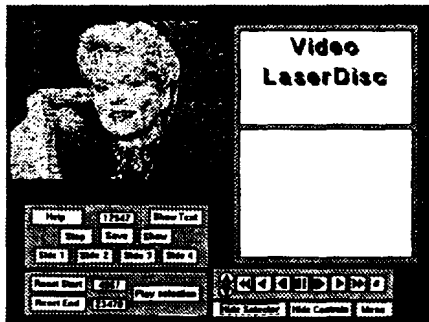


Figure 4: The "Real World"

As suggested by the controls at the bottom of the figure, the user has considerable discretion over a video. Options available through the computer include running the video forward and backwards, at various speeds; changing the volume; choosing a particular set of frames to be displayed; and exhibiting the text of the discussion.

## Examination and Quizzes

The standard form of examination and quiz computer data base is available in an MCC-AS environment. It is easily upgraded to incorporate new questions and provides random access to specific topics.

As a complement to this data base, we have constructed an Examination Preparation

Laboratory (EPL), which students can use to test their knowledge on a subject and identify areas where they are weak.

Of course, this question and quiz data bank (including password-protected extension) is available to the instructor, and can be used to give classroom examinations and quizzes. It can also be used in classroom discussion, to project a discussion point on the screen and have students respond via their personal keypads. This gives an immediate feedback as to the extent of the class's understanding of the topic, and helps dynamically adapt presentations to the needs of the class.

## **DOCUMENTED EFFECTIVENESS AND SPECIFIC BENEFITS OF THE PROJECT**

Much of the technology incorporated into this project is of relatively recent vintage. The software construction set, for example, did not formally appear on the market until the spring of 1990 and the audio-video facility is still referred to as a "new product". Nonetheless, there is strong evidence that an MCC-AS is an extraordinarily effective teaching tool.

Perhaps, the best evidence of this comes from students. Since the project has been underway, numerous unsolicited students have volunteered to participate in the MCC-AS project. Their interest has varied. In some instances, they were interested in "playing" with the instruction modules; in other instances, they wanted to help build such modules; in still other cases, they simply offered constructive criticism on how the MCC could be improved or modified. As a general rule, graduate students are enthusiastic about using an MCC for their coursework presentations.

This is not to say that there is no hard evidence on the potential effectiveness of a MCC. To the extent that our prior actuarial science instruction configurations were the building blocks upon which our current configuration relies, there is a good deal of documentation. The general thrust of prior and current student evaluation forms is that the MCC produces an interactive classroom environment that is conducive to learning and enhances the learning experience. A similar conclusion can be drawn for the self-study module of the MCC.

There also is compelling indirect documented evidence of the success of an MCC environment. It is an outgrowth of the widely acclaimed technology that created the "Writing to Read" program, which thousands of elementary schools use to help teach their kindergarten children to write what they can say and read what they have written. It is an enhancement of the successful HyperCard technology of the Macintosh. Lastly, it allows the actuarial science instructor to use and create courseware that can capture the imagination of the video-games generation, and use to advantage their addiction to computer graphics and simulation.



## PROGNOSIS

During the last 15 years, I have used various computer-related technologies for instructional purposes in actuarial science courses. This has included the use of mainframes, mini-computers, micro-computers, and an array of software, including the major languages, spreadsheets, text processors, and presentation software. The configuration depicted in Figure 1 is by far the most dynamic and productive one for actuarial science instruction that I have ever been associated with. There is no question in my mind that a multimedia computer-based colloquium will be an integral part of the state-of-the-art actuarial science classroom of the future. Multimedia will have as large an impact on instruction as the microcomputer.

