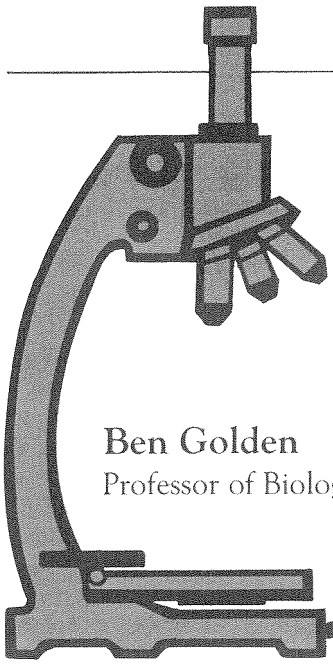

DEVELOPING COMPUTER-ASSISTED INSTRUCTIONAL PROGRAMS

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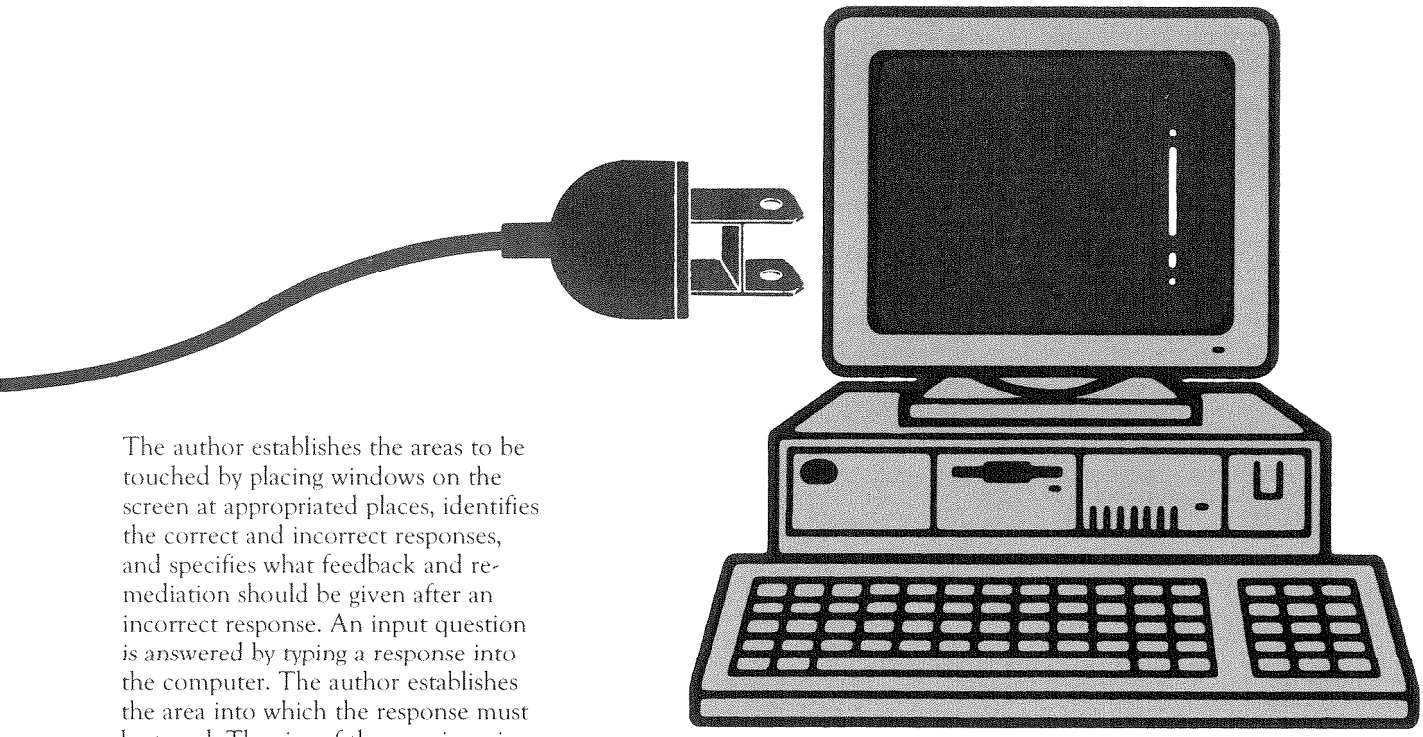
Whenever I listen to any teacher discuss his/her work, a remarkably similar group of concerns always seem to emerge. The details vary with the discipline and with the age of the students, but the struggles are fundamentally the same. How can I give this individual the attention he/she requires without short-changing the rest of my students? How can I fully develop these ideas without short-changing other important ideas? How can I teach from my own perspective and with my own style without ignoring individual differences in my students? How can I give my students all they need and still have a life of my own?

As one who is always struggling with these issues, I have found a solution which is helping me. I long ago saw that individualized, interactive, student-paced lessons would solve the personal tutoring problem for many students. Designing such lessons, with my own style and perspective, around the most frequently repeated errors and difficulties could provide my tutoring without directly tying up my time. I also saw such lessons as a way of expanding the content of my courses by allowing me to present topics I would be forced to skip in a class situation. However, the available presentation methods seemed so uninteresting and difficult to develop that I never attempted it until I was exposed to the capacities of the personal computer. I quickly realized that the computer could make developing this kind of lesson worthwhile. Among the things that excited me about the computer's possibilities are its potential for presenting information in a variety of stimulating ways; for actively involving the student; for self-pacing; for giving immediate feedback; and, most importantly, for diagnosing specific difficulties and individually routing the student through activities designed to alleviate his/her particular problem. I began working on putting together a system which would combine an interesting student-interactive presentation with a strong, versatile answer-judging capacity. Through the cooperation of many people, especially Dr. Herbert Davis, Dean of the School of Science and Allied Health and Dr. Dorothy Zinsmeister, Chairperson of Biology, a wonderful system is now available and in use at Kennesaw State College.

The hardware is an IBM Personal Computer, with a hard-disk drive and with enhanced memory and graphic capacities. The monitor is an Infowindow touch-screen and voice-synthesizer system. A Pioneer video-laser disk player has recently been added.

The software used is the *IBM Learning System I Authoring and Presentation System.* It is a menu-operated authoring system which is amazingly simple to use. It supports designing student-interactive and student-paced lessons using a combination of graphics and text. Graphics can be developed within the system from a moderately versatile graphics design program or can be imported from IBM or IBM compatible drawing programs such as *Story Board* and *PC-Paint.* Graphics from any video-laser disk compatible with the player can also be used. The graphics can be manipulated in a number of ways to achieve simple animation. Text can be presented in a choice of six letter sizes, sixteen colors and seven fonts on a background of any one of the same sixteen colors. Screen placement for a line of text or a graphic is controlled by a PC-mouse. The coordinates are automatically recorded and require no manipulation by the author. The system includes a voice synthesizer with a moderate vocabulary of frequently used words, computer terms, and numbers. The appearance of graphics or lines of text can be sequenced by overlaying variable sized windows anywhere on the screen. This feature allows for text or labelling to be added to a graphic or for a question to be presented without removing a graphic. The system can take a single frame graphic from the video-laser disk or can be used to show sequences of frames such as short movies. The window system also works in conjunction with the video-disk.

The *Learning System I Authoring and Presentation System* includes a remarkably sophisticated answer-judging system limited only by the author's ability to anticipate student responses. The system can judge answers to two types of questions, select and input. A select question is answered by touching an area of the screen. This type of question can ask the student to identify a particular feature of a graphic or to answer a multiple choice question by touching the screen over his/her choice.



The author establishes the areas to be touched by placing windows on the screen at appropriated places, identifies the correct and incorrect responses, and specifies what feedback and remediation should be given after an incorrect response. An input question is answered by typing a response into the computer. The author establishes the area into which the response must be typed. The size of the area is variable and should reflect the amount of typing required for an acceptable answer. Input questions can range from fill-in-the-blanks to open-ended questions such as "Why did this happen?" The author identifies possible correct and incorrect responses and determines whether to accept capital or lower case letters, numbers or words, specific spellings, specific words, specific orders of words, specific spacing, and specific punctuation. Appropriate synonyms can also be identified. The author then specifies what feedback and remediation should follow a particular incorrect response. Questions can be dispersed through the lesson to evaluate the student's understanding of the information or can be grouped as a test at the end of the lesson. The student's test scores are recorded without any chance of the student altering the report. When questions are used as a diagnostic tool to check on the students understanding, the program evaluates the students answers, provides written and/or verbal feedback about incorrect answers followed by another chance to answer the question and/or by remedial activities.

The *Learning System I Authoring and Presentation System* allows the author to sequence the primary lesson and to determine individualized routes for specific students. The author can develop glossary and student help supplements into the lesson that the student may access at any time. A menu feature can be used to give the student options in the flow of the lesson. For example, the author can construct a menu which gives the student the option of reviewing or repeating a part of a lesson. I have been working with this system for two years and have several programs in student use at this time. One is used in Biology 104 laboratory, another on blood-typing has been used in our Nursing Anatomy and Physiology course. A SALT student has learned the system and has programmed a course on Human Genetics developed by Dr. Kathleen Fleiszar as a supplement for a class. I was given a Summer Instructional Enhancement Grant in 1988 to develop a Computer Assisted Instructional Software Package for use in Science 301: Science Concepts. I have completed a five-module program, entitled "The Origins of Our Current Models of Matter, Energy, and Motion," which deals with how energy and matter are currently defined, how these concepts have been defined at various times in the past, and the events, philosophies, and experiments that have caused these definitions to change. The work of researching the topic and planning the presentation is as time consuming as preparing for any new lesson and constituted a major part of my work on the grant. The development of the graphics was time consuming but great fun. The actual programming of a major lesson required less than a day's work.

The "The Origins of Our Current Models of Matter, Energy, and Motion" program has been used with two sections of the Science 301 course. In the first section, it was used as a reinforcement for content covered in class discussions. In the second section it was the only presentation of the information. Students in both sections scored very well when tested on the lessons. About 60% of the students in both sections rated the program as excellent, 30% rated it as acceptable and about 10% as poor. While I hope to improve the efficiency of the lessons, I am very happy with the results. I know I have a workable method of solving these problems, and that is very exciting. I would be most happy to share the equipment and my expertise with any interested in these approaches.