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SOFTWARE REVIEW

BASIC MEDICAL PATHOLOGY: CELLULAR ALTERATIONS AND ADAPTATIONS*

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OVERVIEW AND PURPOSE

Cellular Alterations and Adaptations is part one in a currently five, but planned eleven, part series in basic medical pathology. The MS-DOS version of this first program was released in 1984 by the National Library of Medicine (NLM) as part of a project instituted in 1980 on computer-assisted curriculum delivery systems. Some 57 US, Canadian, European, and Philippine health profession schools, including over 2,000 students and faculty, have been involved with the evaluation of this first program. Reported student and faculty evaluations have been positive (12).

The series of programs in pathology, of which this program is a part, will most probably establish standards in image resolution for interactive video in basic health science education for some time. The program, Cellular Alterations and Adaptations, uses many sound instructional strategies coupled with high-resolution delivery of extremely clear videomicrographs to teach basic concepts in pathology.

Entry into the program places the student within a menu in which initial choices are: (a) pretest, (b) mini-lecture, or (c) quit. Since this program was developed as part of a research initiative by NLM, data are collected on student performance and made available to the National Library as part of a use agreement. In addition, students are requested to take the pretest prior to the mini-lecture so that accurate data may be developed on the impact of the program reflected by differences in pre- and posttest scores.

After completing the pretest, the learner is given access (via a revised menu) to the study module. Upon completion of the study module the posttest is placed on the menu. After the posttest, all options (mini-lecture, pretest, study module, and posttest) are available for review (score data are collected only on the first pass).

The 27-minute video lecture is clear, concise, and presents objective-supporting concepts in an organized and logical manner. Introduction of terminology such as atrophy, aplasia, hypoplasia, hypertrophy, hyperplasia, and metaplasia is accompanied with definition, general schematic visualization, distinguishing features for differentiation from related terms, causes,

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and examples. Since the emphasis is on cellular alterations, liberal use is made of split-screen presentations, allowing contrast between normal and abnormal, an important strategy for using the program with learners who lack a histologic background. The learner may choose to pause, move forward, or move backward at any time during the presentation.

The study module is composed of a series of 40 randomly drawn questions with reenforcing or corrective feedback. Questions may or may not have accompanying videomicrographs which are taken from the video lecture. On completion of the study module, the learner may either repeat the module, take a posttest, or opt to repeat the lecture. Questioning strategy within the pre/posttests requires correct answers before the learner is permitted to proceed.

SCHOLARLY CONTEXT

Previous attempts to teach visually dependent courses such as pathology have relied on a hands-on laboratory (2,11), video tape/slides (3, 5, 9), closed-circuit television (3), or computer-based programs (1, 7) in which images are represented in schematic. This program allows the student to interact with the lecture material with microscope in hand.

The stated primary instructional goal for this program is to present the basic physiologic concept that a cell may undergo reversible changes while still in fine tune with its environment. In this regard, the program accomplishes its goal. Several traditional texts in pathology introduce this science with comparable concepts (4, 6). A distinct advantage of the interactive video program, however, is the capability to immediately test the learner on visual recognition of these changes. As adult learners, health-science students prefer to apply what they learn shortly after learning it (8), and this is a strength of the program. In comparison to other modes by which these concepts may be presented, students in my pathophysiology course find linking information, visual imagery, and questioning with immediate corrective feedback to be an efficient and effective mechanism for curricular delivery. It would, at best, be difficult to deliver these objectives as effectively and efficiently by other mechanisms. Cellular Alterations and Adaptations offers an alternate learning resource for presenting certain pathologic concepts that have been previously presented in a variety of other forms.

Overall, this program is a useful teaching aid that can be used independent from laboratories/lectures to teach the basic concepts of cellular adaptation and alterations in response to environmental stresses or may be used more ideally in conjunction with lectures in linking concepts to laboratory preparations. The program follows a simple strategy in interactive video, namely of linking a lecture with a question/answer session to reinforce objectives. It would be difficult to use the videodisc in any other forum. The video is not a large collection of micrographs, as has been produced by others (10), that might be used alone or tailored to augment a series of lectures in pathology. Instead, the video uses a limited number of quality slides as a lecturer might in a single session on introductory pathological concepts. In addition, there is not a large database of questions about the videomicrographs that could be used without the lecture.

In summary, this program is unlikely to change the student's basic understanding of pathology or the understanding of these concepts. It will, however, allow an easier learning process for many students in basic pathology.

PERSONAL REACTIONS

I found the program, Cellular Alterations and Adaptations, to be a useful alternative for delivery of these basic concepts in a traditional lecture forum. Other than the problems

outlined below, the program was an excellent link between the visual imagery and information by discourse, and I would feel comfortable in recommending its use in a health science environment. The program would best be used in medical pathology but may be useful in other health-care curricula where pathology may be important. This educational program may be a suitable substitute for lectures over comparable topics. Prerequisites, although not listed within the program itself, should include basic medical terminology and histology for maximum impact.

Several times within the module, the learner is asked to identify tissue type, e.g. discern whether the tissue is testis or ovary, when the goal of the program deals with conceptual changes. If tissue recognition is an objective, then mechanisms for that identification perhaps should be presented or reviewed within the module. This may only be frustrating to students who may lack a background course in histology. Students within my course in pharmacy pathology voiced these frustrations after using the program.

Choices of slides for the presentation and study module, although excellent in quality, might lead the learner to believe that tissue alteration could be identified simply via staining qualities of the tissue. For example, when asked to identify an abnormal feature within a tissue, often examples of alterations consistently involved preparations with less staining contrast than their normal counterparts. This could allow the learner to easily guess that the tissue was atrophic by noting the diminished density of staining without recognition of any other feature. If this is a marker for recognition of this alteration, then perhaps the learner could be told and tested on incorporation of this tool for problem solving. In addition, if other diagnostic markers are useful, e.g. increased or decreased organelles within a cell, then the learner could be questioned and reinforced in the use of the features as diagnostic tools. In that context this may be an educational flaw, particularly when the program is used by students who may be required to visually recognize cellular alterations. This may not be as important when the program is used by nonmedical students who may not be required to visually recognize change but instead are queried at a conceptual level.

Instructional/logistical problems associated with data keeping routines were encountered during student usage. These problems included inflated pretest scores as a result of students retaking pretests following completion of the program, and/or student sharing of identification numbers required for entry into the program.

When questioned on videomicrographs, the learner is informed of several options for controlling the image: contrasting normal with abnormal, receiving a brief video help sequence, or changing the magnification of the image. These features, although an extremely important aspect of the strength of this approach, did not always work as advertised or its availability was unclear to the learner. In addition, there are no mechanisms for quickly moving to any particular location within the lecture itself; it must be viewed in a linear format. The option to review each question within the module following response is available. This allows the learner to read all feedback on incorrect responses without being penalized on score, an excellent instructional strategy.

Although the forcing of the learner to type in the correct answer before moving on may be a good educational approach, after two attempts most input is based on guessing. It would seem more appropriate to provide the correct answer after two attempts and then force the learner to enter the correct response prior to moving forward. At the conclusion of each testing sequence, the learner is presented with a score for performance and a diagnostic statement. These general statements assist in giving direction to the student in cases in which additional work may be necessary.

A student instructional management program maintains data on each student, including cumulative time in the program and pre- and posttest scores. Minor statistics, including mean and standard deviation, are calculated for all students.

Medical as well as pharmacy students who used the program at this institution were positive in their overall program comments. In comparison, the medical students found the program to be more useful and helpful in learning the educational concepts presented.

OVERALL EVALUATION

I recommend this program for use in medical pathology as a supplement to a lecture/laboratory sequence on the concepts of cellular alterations/adaptations. I do not recommend this program as an independent, exclusive resource for teaching these concepts.

BASIC PROGRAM DATA

Cellular Alterations and Adaptations is appropriate for use in basic medical curricula, other health care areas including dentistry, pharmacy, nursing, etc., as well as graduate school curricula in the life sciences. It requires one to two hours of contact on the average for students to complete. Of that time, a video lecture comprises 27 minutes, self-assessment with help sequences/feedback about 30-45 minutes, and pre- and posttests each requiring about 15 minutes. Students should be able to master the educational concepts addressed within this program if they completed the program a second time.

All of the pathology series programs require MS-DOS or PC-DOS computers with a minimum of 384K main memory. The system must also have an RS232 or serial communications port and either a hard disk or two floppy diskette drives. Approximately one megabyte of disk storage space is required for the currently available programs (5). The pathology programs accept input for either keyboard or lightpen and support seven videodisc player(s) interfaces. These players include:

Hitachi 9500 series
Pioneer LD-V4200
Pioneer LD-V6000 series
Pioneer 7820-3 with SIA
Pioneer 7820-3 with UVC
Sony 1000a
Sony 2000/1

The main driver routines for the program are written in the BASIC language.

At the present time, Basic Medical Pathology: Cellular Alterations and Adaptations is available to health professions schools in a beta test mode. There are no fees for the software or videodiscs; however, schools would need appropriate equipment. Contact:

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