

PC GI Board Review

A ToolBook Application for Postgraduate Review of Gastroenterology

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ABSTRACT

"Hypertext" applications have become an important educational resource for medical teaching. ToolBook version 1.5 allows the import of SVGA 256 color, 640x480 pixel images. We developed a program for the review of Gastroenterology by Subspecialty Board applicants which included digitized pathology, endoscopy, dermatology, and radiology images interfaced with textual description. 5 cases were presented with 6 questions per case to test the user's comprehension of the material. A scoring function was included to give feedback to the users. An evaluation questionnaire was also completed to survey user satisfaction with the program. A similar "shell" could be applied to other teaching programs.

INTRODUCTION

We developed this application particularly for physicians at the Fellowship and Attending level who were either preparing for the Subspecialty Board exams in Gastroenterology or reviewing for continuing medical education purposes. In order to provide a complementary learning aid for a biennial Board Review course for the Gastroenterology specialty, sponsored by George Washington University Medical Center, we developed a case-oriented collection of images and text questions to help candidates (fellows and practicing gastroenterologists) preparing for their Board Exams.

As we had previously used Zenith Data Systems computers equipped with Flat Tension Monitors (FTM-1490) for development of other teaching programs [1], we continued to use 640x480 pixel, 256 color images in "superVGA" mode when developing this application.

Our specific aims were to produce a hypermedia system that would give access to endoscopic, xray, pathologic (both gross and microscopic) and

dermatologic images. These images could become integral parts of text-based case scenarios. A series of questions could then be asked which could test the user's grasp of the key concepts of each case. Feedback could be given to the user via a scoring system. Finally, a prototype program (consisting of 5 case scenarios) was tested on participants of the George Washington University Board Review Course, October, 1991. Questionnaires were administered to determine user acceptance of the software and to help in obtaining advice for future development and improvement.

METHODS

Image Capture

Xrays (flat plates, upper GI, small bowel series, CT scans, etc.) were first backlit and photographed to provide high contrast Black and White 35 mm slides. Pathology slides were photographed to produce color 35 mm slides. Endoscopy images obtained via Mavigraph (Olympus Corporation) were scanned directly with a desktop Howtek Scanmaster (Howtek, Hudson, NH). 35 mm slides were digitized using the Dept. of Pathology's Barneyscan 35 mm slide digitizer linked to a Macintosh II computer. Barneyscan XP with Quickscan (Adobe Photoshop) software allowed for image capture and modification of both gray scale and color images. Graphic images were stored at 640x480 pixels x 24 bits of color and converted to TARGA 16 file format (.TGA). Apple File Exchange software and a Macintosh Superdrive (courtesy Dr. Jon Merrill, Dept. of Computer Medicine) enabled conversion of the images to an MS-DOS format. The CHROMATOOLS program (Videotex Systems, Dallas, TX) was then used to convert images to 256 color, 640x480 pixel .PCX files. These files were then imported to Microsoft Windows 3.0 Paintbrush program and converted to 256 color bit-map files (.BMP). These .BMP files are directly useable by TOOLBOOK version 1.5

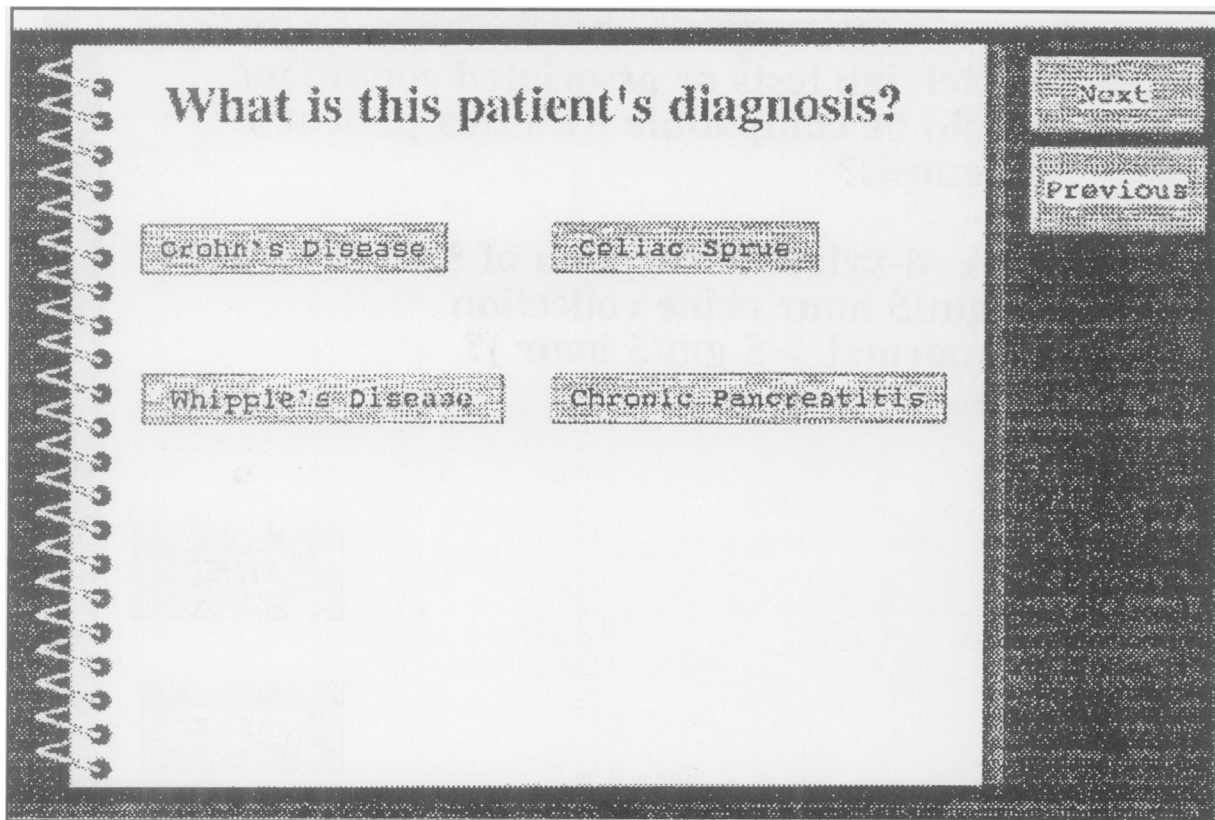


Figure 1 Typical "diagnosis" screen from this ToolBook application

(Asymetrix Corp., Bellevue, Washington) (One image per TOOLBOOK "page" was imported).

Program Development

The cases were developed with the latest version (1.5) of TOOLBOOK, an object oriented hypermedia authoring system which runs under Windows 3.0 (Microsoft, Redmond, Washington). TOOLBOOK is similar to the HYPERCARD/SUPERCARD programs developed for Apple computers. Pages are linked via "mouseable" buttons and "hotwords" in a non-linear fashion. The individual page structure is flexible and graphics and record fields may be placed anywhere on the pages. Open Script, the scripting language of TOOLBOOK, allows for a variety of techniques in programming. TOOLBOOK uses Windows' DLL (dynamic linked libraries) and DDE (dynamic data exchange) for extra flexibility.

Content

The demonstration program was composed of 5 representative clinical cases in the Internal Medicine subspecialty of Gastroenterology. Several pages of text outlining a brief clinical history and lab data were enhanced by the inclusion of 3-4 images per

case (see Image Capture). After working through a case, the user would then be prompted to select a diagnosis (Figure 1).

6 questions per case were asked, to test the user's knowledge of the diagnosis (Figure 2). For these cases, all user responses to questions were "point and click" in nature using a Microsoft Mouse. No typing from the keyboard was required. After all 5 cases were complete, a scoring function (written in Open Script) was accessed which gave the user an indication as to his/her performance.

Development Platforms

Zenith Data Systems 386/25 computers with FTM-1490 monitors were used to produce the software (there are many Zenith 386SX and 386DX computers already available for computer medicine instruction at our medical center). This was a logical platform with which to develop the program. In addition, Paradise VGA (Western Digital), Orchid ProDesigner IIs or ATI VGA Wonder (ATI, Scarborough, Ontario, Canada) video adaptor cards were used along with the appropriate WINDOWS 3.0 software drivers (supplied by the VGA card manufacturers) to enable 640x480

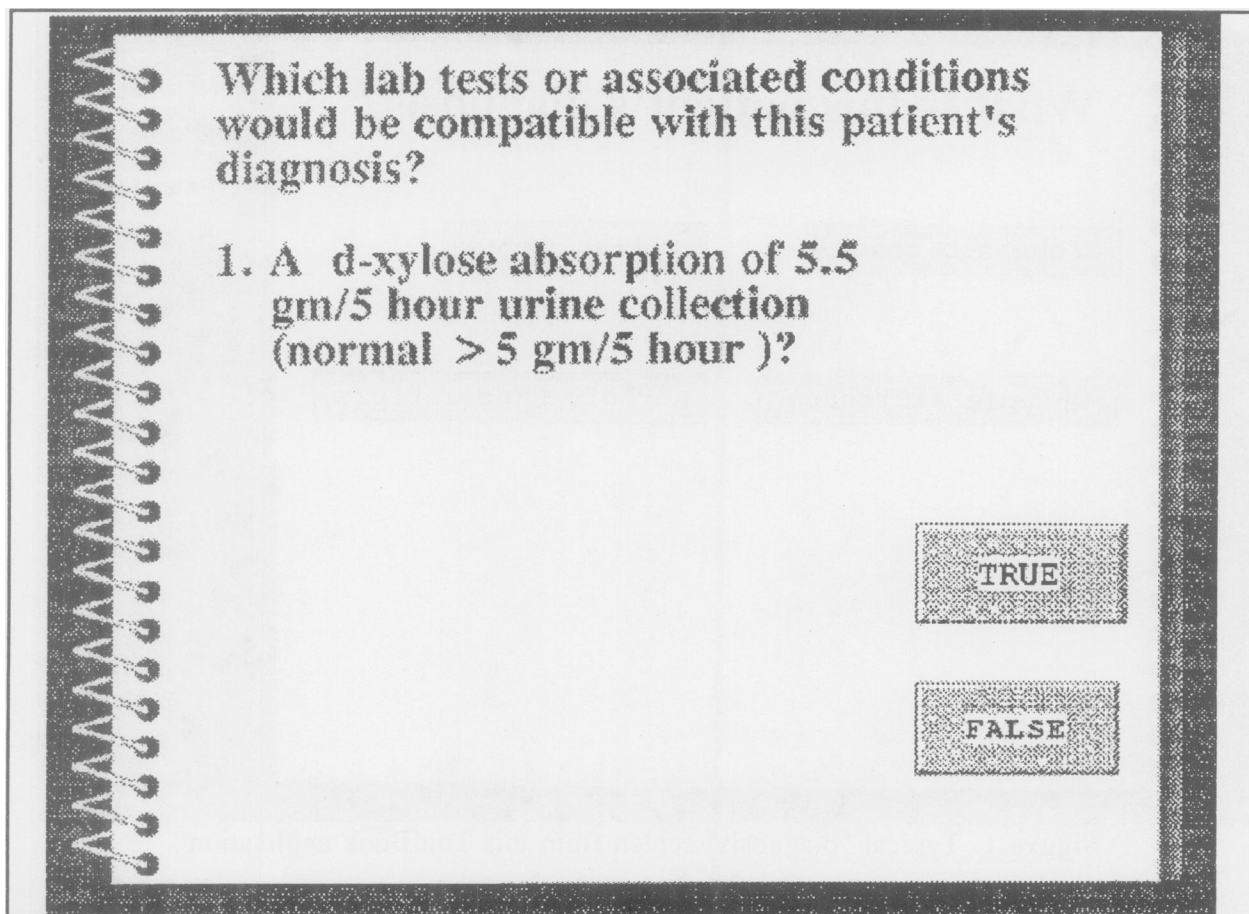


Figure 2 Sample question screen for this application

pixel 256 color resolution of the images.

RESULTS

The total size of the demonstration program was approximately 6 MB. Each case (slightly over 1 MB per case) consisted of 20-30 "pages" and was saved as a separate *.TBK file. The *.TBK files were all linked via Open Script programming. Although developed on 386/25 machines, the program was actually run on 386SX/16 systems with 4MB RAM, 80 MB hard drives, and Paradise 1024 VGA cards with 512K RAM. 36 participants at the Board review course used the program and responded to the questionnaire (all 36 users remarked that the quality of the images was excellent). The questionnaire is shown in Figure 3. The users found the program very easy to use ($4.44 \pm .13$, mean \pm SE on a scale of 1-5). The learning effectiveness was also very good ($4.54 \pm .10$, mean \pm SE on a 1-5 scale). In addition, efficiency of the software received high marks -- ($4.33 \pm .15$, mean \pm SE on a scale of 1-5). 31 of 36 participants felt that even more imbedded textual image description would be desirable. All users felt

that more cases should be developed, and 35 of 36 thought that a computer exercise was a useful addition to a Board Review course. Interestingly, 16 of 36 users did not own personal computers, so the program appeared to be equally useful (robustness) to the typical physician taking the GI Board exams. Comments were overwhelmingly quite favorable.

DISCUSSION

The most popular and highly regarded aspect of this program (by the users) was the image quality (see Results). The FTM-1490 monitor and appropriate superVGA adaptors produced clear reproduction of xray, pathology, endoscopy and dermatology material. One of the liabilities of the initial version of TOOLBOOK (version 1.0) was its limited page size (64K). This made it impossible for the program to display 640x480 pixel, 256 color images, as the size of a typical image is about 300K. The current v. 1.5 of TOOLBOOK is more versatile, being able to easily display such large image files (page size 1 MB). As

noted above (see Results), the demonstration was run on 386SX/16 computers, which elicited user comments such as "screen update too slow", "program too slow", etc.) from 2 of 36 subjects. The demo version of the program asked whether changes to each *.TBK file should be saved upon exit. Also, when moving between "pages" with different 640x480 pixel, 256 color images, a lingering "reverse color image" of the graphic would temporarily appear, "slowing" perceived program execution. We found that by setting the sysChangesDB Open Script command to "false" on the enterBook script for each *.TBK file, and by using the fxWipe and fxDissolve commands when moving between "pages", we were able to smooth the execution of the program as noted by the users.

This is the first program developed specifically for teaching and review of the Internal Medicine subspecialty of Gastroenterology at the Fellow/Attending level using the ToolBook/Windows interface. We are continuing development of this program using each case as a separate *.TBK file. This modular construction allows us to easily add more cases and link the *.TBK files together from a Table of Contents page. The program will be available to Attendings, Fellows, House Staff, and medical students using the computer resources of the Himmelfarb Medical Library and Dept. of Computer Medicine. If future work with this type of approach continues to be successful, other clinical case-related TOOLBOOK applications could be developed using a similar "shell" in other areas of undergraduate and Continuing Medical Education. Now that the WINDOWS multimedia extensions (MME), WINDOWS 3.1 and the MultiMedia Resource kit for TOOLBOOK are available, video and sound enhancements may further add to the versatility of this learning environment.

ACKNOWLEDGEMENTS

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REFERENCES

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Figure 3

GI Computer Board Review Questionnaire

1. How would you rate the ease of use of this program?

1 2 3 4 5
Difficult Easy

2. How would you rate the learning effectiveness of the program?

(Did it help you learn or review the materials?)

1 2 3 4 5
Poor Excellent

3. How time efficient did you find this program?

(Was it worth taking the time to review in this format as compared with reading, tapes, etc.?)

1 2 3 4 5
Poor Excellent

4. Would a program like this with even more imbedded textual description of the xray and pathology images improve your ability to learn the material?

Yes No

5. Would you like to see more of these modules?

Yes No

6. Can you see this as a useful addition to the traditional GI Board Review Course?

Yes No

7. Do you own a personal computer?

Yes No

If YES, please answer questions 7A-F

A. Apple or IBM/Clone? If IBM/Clone, what
CPU? (8088,80286,80386,80486)

B. Do you have a hard drive? What size in MB?

C. What type of floppy drive?

3.5" 1.44 MB

3.5" 720K

5.25" 1.2 MB

5.25" 360K

D. What type of graphics?

Monochrome

EGA

VGA

SuperVGA

E. Do you own a mouse?

F. Do you own a modem?

G. Do you own a CD-ROM?

Do you have any comments or suggestions for us?