CS5604, Course Format

Edward A. Fox
Department of Computer Science
Virginia Tech, Blacksburg VA 24061-0106

Abstract:

Since 1992, CS5604 has been offered in a new format that synthesizes educational and technological approaches oriented toward improvements in motivation, comprehension, test performance, grades, study skills, retention, and student satisfaction. The key features are discussed and explained, including: modularity, personalization, testing of mastery, tutoring, computer demonstrations, illustrative exercises, intensive practice in technical reading and writing, and use of a digital library. All students should read this explanation carefully, and follow all relevant instructions given in the ***DLPSI****,* ***Timetable and Events****, and* ***Reading and Writing*** *sections.*

Digital Libraries

Improvements in storage technology and computer networks have made possible the creation of collections of articles, books, multimedia documents, and other results of an emerging electronic publishing industry. Advances in information access theory, techniques, and systems allow these collections to become easily accessible for searching, browsing, reading, research, and re-use - transforming them into value-added digital libraries.

Building upon various research projects at Virginia Tech, and using resources of the Computing Center and the Department of Computer Science, Project Envision was funded for 1991-95 by the National Science Foundation, and aided by ACM. This project, to build a User-Centered Database from the Computer Science Literature, has

supported CS5604 by providing access to readings, hypertext collections, algorithms, images, and specialized software. Another project, Interactive Learning with a Digital Library in Computer Science, has NSF support for 1993-97 and continues these efforts. Project results will be made available for class demonstrations, laboratory exercises, homeworks, and independent research.

Personalized System of Instruction

Keller Plan

In the 1960's, Fred S. Keller, J. Gilmour Sherman, and others developed a synthesis of educational methods and practices that has often been called the Keller Plan or the Personalized System of Instruction (PSI) [3][2]. Key aspects of this teaching method include [1]:

go-at-your-own-pace
: so students can proceed according to their abilities, interests, and personal schedules;

unit-perfection requirement
: which means students must demonstrate mastery of a unit before proceeding to other units;

lectures and demonstrations for motivation
: instead of for communication of critical information;

stress on the written word for teacher-student communication
: which helps develop comprehension and expression skills; and

tutoring/proctoring
: which allows repeats on exams, enhanced personal-social

interaction, and personalized instruction.

Research studies have shown PSI to have a number of advantages over conventional educational methods, and few serious disadvantages. Students, especially those who would normally perform at the lower or middle levels, learn significantly more, as measured by final examinations and by tests of long-term retention (given years later). They like the classes and tutoring, and develop good habits that carry over to other courses and learning activities. Disadvantages are mostly concerning extra effort being required by the instructor, a higher drop rate in some courses (especially by students who cannot break their habits of procrastination), and extra space requirements.

Adapting to our Graduate Program

To adapt PSI to CS5604, several changes or additions seemed appropriate. First, given the scarcity of GTA support, it is necessary for the instructor to play the role of proctor and tutor too, during office hours and during specially scheduled appointments. Second, given space limitations and the current lab situation for Computer Science, it is necessary to hold lab sessions only on occasion during class time; usually students must work in the lab at other times. Third, given the availability of computing resources, it seemed sensible to use electronic forms and electronic mail as much as possible, to encourage additional communication with the instructor and to avoid needless use of paper. Finally, due to space limitations, it was decided that regular class periods would be used for motivational lectures, which has the added benefit that the suggested schedule of unit completion would be strongly supported by those short presentations.

DLPSI

The course format for CS5604 is thus an adaption of PSI, making use of digital library support, and adjusting for the situation at Virginia Tech in Fall 1994. The main elements of this Digital Library

Personalized System of Instruction (DLPSI) are given below. Students should read these explanations carefully, and ask about any questions that come to mind. Remember that improved reading comprehension is a key objective of this course, but that the instructor is happy to provide tutoring assistance to all students as needed.

Units, Grades, Procrastination

- The course has 11 units or modules, each designed to be completed in a 1-2 week period if a normal pace is followed, with the number of points credited from mastery of each unit keyed to the amount of work (i.e., 10 points for units taking 1 week, 15 points for 1 1/2 weeks - see syllabus for details).

- The grading plan given in the syllabus gives students flexibility regarding amount of work, but less work (i.e., fewer units completed), or a poorer showing on the final, will result in a lower grade. Thus there is nothing arbitrary in the grading, and anyone should be able to get a course grade of A, if an adequate amount of work is performed.

- To complete a unit, a student must demonstrate mastery. This is done by passing a quiz, where a grade of 90% or higher is required. Quizes are graded as soon as possible, and students may request re-consideration of the grading. This is one situation where tutoring takes place - students must convincingly explain and justify their answers to receive credit, but otherwise will be referred to further reading or exercises aimed at improving comprehension.

- Students who do not pass a unit quiz can take an alternative quiz on another day; there will be a total of 3 quizes available for each unit. If none of these are mastered, the student must pass an oral examination given by the instructor in order to complete the unit. A student's grade in the course is not lowered because of taking multiple quizes for units.

- The Honor Code is in effect in this course. All quizes, oral examinations, and the final must reflect individual effort. Open books and open notes are allowed, since comprehension as opposed to memorization is called for at the graduate level. Note however that students should learn course material well, since quizes and the final will be timed. Unless otherwise indicated in writing, other work for this course can be carried out in groups, since at the graduate level it is important to learn how to work with your colleagues on research problems, and employers favor good collaboration and discussion skills. If homework or other exercises are turned in on paper or electronically, as the result of efforts by several people, please be sure to give the names of all students who contributed.

- Discussions with the instructor about quizes should be deferred to times and locations that assure privacy. Quiz question and answer booklets or electronic files should not be shared with others, and will be retained by the instructor when not in use.

- **Procrastination is the number one danger with DLPSI.** You should target completion of each unit soon after the days for that unit have passed. The instructor will maintain a chart showing unit completion of all students in the class, so you can compare your progress. You will be warned if you are falling behind, by email. Please, please talk with the instructor if you have any problems! Do not be afraid to discuss these matters, or any special problems that arise. However, procrastination is a bad habit that must be broken, so the instructor will generally refuse to give any unit exams after the last day of classes. No work turned in after the final will be counted. Further, the instructor plans on only one sitting for the final, at the assigned time.

Readings

- Aside from the textbook, all readings and multimedia resources used for the course will be available on computers. Students who

sign the appropriate forms (indicating their willingness to follow the Rules of Acceptable Use) will receive accounts on one or more of the following: a Personal DECstation (fox.cs.vt.edu), a SPARC 10 Model 40 (video.cs.vt.edu) and a DEC Alpha (nova1.cs.vt.edu or ainur.cs.vt.edu) in Northern Virginia. Use of other computers will occur as needed, such as on machines that run under the Macintosh or Windows operating systems. Students who lack access to the CS labs should contact the instructor to get the necessary authorization and access card.

- Once the textbook is obtained from a bookstore, a student will be able to read those chapters listed in the syllabus. Most of the code shown in the textbook is available online and can be experimented with.

- Other course readings will be available in several ways. All of the readings listed on the syllabus are available on reserve at the library. Since the articles appeared in *Communications of the ACM*, they also should be readily available from the library stacks or personal collections.

- As a result of Project Envision, all of the supplemental CACM articles are available in page image form (CCITT Group IV facsimile format). Either the xv or xtiff programs can be used to read articles, but xprcedit is even better. The files are all stored on video.cs.vt.edu in /u4/pages/acm/cacm and can be located given the volume and issue numbers as well as a short key for each article. Each article is stored in a separate subdirectory, containing a separate file for each page. Thus, in /u4/pages/acm/cacm/v34/n10/SAMU91a will be six Group IV tiff files: 0000.tif for the first page, 0001.tif for the second page, etc.

- Online copies of documentation for software packages used will be available in several forms. There will be standard UNIX-style *man* pages, PostScript files, and simple ASCII files.

Timetable and Events

For the course as a whole, the overall timetable is given in the syllabus. For each unit, a handout will be provided, on or before the first date listed for that unit in the syllabus. Please read this over right away. During the dates listed, any special lectures, discussions, demonstrations, lab exercises, field trips, etc. that relate to that unit will take place. Students are invited and encouraged to attend, especially if they fulfill all of the prerequisites listed.

Note that the instructor is involved in a great deal of professional service activities, and constantly tries to bring back new knowledge that relates to this and other classes. As a consequence, he will miss a number of class sessions due to travel. Some of the field trips and guest lecture activities will take place at those times. Other special lectures will take place when visitors interested in departmental research work come and give seminars.

If nothing is scheduled, students are encouraged to come to class to pick up any new materials provided. Also, they can read or do exercises, and ask questions of their colleagues or the instructor. As in many graduate classes, some students have little background in the field, while others are involved in research projects and have a great deal of specialized knowledge. When students with diverse backgrounds work together, all benefit - those who tutor others often learn more than those who are asking for help.

Working in the laboratory is another alternative to attending class, of particular value when nothing is scheduled, and when there are demonstrations or exercises involving computers. Part of the DLPSI experience is to use computers and software to obtain some insight into how digital libraries of the future might operate. Be sure to share your comments, preferably in writing, with the instructor, so we can improve things for others.

Remember that the core of the course is the readings, so concentrate on

them until you thoroughly understand each unit. Other activities should supplement these, make the course more enjoyable, and provide other educational and experiential benefits. You are free to work a bit ahead or to in other reasonable ways adjust your work schedule to harmonize with demands from other courses or special circumstances, but please, please, DO NOT PROCRASTINATE!

We hope that DLPSI works for you, and helps you learn even more effectively in the future!

Reading and Writing

As already mentioned, there will be a good deal of reading in this course. You must take it seriously, and follow the instructions for each unit about the readings. You should read to comprehend, and to learn where to find answers to questions, and where to refer when designing or critiquing information retrieval systems.

Writing is also an important part of this course. Indeed, CS5604 counts as a Writing Intensive Course. You must write:

- short essays, typically 1-4 paragraphs long, individually, for quizes;
- short essays, like those for quizes, individually, for the final;
- lab notebook type descriptions, in groups, for unit exercises;
- daily summaries and questions, individually, after each class;
- article summaries, in groups, for readings from CACM; and
- group discussion overview, for the debate on digital libraries.

In addition, you are encouraged to write:

- suggestions, to improve the course this term or hereafter;
- annotations, to improve course materials, that the instructor can add as a supplement to the online documents.

Writing to Communicate

Most of the writing you have been asked to do before has the goal of communicating and informing. It is usually prose, focused on allowing the reader to quickly and easily understand your message. It often follows careful and critical thinking, analysis, problem solving and determining how the subject matter fits in with most readers' systems of knowledge and beliefs. Typically, such writing is done in the approved way for the discipline, e.g., as one might read in a technical journal, magazine, or report. Thus, careful attention is given to organization, grammar and spelling. There are typically several revisions, where sentences, ideas, and thinking are clarified as a result of being reworked, sometimes with the advice of others who have made comments on earlier drafts.

During this course you will occasionally write to communicate. In particular, there are two types of group activities where such polished writing is expected:

- article summaries for readings from CACM; and
- discussion overview for the debate on digital libraries.

In both cases, your group must have different people to:

- write the first draft;
- review, critique and markup the first draft;
- prepare the second draft;
- edit and refine to prepare the final submission; and
- critique the work of another group.

In revising works, stress clarity and content. Make sure you say what needs to be said in a way that will interest and inform the reader. Be sure:

- the introduction establishes clearly for the reader the scope and direction of the essay;

- the ideas are properly sequenced and easy to follow;
- no section is weak;
- there are no words/terms/phrases that will be unknown or unclear;
- the reader can find and comprehend the main point and the conclusions.

When you proofread:

- Use tools like a spelling checker, first, and last.
- Do the second half of the work first.
- Work backwards paragraph by backward, thus concentrating on the surface elements.
- Place a ruler under each line as you read it.
- Use a checklist; keep a record of the types of errors you or others typically make, and look for them.
- Look for one type of error at a time.
- Wait a while after writing before proofreading.
- Do it when you are fresh, thinking clearly.
- Do it once, aloud.

Writing to Learn

For the rest of the course writing, you can be less formal, more focused on speed, getting your ideas down quickly, discovering as you write (much as one might think aloud), creative, and personally integrating knowledge. You will turn in what would normally be considered a draft, done by you as an individual. When there is time you should correct obvious errors in spelling or grammar. However, your focus should be on recording your thoughts, much like when you take notes, rather than on preparing a polished work.

This type of writing works well for lab notebooks, for brainstorming sessions, for timed writing activities, for suggestions or annotations, and for answers to questions.

References

1 Fred S. Keller. Goodbye, teacher ... *J. of Applied Behavioral Analysis*, 1(1):79-89, Spring 1968.

2 J. Gilmour Sherman and Robert S. Ruskin. *The Personalized System of Instruction*. Educational Technology Publications, Englewood Cliffs, NJ, 1978. Vol. 13 in The Instructional Design Library, series ed. Danny G. Langdon.

3 J. Gilmour Sherman, Robert S. Ruskin, and George B. Semb, editors. *The Personalized System of Instruction: 48 seminal papers*. TRI Publications, Lawrence, Kansas, 1982.

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fox@cs.vt.edu
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