COMPUTER AIDED INSTRUCTION ON THE HP3000

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The original CAI package was delivered with the installation of our HP3000 cx machine in August of 1975. An attached note from the sales representative said it would be a trivial task to convert the package to run on our machine. After three years of trial, error and much frustration, CAI is now running on an HP3000 Series II.

A good Computer Aided Instruction package should have three main goals. First, it should be an instructional tool to be used by educators as well as a learning experience for the students interacting with it. Secondly, good "courseware" must be available to allow for optimal utilization. Lastly, and most importantly, it must be easy to use for a person unfamiliar with computers. Thus, the teacher generates text for students without concerning himself with programming details. We feel that this CAI package meets these goals.

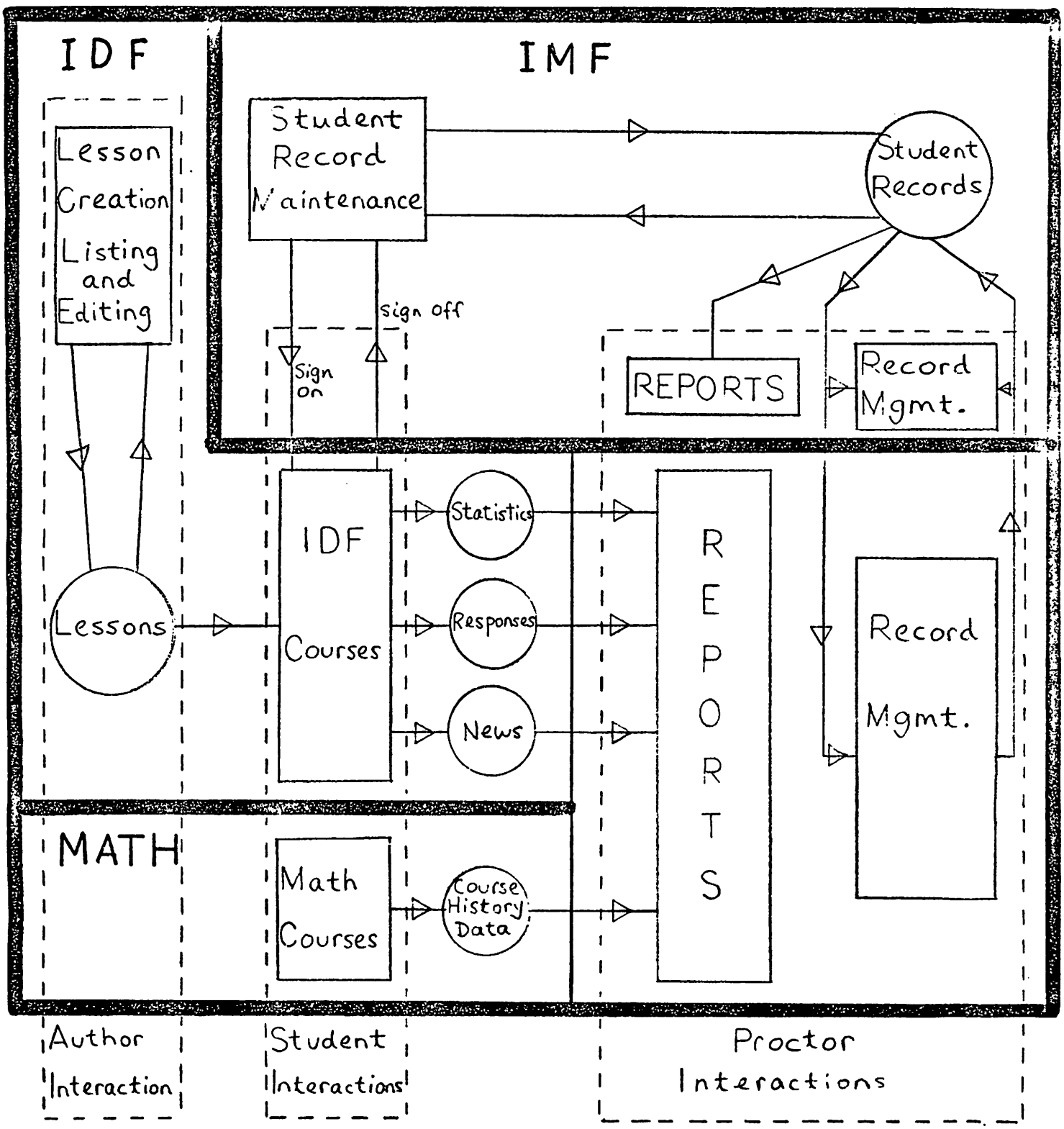
The CAI instructional package consists of three inter-related parts: IDF, IMF and Math Drill and Practice. A short description of each follows:

Lesson material is prepared through the Instructional Dialogue Facility (IDF) by the teacher who specifies the components of a course. These components include the questions to be asked with correct and incorrect anticipated answers, and the hints and clues that might be given -- together with the circumstances under which they are to be given.

The Instructional Management Facility (IMF) is a set of programs and files used to maintain Computer Assisted Instruction courses and make them available to the terminal user. The number of courses made available and the number of groups and students entered are limited only by the amount of storage available on a particular system.

The Mathematics Drill and Practice Program provides drill and practice in arithmetic fundamentals to supplement classroom instruction. Comprehensive records of all students using the program are maintained, permitting automatic individualized pacing of each student through the curriculum. The curriculum consists of six consecutive years of material -- with each year's material arranged in 24 consecutive blocks. A student's interaction with the course contains pretests, post-tests and review lessons in addition to the regular lesson. Depending on a student's progress, he/she is allowed to advance or review required material.

STRUCTURAL ORGANIZATION OF THE CAI PACKAGE



IDF

The Instructional Dialogue Facility (IDF) enables educators to create and present computer assisted instruction (CAI) lessons without learning a programming language. The IDF guides them through each stage of the lesson creation, allowing the educators to concentrate on the instructional content of the lesson.

The program records student responses and compiles statistics to assist in evaluating and improving course material. Using these reports, the educator is able to immediately assess the effectiveness of the lesson that he has written and, if necessary, to modify the lesson using the editing facilities of the IDF. The educator can analyze the lesson either on a student-by-student basis (in which case he sees essentially a reconstruction of each student's interaction with the lesson) or on a group basis (where he sees statistical information of student performance).

Some other important features of IDF are:

1. The educator may allow the student to exit from an IDF lesson to use a simulated calculator capability or to use or write programs in BASIC. The student is then returned to his lesson exit point.

2. The educator and students are able to interact with IDF in English, German, French, Italian, Portugese, Spanish and Swahili.

3. Key word searches of two different types may be specified by the educator for answer processing: ordinary key word and context-sensitive (delimited) key word searches.

4. String or numerical answers are allowed; ranges may be specified for numerical answers, and there is an automatic provision for handling numerically-equivalent answers.

5. Students may request hints for problems if the educator has provided them.

6. Time limits and the number of times a student can try to answer a question may be specified.

7. A more sophisticated capability of IDF is in the use of as many as 12 counters. These counters can be incremented when a student's response matches a correct or wrong answer. The values of these counters can be used to provide branching to different IDF lessons.

A table showing how IDF guides an educator in lesson creation follows.

PROMPT		DEFINITION
Text		Noninterrogative information displayed to the student before a question is asked.
Question		A request for a student response.
Correct Answer Group	(1)	A collection of one or more answers the author considers correct.
Wrong Answer Group	(1)	A collection of one or more answers which the author regards as incorrect but which he suspects that a student may try.
or		
Correct Answer Range	(1)	A range of numbers the author considers correct. If the student's answer is within this range, it is correct.
Wrong Answer Range	(1)	The author considers numbers in this range to be incorrect.
Reply To Correct (Or Wrong) Answer Group (Or Range)	(2)	The message the author wishes to have displayed to any student whose answer falls in a correct or wrong answer group or range.
Reply to Unexpected Answer		The message the author wishes to have displayed to any student whose answer was not anticipated.
Failure Message		The message the author wishes to have displayed to a student who has exhausted his permitted number of trials.
Hint	(3)	A hint to be given to students who request it.

(1) Any number of groups or ranges is allowed.

(2) One reply is allowed for each group or range.

(3) Any number of hints are allowed.

IDF has the following editing capabilities:

1. Inserting, deleting, moving and appending sections;

2. Inserting, deleting or changing lines within a section;

3. Changing lesson branching;

4. Changing options.

IMF

The Instructional Management Facility (IMF) is a set of programs and files used to present Computer Assisted Instruction, record student progress and provide a variety of reports for the teacher and the course author. The number of courses made available and the number of groups and students entered are limited only by the amount of storage available on a particular system.

Following is a list of the programs and a short description of what they do:

Program	Description
ADMIN	Used to enter: 1. Each course in the IMF files; 2. School name, code word, group names; 3. Messages to be displayed to students; 4. Changes in the language.
PUPIL	Used to: 1. Enter students' names in the IMF files; 2. Enroll students in the CAI courses; 3. Change group assignments and session lengths; 4. Drop students from courses; 5. Obtain the Course Usage Report.
START	Asks students to sign in by typing their first name and identification number and the name of the course they wish to take. The course is then presented to the student.
OUTCOM	Used to: 1. Obtain IDF Statistics Reports; 2. View the IDF Response File; 3. Clear the Statistics and Response Files.
CNEWS	Used to: 1. List the News file; 2. Clear the News file. This file contains comments to authors from the IDSF.

HPMATH

HPMATH is a package that provides drill and practice in arithmetic fundamentals to supplement classroom instruction for elementary students. Lessons are drawn from a pool of problem types (blocks) that cover such concepts as counting, addition, subtraction, multiplication, division, decimals, fractions and measurement. The students are assigned a starting year by their teacher; then they proceed through the course at their own skill level and pace.

The curriculum consists of six consecutive years of material -- with each year's material arranged in 24 consecutive concept blocks. Each block consists of a pretest, five drill lessons, and a post-test. The teacher enrolls a student at the beginning of any block in any year. If the student scores 100 per cent in the pretest of that block, then he will skip to the next block. Otherwise, he proceeds with the first lesson in the current block. His score on the pretest determines the level of difficulty at which he takes the first lesson. Within the curriculum block, the student's score on a main lesson determines the level of difficulty at which he takes the next main lesson. His score is determined by the number of correct answers he gives. The student's post-test score is recorded and used to determine whether he should review a curriculum block.

The system generates reports which keep the teacher informed of each student's progress. The following reports are available to the teacher:

1. Daily Report

This shows the following exceptional conditions:

i. Performance of a student below 60 per cent at level 1;
ii. A student skipping consecutive blocks;
iii. A student reaching a new concept block;
iv. Absences -- a student not taking the course.

2. Student Report

This contains post-test scores on blocks completed by the student, plus the number of times the block was reviewed.

3. Progress Report

This lists each student in the group, his exact position in the curriculum, and how many blocks he has completed to date.

4. Course History Report

This presents a statistical summary for the year (primarily of interest to school curriculum specialists) showing average and standard deviation of pre- and post-test scores.

5. Lesson Report

This provides the teacher with a sample lesson for any year, block and level.

6. Usage Report

This lists the students in alphabetical order with their identification numbers and the number of hours they spent using the math course.

7. Roster Report

This provides a permanent reference listing of students their identification numbers and their time limits.

IDF: A SAMPLE RUN

An example of a lesson created using the Instructional Dialogue Facility is shown below. The computer prompts the author for all of the structural elements in the natural order. For clarity, entries typed by the author are underlined.

SECTION # 1

OPTIONS? KEYWORD *cr*

OPTIONS? *cr*

TEXT:

? RECALL FROM OUR PREVIOUS LESSON THAT GEORGE II *cr*
? RULED GREAT BRITAIN FROM 1727 TO 1760, AND *cr*
? THAT DURING HIS REIGN BRITAIN HAD A SERIES *cr*
? OF WHIG PRIME MINISTERS. *cr*
? *cr*

QUESTION:

? WHO WAS THE FIRST PRIME MINISTER TO SERVE *cr*
? UNDER GEORGE II? *cr*
? *cr*

CORRECT ANSWER GROUP:

? WALPOLE *cr*
? *cr*

REPLY FOR THIS GROUP:

? THAT'S CORRECT; ROBERT WALPOLE WAS PRIME *cr*
? MINISTER UNDER GEORGE I FROM 1714 TO 1727; WHEN *cr*
? GEORGE II ASCENDED TO THE THRONE IN 1727, WALPOLE *cr*
? BECAME THE FIRST PRIME MINISTER UNDER HIS REIGN. *cr*
? *cr*

WRONG ANSWER GROUP # 1

? COMPTON *cr*
? *cr*

REPLY FOR THIS GROUP:

? NO—COMPTON WAS THE SECOND PRIME MINISTER TO *cr*
? SERVE UNDER GEORGE II; PLEASE TRY AGAIN. *cr*
? *cr*

WRONG ANSWER GROUP # 2

? PELHAM *cr*
? HOLLES *cr*
? CAVENDISH *cr*
? *cr*

REPLY FOR THIS GROUP:

? NO—HE DID IN FACT SERVE AS PRIME MINISTER UNDER *cr*
? GEORGE II, BUT WELL AFTER THE MAN I'M THINKING *cr*
? OF. PLEASE TRY AGAIN. *cr*
? *cr*

WRONG ANSWER GROUP # 3

? WALP *cr*
? *cr*

REPLY FOR THIS GROUP:

? I THINK YOU HAVE THE RIGHT ANSWER, BUT YOUR *cr*
? SPELLING IS WRONG; PLEASE TRY AGAIN. *cr*
? *cr*

WRONG ANSWER GROUP # 4

? *cr*

REPLY TO UNEXPECTED ANSWER:

? NOW STOP PLAYING AROUND; NO ONE BY THAT NAME *cr*
? EVER SERVED AS PRIME MINISTER IN GEORGE II'S *cr*
? TIME. PLEASE TRY AGAIN. *cr*
? *cr*

FAILURE MESSAGE:

? WELL, IT DOESN'T LOOK LIKE YOU'RE GOING TO GET *cr*
? THE RIGHT ANSWER ON THIS ONE, SO I'LL TELL YOU. *cr*
? THE MAN I'M THINKING OF WAS ROBERT WALPOLE; HE *cr*
? SERVED AS PRIME MINISTER UNDER GEORGE I FROM *cr*
? 1714 TO 1727, AND WHEN GEORGE II ASCENDED TO THE *cr*
? THRONE IN 1727, WALPOLE BECAME THE FIRST PRIME *cr*
? MINISTER UNDER HIS REIGN. *cr*
? *cr*

HINT # 1

? THE MAN I'M THINKING OF ALSO SERVED AS PRIME *cr*
? MINISTER UNDER GEORGE I. NOW TRY AGAIN. *cr*
? *cr*

IMF: A SAMPLE RUN

An example of using the Instructional Management Facility appears below. It shows how to enter a school, group, course and student names into the IMF files.

```
ADMIN
CODE?MMMMMM
COMMAND?//HELP
TYPE CODE, SCHOOL, GROUP, COURSE, MESSAGE, RESET, LANGUAGE, OR PUPIL.
COMMAND?SCHOOL
  SCHOOL NAME?CAI HIGH
  SCHOOL NAME IS NOW CAI HIGH.

COMMAND?GROUP
  GROUP COMMAND?//HELP
  TYPE ENTER, CHANGE, REMOVE, OR LIST.
  GROUP COMMAND?ENTER
    NEW GROUP NAME?GROUP1
GROUP1 IS NOW ENTERED AS A GROUP.

    NEW GROUP NAME?GROUP2
GROUP2 IS NOW ENTERED AS A GROUP.

    NEW GROUP NAME?
  GROUP COMMAND?
COMMAND?COURSE
  COURSE COMMAND?//HELP
  TYPE ENTER, CHANGE, REMOVE, OR LIST.
  COURSE COMMAND?ENTER
    COURSE NAME?HISTORY
    CODE WORD?H1
    DOES IT HAVE A DEMO MODE?YES
    SPECIAL COURSE TYPE?IDF
    HISTORY IS NOW ENTERED AS A COURSE.

    COURSE NAME?MATH.PUB.CAI
    CODE WORD?MATH
    DOES IT HAVE A DEMO MODE?YES
    SPECIAL COURSE TYPE?MATH
    MATH.PUB.CAI IS NOW ENTERED AS A COURSE.

    COURSE NAME?
  COURSE COMMAND?
COMMAND?PUPIL
```

```
PUPIL

COMMAND?//HELP
TYPE ENTER, CHANGE, REMOVE, RESET, ADMIN, ENROLL, ALTER, DROP, OR LIST.
COMMAND?ENTER
  FIRST NAME?DIANE
  LAST NAME?CHRISTOPHERSON
  ENTERED WITH ID NUMBER 1000.

    COURSE NAME?MATH.PUB.CAI
    GROUP NAME?GROUP1
    STARTING YEAR?4
    ENROLLMENT COMPLETED.

  FIRST NAME?BEVERLY
  LAST NAME?SHEPHERD
  ENTERED WITH ID NUMBER 1001.

    COURSE NAME?HISTORY
    GROUP NAME?GROUP2
    ENROLLMENT COMPLETED.

  FIRST NAME?
COMMAND?LIST
  LIST BY ID, NAME, OR COURSE?ID
   PAGINATE?NO
    ID RANGE?1000,1001



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ID LISTING                  PAGE 1

                                        PREFERRED  TYPING  ENROLLED  USAGE
  ID          NAME                       LANGUAGE   MULT.   COURSE   (HRS)

 1000   CHRISTOPHERSON, DIANE            ENG          1     MATH.PUB.CAI   .0
 1001   SHEPHERD, BEVERLY                ENG          1     HISTORY        .0
 -----




    ID RANGE?
  LIST BY ID, NAME, OR COURSE?
COMMAND?//STOP
```

HPMATH: A SAMPLE RUN

```
>START
Upper case only?YES

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Please type your ID number and first name:  1000 DIANE
Is your last name CHRISTOPHERSON?YES

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HELLO DIANE,  WE HOPE YOU ENJOY TODAY'S PROBLEMS,
M 6061
********** HERE WE GO !!!!! **********

 90
+ 5
---
 95
```

```
 16
+ 2
---
 18


  18
+ 10
----
  28


  69
+ 20
----
  89


 25
- 2
---
 23


 36
- 2
---
 34


  39
- 20
----
   8
WRONG, TRY AGAIN

  39
- 20
----
  19


  28
- 15
----
  13


 ENTER   <  OR  =  OR  >

6 + 1  <  3 + 5
```

```
8 + 6  >  1 + 3


  2^2 =  4

  6^2 =  36


 42
X 1
---
 42



   -----
3 / 2 4
    2 4   8
    ---
      0

3 X 8 = 24
```

LESSON OVER. YOU ANSWERED 26 OUT OF 27 QUESTIONS CORRECTLY.
GOODBYE DIANE.

```
Please type your ID number and first name:  //STOP
>EXIT
```