This project was the third in a proposed 5-phase project for developing vocational education curriculum for junior and senior high school students. Thirteen vocational education teachers participated during the period from July 13 to October 15, 1966. A specific objective for each participant was to develop a 1-semester course in his particular subject area which would be used in establishing a Computer Assisted Instruction (CAI) Curriculum in vocational education. The objective of completing a semester's course appeared to have been too ambitious. From 50 to 150 hours of work was required to produce one 40-minute class lesson. Only one to one and one half class lessons could be prepared since the participants spent 15 hours in preparation each week, outside of the required attendance of 2 hours each evening on Monday through Thursday, in 6 weeks. The most important single impediment of the project was the lack of reliability of the CAI equipment. Recommendations and guidelines for future programs are listed. A sample course section, "Introduction to Data Processing," for CAI instruction is included in the appendix. (PS)
COMPUTER ASSISTED INSTRUCTION

PROVIDENCE COLLEGE COMPUTER CENTER

U. S. OFFICE OF EDUCATION

CONTRACT

OE - 7-062811-0016
Final Report
Project No. 6-2811

TITLE: "In Service Training in Computer Assisted Instruction for Vocational Teachers."

AUTHOR: Robert R. Reynolds

INVESTIGATOR: G. C. McGregor, O.P.

GRANT NUMBER: OEG1-7-062811-0016
Vocational Education Act of 1963, P. L. 88-210, Sec 4 (c)

GRANTEE INSTITUTION: Providence College
Providence, Rhode Island

DATE: July 13, 1966--October 15, 1966

The Project Reported Herein was Supported by a Grant from the U. S. Department of Health, Education, and Welfare Office of Education Bureau of Research Division of Adult and Vocational Research
SUMMARY OF PROJECT NO. 6-2811

GRANT NUMBER: OEG1-7-062811-0016

TITLE: "In Service Training in Computer Assisted Instruction for Vocational Teachers."

INVESTIGATOR: G. C. McGregor, O. P.

INSTITUTION: Providence College
Providence, Rhode Island

DURATION: July 13, 1966--October 15, 1966

PURPOSE: The purpose of this project was to allow the participants to revise, rewrite, and evaluate course material in hopes of producing one unit or semester of work in Computer Assisted Instruction mode.

PROCEDURE: Formal instruction in the use of the Coursewriter Language and discussion periods were conducted four evenings per week, for two hours each evening. Each participant was required to attend these sessions. At his convenience, each participant was required to schedule two hours of computer time to be used to test stored materials and revise or enter new course data. Any procedural difficulties encountered during the entry or testing of material were discussed at the evening sessions. Many of the recommendations and guidelines for future programs resulted from these discussion periods.

RESULTS AND CONCLUSIONS:

This project was the third phase in a proposed five phase project which was hoped to result in a vocational education curriculum for junior and senior high school students. The third phase was designed to produce course material which would be used to test student progress, or the lack thereof, when instruction was presented in Computer Assisted Instruction mode. Although we realize that the scope of our objective, to produce one semester of work, was too broad to be wholly achieved, we feel that several participants have made significant progress in realizing the spirit of this objective. (See Appendix 1.)

1. Each participant entered some portion of his program...
2. Most participants wrote and planned material in excess of the amount he was able to enter.

3. Additional experience gave rise to a good deal of revision and expansion of previously entered material.

4. Many participants assisted each other by acting in the role of students to test previously entered material. This brought to light problems in the selection of wording in both directions and text material, in formatting of text material, and in the need for expanded use of functions.

5. Several visitors to the computer center were allowed to try course material and were enthusiastic about the potential of CAI. (See Appendix 2.)

6. Provision has been made in many programs for the use of the tape recorder and slide projector features of our system.

7. Each participant developed a high degree of proficiency in the following CAI skills:

   a. Initializing the system.
   b. Inserting and deleting course material.
   c. Polling the units of the system.
   d. Functioning in the role of the author, student, and the proctor.

8. Many participants continued working on their programs well beyond the six week workshop period. Several continued through the Labor Day weekend.

The process of learning to write effective programs in Computer Assisted Instruction mode is a very slow process. Continual revision is necessary as an author reaches new plateaus of understanding and proficiency revealing inadequacies of the past. The author must assume an active and self-directing role. His best support is the stimulation provided by the company of others similarly engaged in CAI.

The amount of time and effort expended by the participants in this project attest to the ability of CAI to capture the imagination and to provide a continuing motivating force, despite failures of equipment and frustration of constant revision of materials. It is our belief that the enthusiastic reception by the participants and visitors, who have been able to be engaged in CAI, indicates the future effectiveness of the computer in education.

It is the belief of the participants that the discipline imposed by their individual CAI projects--being com-
elled to view a curriculum as a detailed, preplanned entity—has produced a heightened appreciation of the learning process and improved their effectiveness as teachers.
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STATEMENT OF PURPOSE

The purpose of this project covering the period of July 13, 1966 to October 15, 1966 was to test and evaluate course sectors leading to the development of one semester courses which would be used in establishing a Computer Assisted Instruction Curriculum in vocational education for junior and senior high school students.
GENERAL OBJECTIVES

1. To test and evaluate course material.

2. To revise and expand previously written material.

3. To develop proficiency in the use of the Computer Assisted Instruction system as a proctor, an author, and as a student.

4. To develop a better appreciation in the problems of developing a curriculum in Computer Assisted Instruction mode.
SPECIFIC OBJECTIVES

1. Each participant was to complete the writing of one unit or semester of material in his particular course area.

2. Each participant was to enter as much of his course material as possible on the disk storage unit.

3. Each participant would select two high school students to test his course material.

4. Each participant would utilize the record of student responses to evaluate his course material.
DESCRIPTION OF PROJECT

The project was directed by the Rev. G. C. McGregor, O.P. and supervised and coordinated by Mr. Paul Bartolomeo. Workshop periods were conducted on Monday through Thursday from 7:00 to 9:00 PM July 5 to August 12, 1966. These evening sessions were conducted in the workshop style, except that two hours was reserved for formal instruction in the Coursewriter language. Due to the fact that only two terminals were available, participants were required to schedule two hours of computer time outside of the normal class hours to enter and test their course material.

One hour of each evening session was devoted to the accomplishment of our general objectives of developing proficiency in role of the author, proctor and student on the system. The remaining hour was used for discussion, conferences with the instructor, working alone, or observation of other participants utilizing the system.

About August 1, 1966, a new method of entering course material into storage was made available by the University of Texas. This method enabled the participants to write their course material on coding sheets and to have this material punched into cards. However, our equipment would not accept this method and IBM technicians had to be called upon to make necessary adjustments. Unfortunately, this work could not be completed before the end of the workshop period. We did begin formal instruction in the use of the coding sheets so that as soon as the system was adjusted, course material could be entered by this media.

Each participant was evaluated by the director and coordinator of the project. Quality of written material, degree of professional improvement, proficiency in use of the equipment, and demonstration of interest as evidenced by independent pursuit of learning, extra hours of work, superior degree of workshop participation, and attitude were considered in obtaining the participant’s final grade.
STUDENT SELECTION

The thirteen vocational education teachers who participated in this project are the same participants who took part in earlier phases of this project under U. S. Office of Education contracts OE-5-85-105 and OE-6-85-093. All members of this group were selected on the basis of their scores on the IBM Programmers Aptitude Test. The names of the participants will be found in Appendix V.
PROJECT EVALUATION

The project was not free from technical difficulties inherent in experimental situations. Repeated equipment failure shut down the system many days and snarled input. Some logic difficulties in the Coursewriter language were encountered. Disks damaged in transit required re-entering. As a result, the entering and testing of course sectors fell well behind schedule. This caused problems in motivation for the authors. A more detailed explanation of the technical difficulties may be found in Appendix 8.

The stated objective of completing a semester’s course appears to have been too ambitious. As the work progresses, there is an increasing realization that a great deal of time is required to produce a CAI course approaching professional quality. Anywhere from 50 to 150 hours is required to produce a forty minute lesson. Much of this time is taken up in revising, rewriting, and re-entering data in addition to writing and entering new material. Many of the participants worked well beyond the grant period, several right through Labor Day weekend.

The manner in which classes were conducted seems to have achieved the kind of atmosphere that was desired. Teachers were able to pursue that which was of immediate concern to them. They shared their experience by giving others their perspectives and opinions. Programming problems were solved with individual guidance from the instructor. Extemporaneous group or class discussions delved into matters of common concern. It is felt that more formal methods tend to discourage individual involvement, discovery, and creativity, and to distort specialized subject matter into stereotyped and inappropriate patterns.
We feel that the following results have been achieved:

1. Each participant entered some portion of his program.

2. Most participants wrote and planned material in excess of the amount he was able to enter.

3. Additional experience gave rise to a good deal of revision and expansion of previously entered material.

4. Many participants assisted each other by acting in the role of students to test previously entered material. This brought to light problems in the selection of wording in both directions and text material, in formatting of text material, and in the need for expanded use of functions.

5. Several visitors to the computer center were allowed to try course material and were enthusiastic about the potential of CAI. (See Appendix 2.)

6. Provision has been made in many programs for the use of the tape recorder and slide projector features of our system.

7. Each participant developed a high degree of proficiency in the following CAI skills:
   a. Initializing the system.
   b. Inserting and deleting course material.
   c. Polling the units of the system.
   d. Functioning in the role of the author, student, and the proctor.

8. Many participants continued working on their programs well beyond the six-week workshop period. Several continued through the Labor Day weekend.

9. Each participant has become familiar with the new punch card method of inputing course material.

We definitely believe that the batch-load method, punch card method, of inputing course material offers tremendous advantages over the entering of material through the 1050 Communications Terminal. As stated in our report, under U. S. Office of Education Contract OE-6-85-093, the 1050 Communications Terminal is not an efficient method of input unless the author has the ability to type. No consideration was given to the participants' typing ability as a prerequisite to admission to the project. Although the necessary adjustments needed to adapt our equipment to accept the batch-load method were not completed before the end of the grant period, many participants had begun to write course material for entry by this method.
CONCLUSIONS

The project has satisfied most of the general and specific objectives stated in this report. We do feel that the objectives of producing a full semester of work and a vocational education curriculum are much too ambitious for a project of this nature. 50 to 150 hours of work are required to produce one 40-minute class lesson. Considering the participants spent 15 hours in preparation each week, outside of the required attendance, in six weeks, only one to one and one half class lessons could have been prepared. This would be far less than that required for one semester let alone a full curriculum.

The most important single impediment in preventing this project from progressing at a higher rate of efficiency was the lack of reliability of our CAI equipment. Most participants wrote far more material than could be entered. Yet, even the data which was entered was, in several instances, destroyed by equipment malfunction. The idea of presenting demonstrations for high ranking school administrators was approached cautiously for fear of adverse reaction due to the unreliability of the equipment. Several authors experienced so much difficulty, they would not bring their students to test material. Finally, we experienced a severe problem in morale among the participants themselves.

One difficulty which we have mentioned in previous reports seems to have been overcome. The development of the batch-load method of entering course material should enable the authors to enter data at a higher rate. In addition, plans have been made to store data on punched cards at periodic intervals, and on magnetic tape before each author work period. After the work period, the updated course will be entered on magnetic tape by the technical personnel to provide a back-up system. These procedures should prevent the destruction of previously entered materials, and an efficient re-entry method will be established in the event of equipment malfunction.

In spite of the problems, which are not unusual in an experimental situation, we are confident that Computer Assisted Instruction provides the most versatile teaching aid to be yet devised. The teacher is freed from the dual task of information transmission and drill. His creative talents can now be utilized to provide instruction for the gifted or exceptional students. The student is required to assume an active role at all times, and the program is tailored to allow him to progress at his own pace. This continual involvement and the immediate knowledge of success or failure should prove to be a positive motivational force.
RECOMMENDATIONS

1. A technical bulletin should be instituted as soon as possible.

2. A users group should be started among the various colleges and universities in Rhode Island which have CAI compatible equipment.

3. More realistic objectives should be established.

4. A review of present equipment should be made, especially the student terminals.

5. There should be coordination, through the U.S. Office of Education, to keep participants in various CAI projects abreast of the newest developments in the field.

6. Individual initiative should be encouraged in entering and testing materials.

7. One session a month should be utilized to document difficulties experienced by the participants with either Coursewriter or the terminal equipment.

8. Visitors should be encouraged to test CAI as soon as equipment is proven reliable.

9. An inservice program for teachers in other fields should be instituted. This could be done with or without equipment.
GUIDELINES

1. Formal instruction in the use of Coursewriter should be continued with special emphasis on the use of functions.

2. The workshop approach should be utilized.

3. All course material should be written prior to formal workshop or class sessions.

4. Authors should be required to utilize the batch-load method of entry. The 1050 terminal use should be limited to testing and minor corrections of format or logic.

5. Author logs for both time spent in preparing material and problems encountered in entering or testing data should be maintained weekly.

6. New participants should be solicited, utilizing the previous participants as instructors.

7. Outside evaluation of course material should be obtained.

8. The objective of producing a single semester of work should be maintained, but the objective of producing a vocational education curriculum in Computer Assisted Instruction mode should be dropped.

9. Future programs should make provision for typists or require the participants to be able to type.

10. Participants should be appraised as to the number of hours of commitment that will be required.
APPENDIX I

Sample course sections completed during the July to August, 1966, phase of the project in Computer Assisted Instruction.
You are about to begin a course designed to introduce you to some of the automated devices used to process data. The course is divided into three basic sections:

1. Simple devices
2. Unit Record Equipment
3. Electronic Computer

The objective of this section is to acquaint you with some of the simple automated devices used in the modern business world. Carbon paper is the simplest automated device. The impression of the original is transferred to a copy by the carbon automatically.

Sensitized paper, developed by the National Cash Register Company, is our next simple device. This paper is treated with chemicals. Original impressions are transferred automatically to the copies without the smudging or mess of carbon paper.

Our next device is familiar to most people. Credit cards, charge account plates, name and address plates, etc., are forms of the embossed plate. Embossed plates are made of plastic or metal. Data on the plate is raised or embossed. Carbon paper or an inked ribbon is placed between the document and the plate. Pressure is applied by a roller, and the data is transferred.

Please key [Alt n coding and 5].

Indicate your answers by using the LETTER ONLY.

Which of the following is the simplest form of automated device used in today's business office?

[a] Embossed plate
[b] Sensitized paper
[c] Punched card
[d] Carbon paper

b
b - not accepted
Incorrect. Try again.
Paper that has been treated with chemicals and is used to make copies of an original document is called:

(a) Carbon paper
(b) Inked paper
(c) Sensitized paper
(d) Copy paper

Very good. Let's go on.

The impression of an ---- is made by means of a pressure roller and carbon paper or inked ribbon.

(a) Embossed plate
(b) Identification cards
(c) Invoice
(d) Order

Very good.

Fine. Now you are ready to go on to the next assignment.

Another simple automated device is the pegboard. A pegboard is a flat writing surface with numbered pegs or posts along one side. Forms are punched with holes to match the pegs for alignment.

Look at the first illustration. When you are ready to go on, key an eob [alt+ coding and 5].

Data is transferred from one form to another by carbon or sensitized paper. The master list is placed on the pegboard first. Then the carbon paper is placed on top. Each additional form is then placed on top. The original is the last to be set on the pegboard. All forms to be used must be coordinated.

Each original is aligned to the pegs in descending order. As our illustration demonstrates, each check would be placed on the pegboard a bit lower than the one before it. When we are finished, we will have a master list or listing without having to copy the data from the original several times.

Please key an eob.

//ss002x//

Indicate your answer by typing the word or words that identify your selection.

A flat writing surface with numbered pegs along one edge is known as a ________.

pegboard

Data on the original is transferred to a copy or master list by means of ________.

carbon paper

Forms are aligned or lined up by using the numbered ________ along the edge of the board.

pegs.

That's it. You are doing well. Keep it up.

The advantage of using a pegboard is that we may have a copy or a ______ without having to rewrite the data on the original document.

mastr list

Forms used with the pegboard are aligned with the pegs on the board by means of______-on the edge of the form.

holes

Fine. Your answer is correct. Let's try the next section.

Our final simple device is a bit more complex than the others. The Keysort Process uses a card with holes punched on the edges of the card.

Please turn to the second illustration.
Information is recorded on the card by notching the holes. These holes may be grouped together to represent data. Holes grouped in this manner are called code fields. The number of holes in each group may vary to meet the needs of the user. A code known as the binary code is used to represent data. Only numeric data may be recorded.

When you are ready to go on, please key an eob.

In order to sort or select data from the cards, we pass a steel rod or needle through the holes in the edge of a deck of cards. The cards that have been notched will fall from the needle, and the unnotched cards will remain on the needle. This procedure will be followed for each position in the code field. Once data has been recorded manually into the cards, the sorting or selection of data is automatic.

Please key an eob.

Supply only the LETTER that indicates your answer.

The fields on a keysort card are:
[a] on the top
[b] on the edge
[c] in the middle
[d] all over the card

Sorry, but that's not it. Try once more.

Very good. Let's go on to the next question.

Note that the picture of the Keysort card shows that the school code has been notched.

What is the school number that has been notched into the card?

24

If the keysort needle is passed through a deck of cards, and this card was in the deck, would it fall into the tray or remain on the needle if you wanted schools 10-19?

If we want to identify the cards used to register boys from those used to register girls, only one position or code field would be necessary. The cards used for boys could be notched, and the ones used for girls would not be notched.

Therefore, boys' cards would fall to the tray and the girls' cards would remain.

The keysort process is the first of our simple automated devices for processing data that resembles the equipment used in card processing systems of today. Our next section will be on unit record systems of processing data. Before we can go on to our new work, we will have a short quiz on the material we have already covered.

If you wish to take the quiz, please type yes. If you do not wish to take the quiz at this time, please type no.

Yes

1. The simplest form of automated device is ________.

Help

No help given.

Carbon paper

Try the next one.

2. Name one other simple automated device.

Embossed plate

Try the next one.
3. A credit card is a form of the ______.

4. The ______ uses numbered pegs to align forms.

5. The holes around the edge of the ______ card are notched to record data.

6. Although data is recorded manually on the keysort card, the selection or sorting of cards is ______.

7. The unnotched holes on the keysort card cause the cards to ______ on the needle.

8. Would you like to know your score? Type yes or no.

You received an A. Let's go on to the next section. Please depress the a key.

Section 2

We can conclude from the previous section on simple devices that automation is not a machine. Rather it is a process. The chief aim of automation is to reduce human effort and handling to obtain less error. The secondary aim is to increase the processing speed. We shall now attempt to apply the principles of automation to Data Processing.

Data processing is the processing of information. The huge volumes of data that must be handled every day by business, science and government stagger the imagination. It is physically impossible to process, catalogue and store all the vast quantities of information accumulated by all sources without the help of machines. Automated equipment enables us to gather data, manipulate it, draw conclusions from it, and store it for future use. Routine handling can be performed at high speeds, freeing men and women for more important tasks. These machines can do many of the tasks that humans find boring without becoming bored. Because our machines do not become bored or tired, they make very few mistakes. Most errors that do occur are the result of human error or machine malfunction.

All information handling, or data processing, goes through a cycle. First, the data to be processed must be assembled. Then it must be recorded in a convenient form. Next, it must be manipulated. The results must be reported. Finally, it must be stored. The next slide shows the data processing cycle in sequence. Please depress the response key.

//ss010 //
end of course.
you have been signed off.
You are about to begin a course designed to introduce you to some of the automated devices used to process data. The course is divided into three basic sections:

1. Simple devices
2. Unit Record Equipment
3. Electronic Computer

Please depress the response key [Alt n coding and 5].

The objective of this section is to acquaint you with some of the simple automated devices used in the modern business world. Carbon paper is the simplest automated device. The impression of the original is transferred to a copy by the carbon automatically.

Sensitized paper, developed by the National Cash Register Company, is our next simple device. This paper is treated with chemicals. Original impressions are transferred automatically to the copies without the smudging or mess of carbon paper.

Our next device is familiar to most people. Credit cards, charge account plates, name and address plates, etc., are forms of the embossed plate. Embossed plates are made of plastic or metal.

Data on the plate is raised or embossed. Carbon paper or an inked ribbon is placed between the document and the plate. Pressure is applied by a roller, and the data is transferred. Please key an eob [Alt n coding and 5].

Indicate your answers by using the LETTER ONLY.

Which of the following is the simplest form of automated device used in today's business office?

[a] Embossed plate
[b] Sensitized paper
[c] Punched card
[d] Carbon paper
Very good. Let's go on.

wa carbon paper
wb Carbon paper
ca cb

//2nt//Typing error.
ty Incorrect. You did not follow directions. You were asked to use the LETTER only to indicate your answer. Please follow directions and try again.
un Incorrect. Try again.
un Incorrect. Did you follow the directions carefully? Try again.
un Incorrect. The correct answer is d, carbon paper. Let's be a bit more careful when reading and make sure you follow the directions. Go on to the next question.

Incorrect. You did not follow directions. Please follow directions and try again.

Incorrect. Try again.

Incorrect. Did you follow directions carefully? Try again.

Incorrect. The correct answer is d, carbon paper. Let's be a bit more careful when reading and make sure you follow the directions. Go on to the next question.

Incorrect. You did not follow directions. Please follow directions and try again.

Incorrect. You did not follow directions. Please follow directions and try again.

Incorrect. The correct answer is d, carbon paper. Let's be a bit more careful when reading and make sure you follow the directions. Go on to the next question.

Typing error.
ty You did not follow directions. Use the LETTER ONLY! Try again.
un Sorry. Try again.
un The correct answer is c, sensitized paper. Go on to the next question.

Typing error.
ty You did not follow directions. Use only the LETTER. Try again.
un Afraid not. Try again.
un What happened!! That's not right either. Try once more.
un Nope. You should have answered a, embossed plate. Let's try the next assignment.

Another simple automated device is the pegboard. A pegboard is a flat writing surface with numbered pegs or posts along one side. Forms are punched with holes to match the pegs for alignment. Look at the first illustration. When you are ready to go
Data is transferred from one form to another by carbon or sensitized paper. The master list is placed on the pegboard first. Then the carbon paper is placed on top. Each additional form is then placed on top. The original is the last to be set on the pegboard. All forms to be used must be coordinated. Each original is aligned to the pegs in descending order. As our illustration demonstrates, each check would be placed on the pegboard a bit lower than the one before it. When we are finished, we will have a master list or listing without having to copy the data from the original several times.

Please key an eob.

Indicate your answer by typing the word or words that identify your selection.

A flat writing surface with numbered pegs along one edge is known as a ---------.

cb pegboard
ca no help given.

ca Pegboard
ca pegboard

Watch your typing.

You are correct.

Okay, but pegboard is one word.

This answer is not correct. Remember that typing errors are considered as incorrect answers. Try again.

I'm afraid not. LET'S GO BACK AND READ AGAIN.

Your answer is correct. Let's go on.

Wrong. LET'S TRY AGAIN.

Check your typing and try again.

Sign off and get help from your instructor.

Data on the original is transferred to a copy or master list by means of --------.

ca no help given.

cb carbon
ca carbon paper

Be careful of typing errors.

cb sensitized paper
ca cbn pr

Watch your typing errors.

cb sensitized or sensitized paper
ca fn k1

cb sensitized or carbon paper

cb carbon or carbon paper
ca fn k1

cb carbon or sensitized paper
ca fn k1

cb sensitized or carbon paper

cb carbon or sensitized paper
ca fn k1

cbn or sens pr

Watch your typing errors.

cbn or sens pr

You answer is correct. Let's go on.

Wrong. LET'S TRY AGAIN.

Check your typing and try again.

Sign off and get help from your instructor.

Forms are aligned or lined up by using the numbered -------- along the edge of the board.

cb no help given.
The advantage of using a pegboard is that we may have a copy or a master list without having to rewrite the data on the original document. No help given.

ca master list
ch master
ca master list
fn kl
ca listing.
ca list:
fn kl
fn edits //sh//c/r
ca duplicate
fn edits //sh//c/r
fn edits //sh//c/r
fn edits //sh//c/r
fn edits //sh//c/r
fn edits //sh//c/r
ty This is a good try, but I was looking for a term mentioned in the text.
try again.
un This answer is not correct. Try again.
un What's the matter? That is not the correct answer. Let's go on anyway and see if you cannot do better.
hr secbl ok

The forms used with the pegboard are aligned with the pegs on the board by nears of punching holes. No help given.

ca punched holes
ch punched holes
fn edits //sh//sp//c/r
ty Fine. Your answer is correct. Let's try the next section.
un Sorry, try again.
un sign off and see your instructor.

rd The final simple device is a bit more complex than the others. The keysort Process uses a card with holes punched on the edge of the card.
rd Please turn to the second illustration.
rd Information is recorded on the card by punching the holes. These holes may be arranged together to represent data. Poles grouped in this manner are called code fields. The number of holes in each group vary to meet the needs of the user. A code known as the binary code is used to represent data. Only numeric data may be recorded.
rd In order to sort or select data from the card, we pass a steel rod or needle through the holes in the edge of a deck of cards. The cards that have been notched will fall from the needle, and the unnotched cards will remain on the needle. This procedure will be followed for each position in the code field.
rd Once data has been recorded manually into the cards, the sort-
rd line or selection of data is automatic.
rd Please key an emb.
Please key an eob.

secic q1
qu Supply only the LETTER that indicates your answer.
The fields on a keysort card are:
[a] on the top
[b] on the edge
[c] in the middle
[d] all over the card
ca b
defilts //sh//c/r

Vry goud. Let's go on to the next question.

This is not quite correct, but why don't you try again.
Sorry, but that's not it. Try once more.
The correct answer is b, on the edge. Go on to the next question.

secic q2
qu //ss009 //
Note that the picture of the Keysort card shows that the school code has been notched.
What is the school number that has been notched into the card?
ca 24
defilts //sh//sp//c/r
un Did you look at the school code? Try again.
un Try 24.

secic q3
qu If the keysort needle is passed through a deck of cards, and this card was in the deck, would it fall into the tray or remain on the needle if you wanted schools 10-19?
ca remain on the needle
defilts //all
ca remain
defilts //sh//c/r
ty We can also conclude from your answer that this card must contain data concerning some other school. So it is possible to obtain two types of data from the keysort card--positive or negative.
un Unnotched cards would remain on the needle. Notched cards would fall to the tray.
br secic q4

secic q4
qu If we want to identify the cards used to register boys from those used to register girls, only one position or code field would be necessary. The cards used for boys could be notched, and the ones used for girls would not be notched. //ss010x//
Therefore, boys' cards would fall to the tray and the girls' cards would remain on the needle.
ca remain on the needle
defilts //all
cn remain
defilts //sh//c/r
un remain on the needle.
br secic q5

secic q5
qu The keysort process is the first of our simple automated devices for processing data that resembles the equipment used in card processing systems of today. Our next section will be on unit record systems of processing data. Before we can go on to our new work, we will have a short quiz on the material we have already covered.
ca yes
defilts //sh//c/r
When you are ready to take the quiz, please use the following format. Use the control words -- go to -- and the label sec1test. You should copy this format before signing off. Please sign off.

Please type yes or no!

sec1test
1. The simplest form of automated device is _______.
   a. No help given.
   b. Carbon paper
   c. Sensitized paper
   d. Pegboard
   e. Key sort process

un Try the next one.

br testlq2
2. Name one other simple automated device.
   a. No help given.
   b. Embossed plate
   c. Sensitized paper
   d. Pegboard
   e. Key sort

un Try the next one.

ad 1//c1

br testlq3
3. A credit card is a form of the _______.
   a. No help given.
   b. Embossed plate
   c. Pegboard

un Try the next question.

ad 1//c1

br testlq4
4. The _______ uses numbered pegs to align forms.
   a. No help given.
   b. Embossed plate
   c. Pegboard
   d. Sensitized paper

un Try the next question.

ad 1//c1

br testlq5
5. The holes around the edge of the _______ card are notched to record data.
   a. No help given.
   b. Carbon paper
   c. Key sort

un Go on.

ad 1//c2

br testlq6
test1q4
1 qu 6. Although data is recorded manually on the keysort card, the
2 selection or sorting of cards is ------.
3 ca No help given.
4 ca automatic
5 fn editls //all
6 ad 1//cl
7 ty Next question.
8 un Next question.
9 ad 1//c2
10 br test1q7

test1q7
1 qu 7. The unnotched holes on the keysort card cause the cards to
2 remain on the needle.
3 ca No help given.
4 ca remain
5 cb stay
6 fn editls //all
7 ad 1//c1
8 ty You have completed the quiz.
9 un You have completed the quiz.
10 ad 1//c2
11 br test1end

test1end
1 qu Would you like to know your score? Type yes or no.
2 ca yes
3 br scrtld //4//cl
4 br scrtlq //5//cl
5 br scrtb //u//c1
6 br scrtla //7//c1
7 ca no
8 ty You may obtain your score from your instructor at a later time.
9 rd Please depress the eob [altn coding and 5].
10 br sec2

scrtld
1 qu You received an A. Let's go on to the next section. Please
2 depress the a key.
3 ca a
4 br sec2
5 un Please depress the a key!

scrtlq
1 qu You received a B. Proceed to the next section. Please
2 depress the a key.
3 ca a
4 br sec2
5 un Please depress the a key!

scrtlq
1 qu You received a C. Proceed to the next section. Please
2 depress the a key.
3 ca a
4 br sec2
5 un Please depress the a key!

scrtld
1 qu You did not do too well. Your grade is a D. This means
2 you had 3 or more incorrect answers. Let's see if you can do a
3 better job on the next section. Please strike the a key.
4 ca a
5 br sec2
6 un Please strike the a key!
Section 2

We can conclude from the previous section on simple devices that automation is not a machine. Rather it is a process. The chief aim of automation is to reduce human effort and handling to obtain less error. The secondary aim is to increase the processing speed. We shall now attempt to apply the principles of automation to Data Processing.

Data processing is the processing of information. The huge volumes of data that must be handled every day by business, science and government stagger the imagination. It is physically impossible to process, catalogue and store all the vast quantities of information accumulated by all sources without the help of machines. Automated equipment enables us to gather data, manipulate it, draw conclusions from it, and store it for future use. Routine handling can be performed at high speeds, freeing men and women for more important tasks. These machines can do many of the tasks that humans find boring without becoming bored. Because our machines do not become bored or tired, they make very few mistakes. Most errors that do occur are the result of human error or machine malfunction.

All information handling, or data processing, goes through a cycle. First, the data to be processed must be assembled. Then it must be recorded in a convenient form. Next, it must be manipulated. The results must be reported. Finally, it must be stored. The next slide shows the data processing cycle in sequence.

Please depress the response key.
KEY:

1. RD
2. INTRODUCTION TO DATA PROCESSING
3. PREPARED BY
4. M. R. ROBERT R. REYNOLDS
5. FOR
6. COMPUTER ASSISTED INSTRUCTION
7. P. PROVIDENCE, R. I.
8. PROVIDENCE, R. I.
9. 1965-1966
10. YOU ARE ABOUT TO BEGIN A COURSE DESIGNED TO INTRODUCE YOU TO SOME OF
11. THE AUTOMATED DEVICES USED TO PROCESS DATA. THE COURSE IS DIVIDED INTO
12. THREE BASIC SECTIONS: 1. SIMPLE DEVICES, 2. UNIT RECORD EQUIPMENT, 3. ELECTRONIC COMPUTER
13. THE OBJECTIVE OF THIS SECTION IS TO ACQUAINT YOU WITH SOME
14. OF THE SIMPLE AUTOMATED DEVICES USED IN THE MODERN BUSINESS WORLD.
15. CARBON PAPER IS THE SIMPLEST AUTOMATED DEVICE. THE IMPRESSION OF THE ORIGINAL IS TRANSFERRED TO A COPY BY THE CARBON
16. AUTOMATICALLY.
17. ENHANCED PAPER, DEVELOPED BY THE NATIONAL CASH REGISTER
18. COMPANY, IS OUR NEXT SIMPLE DEVICE. THIS PAPER IS TREATED
19. WITH CHEMICALS. ORIGINAL IMPRESSIONS ARE TRANSFERRED AUTOMATICALLY.
20. TICALLY TO THE COPIES WITHOUT THE SMUDGING OR MESS OF CARBON PAPER.
21. OUR NEXT DEVICE IS FAMILIAR TO MOST PEOPLE. CREDIT CARDS, CHARGE
22. ACCOUNT PLATES, NAME AND ADDRESS PLATES, ETC., ARE FORMS OF THE
23. EMBOSSED PLATE. EMBOSSED PLATES ARE MADE OF PLASTIC OR METAL.
24. DATA ON THE PLATE IS RAISED OR EMBOSSED. CARBON PAPER OR AN
25. INKED RIBBON IS PLACED BETWEEN THE DOCUMENT AND THE PLATE. PRESSURE IS APPLIED BY A ROLLER, AND THE DATA IS TRANSFERRED.
27. QUANDAR indication you answers by using the letter only.
28. CHICOF THE FOLLOWING IS THE SIMPLEST FORM OF AUTOMATED DEVICE USED IN TO-
29. DAY'S BUSINESS OFFICE.
UNITED NATIONS
OCTOBER 1966
PAGE 002

6
CA 0
CB U
7
TY VER GOOD. LET'S GO ON.
8
WA CARBON PAPER
WB C ARBUN PAPER
9
WA CNB PR
FN KL //2N// TYPING ERROR.
10
TY INCORRECT. Y OU DID NOT FOLLOW DIRECTIONS. Y OU WERE ASKED TO USE THE LETTER ONLY TO INDICATE YOUR ANSWER. PLEASE FOLLOW DIRECTIONS AND TRY AGAIN.
11
UN INCORRECT. TRY AGAIN.
12
UN INCORRECT. D ID YOU FOLLOW THE DIRECTIONS CAREFULLY / TRY AGAIN.
13
UN INCORRECT. T HE CORRECT ANSWER IS C, SENSITIZED PAPER. G O ON TO THE NEXT QUESTION.
14
BR SECIAQ 2
15
QU PAPE R THAT HAS BEEN TREATED WITH CHEMICALS AND IS USED TO MAKE COPIES OF AN ORIGINAL DOCUMENT IS CALLED CARBON PAPER. INKED RIBBON IS USED TO MAKE COPIES OF AN ORIG-INAL DOCUMENT IS CALLED 6 C ARBON PAPER. 9 B O I NKED PAPER. 9 C O S ENSITIZED PAPER. 9 D O C OPY PAPER.
16
CA C+
CB C
17
TY VER GOOD.
18
WA SENSITIZED PAPER
WB S ENSITIZED PAPER
19
WA SENS PR
FN KL //2N// TYPING ERROR.
20
TY Y OU DID NOT FOLLOW DIRECTIONS. U SE THE LETTER ONLY. T RY AGAIN.
21
UN S ORRY. T RY AGAIN.
22
UN INCORRECT. T HE CORRECT ANSWER IS C, SENSITIZED PAPER. G O ON TO THE NEXT QUESTION.
23
BR SECIA3
24
QU T HE IMPRESSION OF AN IS MADE BY MEANS OF A PRESSURE ROLLER. CARBON PAPER OR INKED RIBBON. E MBOSSED PLATE. E MBOSSED PLATE.
25
CA A
CB A
26
TY F INE. N OW YOU ARE READY TO GO ON TO THE NEXT ASSIGNMENT.
27
WA EMBOSSED PLATE
WB E MBOSS 5 PLATE
28
WA EMBSD PLT
FN KL //2N// TYPING ERROR.
29
TY Y OU DID NOT FOLLOW DIRECTIONS. U SE ONLY THE LETTER. T RY AGAIN.
30
UN A FRAID NOT. T RY AGAIN.
31
UN HAT HAPPENED IS T HAT IT'S NOT RIGHT EITHER. T RY ONCE MORE.
32
UN N OPE. Y OU SHOULDS HAVE ANSWERED A, EMBOSSED PLATE. L ET'S 6 S
33
TRY THE NEXT ASSIGNMENT.
34
BR SECIB
35
RD

SECAQ2

SECAQ3

SECB
A NOTHER SIMPLE AUTOMATED DEVICE IS THE PEGBOARD. A PEGBOARD IS A FLAT WRITING SURFACE WITH NUMBERED PEGS OR POSTS ALONG ONE EDGE. FORMS ARE PUNCHED WITH HOLES TO MATCH THE PEGS FOR ALIGNMENT. LOOK AT THE FIRST ILLUSTRATION. WHEN YOU ARE READY TO GO ON, KEY AN EOB ALTERNATIVE CODING AND 50 DATA IS TRANSFERRED FROM ONE FORM TO ANOTHER BY CARBON OR SENSITIZED PAPER. THE MASTER LIST IS PLACED ON THE PEGBOARD FIRST. THEN THE CARBON PAPER IS PLACED ON TOP. EACH ADDITIONAL FORM IS THEN PLACED ON TOP. THE ORIGINAL IS THE LAST TO BE SET ON THE PEGBOARD. ALL FORMS TO BE USED MUST BE COORDINATED. EACH ORIGINAL ISAligned TO THE PEGS IN DESCENDING ORDER. AS OUR ILLUSTRATION DEMONSTRATES, EACH CHECK WOULD BE PLACED ON THE PEGBOARD A BIT LOWER THAN THE ONE BEFORE IT. WHEN WE ARE FINISHED, WE WILL HAVE A MASTER LIST OR LISTING WITHOUT HAVING TO COPY THE DATA FROM THE ORIGINAL SEVERAL TIMES. PLEASE KEY AN EOB.

TY: 0266871
SEC13Q1
1 QU INDICATE YOUR ANSWER BY TYPING THE WORD OR WORDS THAT IDENTIFY YOUR SELECTION. A FLAT WRITING SURFACE WITH NUMBERED PEGS ALONG ONE EDGE IS KNOWN AS A PEGBOARD.
2 CA NO HELP GIVEN.
3 CA PEGBOARD
4 CB P EGBOARD
5 CA PGBD
6 FN KL //1NT// WATCH YOUR TYPING.
7 TY YOU ARE CORRECT.
8 WA PEG BOARD
9 WB P EG BOARD
10 WA PG BD#
11 FN KL //2NT// TYPING ERRORS.
12 TY OKAY, BUT PEGBOARD IS ONE WORD.
13 BK SECIB# 17 UN THIS ANSWER IS NOT CORRECT. REMEMBER THAT TYPING ERRORS ARE CONSIDERED AS INCORRECT ANSWERS. TRY AGAIN.
14 UN I'M AFRAID YOU LETS GO BACK AND READ AGAIN.
15 BR SECIB

TY: 0266939
SEC18Q2
1 QU DATA ON THE ORIGINAL IS TRANSFERRED TO A COPY OR MASTER LIST BY MEANS OF ---.--.
2 CA NO HELP GIVEN.
3 CA CARBD
4 CB CARBON PAPER
5 CA CBN PR#
6 FN KL //2NT// BE CAREFUL OF TYPING ERRORS.
7 CB SENSITIZED PAPER
8 CB SENS PR#
9 FN KL //2NT// WATCH YOUR TYPING ERRORS.
10 CB CARBON OR SENSITIZED PAPERS
11 CB SENSITIZED OR CARBON PAPER
12 CB CGA OR SENS PR#
13 FN KL //4NT// TYPING ERRORS.
14 FN EDITIS //SH//C/R#
TY YOUR ANSWER IS CORRECT. LET'S GO ON.

SEC1B Q3
1 QU FORMS ARE ALIGNED OR LINED UP BY USING THE NUMBERED ----- ALONG.
2 THE EDGE OF THE BOARD.
3 CA NO HELP GIVEN.
4 CA POSTS.
5 CB Pegs.
6 CB Pegs or Posts.
7 FN Edits //SH//C/R.
8 FN Edits //SH//C/R.
9 TY THAT'T IT. YOu ARE DOING WELL. KEEP IT UP.
10 UN THAT'S NOT IT. TRY ONCE MORE.
11 UN THAT'S THE MATTER. THAT IS NOT THE CORRECT ANSWER. LET'S GO ON ANYWAY AND SEE IF YOU CANNOT DO BETTER.
12 BR SEC1B Q4

SEC1B Q4
1 QU THE ADVANTAGE OF USING A PEGBOARD IS THAT WE MAY HAVE A COPY OR
2 A --- WITHOUT HAVING TO REWRITE THE DATA ON THE ORIGINAL DOCUMENT.
3 CA NO HELP GIVEN.
4 CA MASTER LIST.
5 CB MASTER.
6 CA MSTR LIST.
7 FN KL //2H1// BE CAREFUL OF TYPING ERRORS.
8 FN LISTG.
9 CA LSTG.
10 FN KL //1N1// WATCH TYPING ERRORS.
11 FN Edits //SH//C/R.
12 WA DUPLICATE.
13 FN Edits //SH//C/R.
14 TY THIS IS A GOOD TRY, BUT I WAS LOOKING FOR A TERM MENTIONED IN THE TEXT.
15 T TRY AGAIN.
16 UN THAT'S NOT CORRECT. TRY AGAIN.
17 UN WE STILL CAN NOT SEEM TO GET TOGETHER. TRY ONCE MORE.
18 UN THAT'S THE correct ANSWER IS MASTER LIST. LET'S GO ON.
19 BR SEC1B Q5

SEC1B Q5
1 QU FORMS USED WITH THE PEGBOARD ARE ALIGNED WITH THE PEGS ON THE BOARD BY MEANS.
2 GF----ON THE EDGE OF THE FORM.
3 CA NO HELP GIVEN.
4 CA Punched holes.
5 FN Edits //SH//P//C/R.
6 CA Holes.
7 FN Edits //SH//C/R.
8 TY FINE. Your answer is correct. LET'S TRY THE NEXT SECTION.
9 UN's OK. TRY AGAIN.
10 UN'S IGN OFF AND SEE YOUR INSTRUCTOR.

SEC1C
1 RD OUR FINAL SIMPLE DEVICE IS A BIT MORE COMPLEX THAN THE
2 OTHERS. THE KEYSORT WORKS USES A CARD WITH HOLES PUNCHED ON
3 THE EDGES OF THE CARD.
4 RD PLEASE TURN TO THE SECOND ILLUSTRATION.
5 RD INFORMATION IS RECORDED ON THE CARD BY NOTCHING THE HOLES.
6 RD THESE HOLES MAY BE GROUPED TOGETHER TO REPRESENT DATA.
GROUPED IN THIS MANNER ARE CALLED CODE FIELDS. THE NUMBER OF
HOLEs IN EACH GROUP MAY VARY TO MEET THE NEEDs OF THE USER. A *
CODE KNOWN AS THE BINARY CODE IS USED TO REPRESENT DATA. ONLY *
NUMERIC DATA MAY BE RECORDED. *
WHEN YOU ARE READY TO GO ON, PLEASE KEY AN EOB. *

STEEL ROD OR NEEDLE THROUGH THE HOLES IN THE EDGE OF A DECK OF *
CARDS. THE CARDS THAT HAVE BEEN NOTCHED WILL FALL FROM THE *
NEEDLE, AND THE UNNOTCHED CARDS WILL REMAIN ON THE NEEDLE. THIS *
PROCEDURE WILL BE FOLLOWED FOR EACH POSITION IN THE CODE FIELD. *
ING OR SELECTION OF DATA IS AUTOMATIC. *
P PLEASE KEY AN EOB. *

GROUP SUPPLY ONLY THE LETTER THAT INDICATES YOUR ANSWER. THE FIELDS ON A KEYSORT CARD ARE 6 *
9 A 0 ON THE TOP *
9 B 0 ON THE EDGE *
9 C 0 IN THE MIDDLE *
9 D 0 ALL OVER THE CARD *
CA 24 *
FN EDITIS /SH//C/R*
TY VERY GOOD. LET'S GO ON TO THE NEXT QUESTION. *
WA *
TY THIS IS NOT CORRECT, BUT WHY DON'T YOU TRY AGAIN. *
UN SORRY, BUT THAT IS NOT IT. TRY ONCE MORE. *
UN THE CORRECT ANSWER IS 8, ON THE EDGE. GO ON TO THE NEXT *
QUESTION. *
BR SECIC Q2 *

QU //SS090 //
A UTE THAT THE PICTURE OF THE KEYSORT CARD SHOWS THAT THE SCHOOL *
CCCE HAS BEEN NOTCHED. *
A THAT IS THE SCHOOL NUMBER THAT HAS BEEN NOTCHED INTO THE CARD *
CA 24 *
CA TWENTYFUUR *
FN EDITIS /SH//SP//C/R*
UN DID YOU LOOK AT THE SCHOOL CODE? TRY AGAIN. *
UN TRY 24. *

QU I F THE KEYSORT NEEDLE IS PASSED THROUGH A DECK OF CARDS, AND THIS CARD *
HAS IN THE DECK, WOULD IT FALL INTO THE TRAY OR REMAIN ON THE NEEDLE IF *
YOU WANTED SCHOOLS 10-19? *
CA REMAIN ON THE NEEDLE *
CA REMAIN *
FN EDITIS /SH//C/R*
TY I CAN ALSO CONCLUDE FROM YOUR ANSWER THAT THIS CARD MUST CONTAIN DATA *
CONCERNING SOME OTHER SCHOOL. S O IT IS POSSIBLE TO OBTAIN TWO TYPES *
OF DATA FROM THE KEYSORT CARD-POSITIVE OR NEGATIVE. *
UN UNOTCHED CARDS WOULD REMAIN ON THE NEEDLE. NOTCHED CARDS WOULD FALL *
TU THE TRAY. *
BR SECIC Q4 *

QU I F WE WANT TO IDENTIFY THE CARDS USED TO REGISTER BOYS FROM THOSE USED TO *
REGISTER GIRLS, ONLY ONE POSITION OR CODE FIELD WOULD BE NECESSARY. THE *

CARDS USED FOR BOYS COULD BE NOTCHED, AND THE ONES USED FOR GIRLS WOULD NOT.

THEY HEREFORCE; BOYS' CARDS WOULD FALL TO THE TRAY AND THE GIRLS' CARDS WOULD NOT.

CA REMAIN THE NEEDLE.

THE KEYSORT PROCESS IS THE FIRST OF OUR SIMPLE AUTOMATED DEVICES FOR PROCESSING DATA THAT RESEMBLES THE EQUIPMENT USED IN CARO PROCESSING SYSTEMS OF TODAY. OUR NEXT SECTION WILL BE ON UNIT RECORD SYSTEMS OF PROCESSING.

IF YOU WISH TO TAKE THE QUIZ, PLEASE TYPE YES. IF YOU DO NOT WISH TO TAKE THE QUIZ AT THIS TIME, PLEASE TYPE NO.

THE SIMPLEST FORM OF AUTOMATED DEVICE IS --------.

A CREDIT CARD IS A FORM OF THE --------.

1. CA N D HELP GIVEN.
2. CA CARBONPAPER
3. FN EDIT1S //ALL
4. AD 1/C1+
5. TY TRY THE NEXT ONE.
6. UN TRY THE NEXT ONE.
7. BR TEST1Q2

2. CA N D HELP GIVEN.
3. CA EMBOSSEDPLATE
4. CB SENSITIZEDPAPER
5. CB PEGBOARD
6. CB KEYSORT
7. CB KEYSORTPROCESS
8. FN EDIT1S //ALL
9. AD 1/C1+
10. TY LET 6 S GO ON.
11. UN LET 6 S GO ON.
12. AD 1/C2+
13. BR TEST1Q3

3. CA N D HELP GIVEN.
4. FN EDIT1S //ALL
5. AD 1/C1+
 Question 4. The holes around the edge of the card are notched to record data.

Question 5. Although data is recorded manually on the keysort card, the selection or sorting of cards is automatic.

Question 6. The unnotched holes on the keysort card cause the cards to remain on the needle.

Question 7. Would you like to know your score? Type yes or no.

Question 8. Try the next question.
You may obtain your score from your instructor at a later time.

Please depress the A key.

If you received an A, let us go to the next section.

Depress the A key.

If you receive a C, proceed to the next section.

Depress the A key.

You did not do too well. Your grade is a D. This means

You had 3 or more incorrect answers. Let us see if you can do a better job on the next section.

Depress the A key.

Unfortunately, you received a B. Proceed to the next section.

Depress the A key.

You received a C. Proceed to the next section.

Depress the A key.

You did not do too well. Your grade is a D. This means

You had 3 or more incorrect answers. Let us see if you can do a better job on the next section.

Depress the A key.

We can conclude from the previous section on simple devices that automation is not a machine. Rather it is a process. The chief aim of automation is to reduce human effort and handling to obtain less error. The secondary aim is to increase the processing speed. We shall now attempt to apply the principles of automation to data processing.

Data processing is the processing of information. The huge volumes of data that must be handled every day by business, science, and government staggers the imagination. It is physically impossible to process, catalogue, and store all the vast quantities of information accumulated by all sources without the help of machines.

Automated equipment enables us to gather data, manipulate it, draw conclusions from it, and store it for future use. Routine handling can be performed at high speeds, freeing men and women for more important tasks. These machines can do many of the tasks that humans find boring without becoming bored. Because our machines do not become bored or tired, they make very few mistakes. Most errors that do occur are the result of human error or machine malfunction.

All information handling, or data processing, goes through a cycle. First,

The data to be processed must be assembled. Then it must be recorded in a convenient form. Next, it must be manipulated. The results must be reported. Finally,

It must be stored. The next slide shows the data processing cycle in sequence.

Depress the response key.

Finish //SS010 //.
APPENDIX II

List of Visitors
Partial list of visitors to Providence College Computer Center to view and try Computer Assisted Instruction techniques.

1. National Teachers Corps enrollee's from Rhode Island College.
3. Reporter and Photographer from the Pawtucket Times.
4. Representatives from Harvard University Bio-Medical Department, Dr. Lawrence Stolurow: department head.
5. Providence School Superintendent; Dr. Charles O'Connor.
6. Various priests and nuns from the Providence Diocese School Department.
10. Dr. Sidney High, United States Office of Education.
11. Mr. Kenneth Mellor, Manpower Development Project Supervisor, Rhode Island Department of Education.
12. Dr. Finger, Rhode Island College.
13. Representatives from various departments of Brown University.
APPENDIX III

Reprint "Pawtucket Times", August, 1966
This 'Teacher' Takes Nobody's Back Talk

The pupil hesitates, glances around, fiddles with a shirt button, and makes a guess. It's wrong.

"Sorry about that. Let's make one further attempt at the correct answer," the "instructor" says.

Surrounded by concrete block walls and electronic gadgetry, the pupil stares at the "teacher:" An oversized electric typewriter. "Sorry, wrong again," the thing chatters. "The correct answer is..."

"The student sets his own pace, and is not handicapped if that pace is different from the rest of the class," the Tolman teacher said.

Hardly fantasy, this scene actually took place recently in the computer center of Providence College. There, four men, among a group programming an IBM 1401 computer to be a teaching machine, proceeded to present information to their students.

"Why, this thing could eliminate teachers!" the pupil exclaimed. Commenting later Robert Reynolds, of Providence, a teacher at Tolman, smilingly disagrees. "It will definitely serve to supplement teachers and use them to the best advantage, though."

Mr. Reynolds is chairman of the coordinating committee charged with writing courses in various subjects for the computer to teach. Others in the committee are Edward P. Sherlock of 22 Miles Ave., Pawtucket, and George J. Grant of 120 Dexter St., Cumberland, both from Pawtucket Vocational High School, and Chase E. Loomis, 161 Balch St., Pawtucket, who teaches at Barrington High.

Their project, which is one of 14 in the nation underwritten by the U.S. Department of Education, is aimed at students on the high school level. Mr. Reynolds has written a program on introductory data processing, and Mr. Sherlock on introductory electrical studies.

The typical instruction program goes something like this: The pupil is asked to identify himself through code words which he types out on a "terminal". In this case, the oversized typewriter. On the same typewriter, the computer explains the purpose of the particular course, and then proceeds to present information and ask questions.

The thing that brings the project many steps beyond being a mere electronic textbook is that it treats the pupil as an individual. "I have written one program that takes 22 pages," Mr. Reynolds said. "An outstanding student could finish it in 10 minutes. A slower student could spend hours."

"The student sets his own pace, and is not handicapped if that pace is different from the rest of the class," the Tolman teacher said. There are several reasons why these machines will never replace teachers — the main one being that nothing will ever replace the desire to please a human, flesh and blood professor. But his computer substitute holds out a seemingly unlimited number of uses for the future.

Schools as we know them could be eliminated, the computer specialist theorizes. Instead of spending millions to house pupils in school buildings, their education could be brought to them by installing the terminals of such a computer in a student's home.

The possibilities seem only to be limited by man's imagination.
APPENDIX IV

Time Utilization Table
<table>
<thead>
<tr>
<th>Activity</th>
<th>Hrs. Wkly.</th>
<th>Period</th>
<th>Total Hrs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formal Instruction</td>
<td>2</td>
<td>1 hr.</td>
<td>12</td>
</tr>
<tr>
<td>Role of Proctor</td>
<td>2</td>
<td>1 hr.</td>
<td>12</td>
</tr>
<tr>
<td>Use of 1050</td>
<td>2</td>
<td>1 hr.</td>
<td>12</td>
</tr>
<tr>
<td>Discussion</td>
<td>2</td>
<td>1 hr.</td>
<td>12</td>
</tr>
<tr>
<td>Entry and Testing</td>
<td>2</td>
<td>2 hrs.</td>
<td>24</td>
</tr>
<tr>
<td>Participant Preparation</td>
<td>15*</td>
<td>--*</td>
<td>90*</td>
</tr>
</tbody>
</table>

25 162

* No actual time record was kept by participants. However, several participants estimated their own time at 15 hours of work outside committed or allotted time.
APPENDIX V

Participants and Course Title
<table>
<thead>
<tr>
<th>PARTICIPANTS</th>
<th>COURSE TITLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Robert G. Brooks</td>
<td>Business Law Vocabulary</td>
</tr>
<tr>
<td>Joseph DeFusco</td>
<td>Survey in General Insurance</td>
</tr>
<tr>
<td>Joseph A. Depasquale</td>
<td>Introduction to Transistors</td>
</tr>
<tr>
<td>Edward A. DeSanto</td>
<td>Basic Electric Arc Welding</td>
</tr>
<tr>
<td>George J. Grant</td>
<td>Special Factors in Math</td>
</tr>
<tr>
<td>Chace E. Loomis, Jr.</td>
<td>Automobile Insurance</td>
</tr>
<tr>
<td>Arthur Montanaro</td>
<td>Filing</td>
</tr>
<tr>
<td>Amato Nocera</td>
<td>General Mathematics</td>
</tr>
<tr>
<td>Robert R. Reynolds</td>
<td>Introduction to Data Processing</td>
</tr>
<tr>
<td>Edward P. Sherlock</td>
<td>Basic Electrical Theory</td>
</tr>
<tr>
<td>Allen F. Swann</td>
<td>Basic Data Processing</td>
</tr>
<tr>
<td>Raynond Szeflinski</td>
<td>Postal Services</td>
</tr>
<tr>
<td>Frank R. Walker, III</td>
<td>English Grammar</td>
</tr>
</tbody>
</table>
APPENDIX VI

Communities and Schools Represented
### High Schools

<table>
<thead>
<tr>
<th>School</th>
<th>Community</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barrington High School</td>
<td>Barrington, R.I.</td>
<td>1</td>
</tr>
<tr>
<td>Coventry High School</td>
<td>Coventry, R.I.</td>
<td>2</td>
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<tr>
<td>Cranston High School</td>
<td>Cranston, R.I.</td>
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<tr>
<td>Pilgrim High School</td>
<td>Warwick, R.I.</td>
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<tr>
<td>Tolman High School</td>
<td>Pawtucket, R.I.</td>
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<tr>
<td>Warren High School</td>
<td>Warren, R.I.</td>
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</table>

### Vocational Schools

<table>
<thead>
<tr>
<th>School</th>
<th>Community</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pawtucket Vocational High School</td>
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</tr>
<tr>
<td>Vocational Tech. School of Rhode Island</td>
<td>Providence, R.I.</td>
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</table>
APPENDIX VII

Basic Computer Assisted Instruction System
BASIC COMPUTER ASSISTED INSTRUCTION SYSTEM

1. Software: Basic IBM Coursewriter Programming Language*

2. Hardware:

<table>
<thead>
<tr>
<th>QUANTITY</th>
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</tr>
</thead>
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<tr>
<td>1</td>
<td>1401 Central Processing Unit</td>
</tr>
<tr>
<td>1</td>
<td>1402 Card Reader-Punch</td>
</tr>
<tr>
<td>1</td>
<td>1403 Line Printer</td>
</tr>
<tr>
<td>1</td>
<td>1409 Model 2</td>
</tr>
<tr>
<td>2</td>
<td>1026 Transmission Control Unit</td>
</tr>
<tr>
<td>2**</td>
<td>1050 Data Communications System</td>
</tr>
</tbody>
</table>

* As adapted by the University of Texas to allow batch-loading of punch cards.

**One 1050 Data Communications System has been modified to utilize a slide projector and a tape recorder. This unit serves as the master terminal.
APPENDIX VIII

Report of Technical Difficulties
DIFFICULTIES ENCOUNTERED WHILE OPERATING COURSEWRITER

I) -Loss of continuity of course material
   -Loss of course material
   -Branching to improper course material

All three problems can be linked to the same weakness of the original CAI system. In order to explain the problem involved it is necessary to consider in some detail the medium of storage employed by the CAI system. This medium is a relatively high-speed external storage device called a disk. Since disk storage is not basically a sequential storage medium, some means of identifying the location of the desired material on the disk must be available. The physical location of a record on a disk lies within a sector of the disk; each sector having a unique address.

Therefore, if course material is to be stored on a disk and a course is to maintain a logical continuity, it is necessary to obtain from the course record presently being processed by the CPU, the physical location of the next logical record; not necessarily sequentially stored. This portion of the record is called a pointer, since it literally points to the physical location (address) of the next logical record of the course.

If an author should desire to insert some material in his course, the CAI system would physically position this material at the end of the course.

To maintain the logical continuity, it would be necessary to
   a. Break the chain of pointers at the logical point of insertion
   b. Cause the pointer in the record preceding the insertion to point to the first record of the inserted material, and
   c. Cause the pointer of the last record of the inserted material to point back to the record that should follow logically; i.e. a so-called "link-up" and "link-back" would have to be established.

If at any time during this process of insertion, the CAI system should be interrupted, either by a hardware malfunction, a software failure, or just plain author error the "link-back" address would be lost and data of an indeterminate nature would be inserted in the "link-back" pointer of the last record inserted. The inserted course material still would be available to the user however, the course would lose its logical continuity after reaching the end of the insertion since no connection had been established to the next logical record. This condition would invariably lead to an interrupt condition, causing the breakdown of the system and possibly the destruction of valuable course material.

In conjunction with this problem, the physical location of some special function keys on the IBM 1050 keyboard has shown to be the principle reason for author error. The manufacturer has been informed concerning this.
II) -Inability of the advanced version of Coursewriter to address the IBM 1050 terminals present at Providence College.

During the course of this contract, we obtained from the University of Texas an improved version of Coursewriter. The original version, as supplied by IBM, under an inflexible system of console addressing, restricted the modes of console operations. For example, the proctor (supervisor of the system) could exercise his functions only from the first console of the system, virtually chaining him to that device and also removing one terminal from classroom usage, since this terminal had to be placed in the immediate vicinity of the computer itself.

The CAI system obtained from Texas U. permitted the proctor to control the system from any console, thus releasing one further terminal for student and author usage. To make use of this flexibility, the terminal addresses; i.e. the codes by means of which the CPU gains access to a terminal were changed. Since we had insufficient documentation on the Texas system, the lack of any response from the terminals was first attributed to a software malfunction. After extensive debugging and consultations with personnel from the local IBM Branch Office and experts from the Advanced Maintenance and Development Department of the IBM FE Division in Poughkeepsie, N. Y., it was determined that the terminal addresses employed by the original version of Coursewriter were sufficiently different from the codes used by the Texas system to prevent any response at all from the terminals. Once this fact had been established, a relatively simple change in the wiring of the IBM 1050 terminals involved remedied the situation. No difficulties have since been experienced in this particular part of the CAI system.