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ABSTRACT
A two-phase study investigated the employment opportunities for visually impaired computer programers and the practicality of training them at a community/junior college. Activities during phase 1 included an employer survey to determine employment opportunities, a department chairperson survey, a blind programer survey, development of profiles and task analysis, request for literature pertaining to the training of blind programers from training centers, gathering of literature on special training devices, and compilation of estimated costs and building requirements. During phase 2, a program to train visually impaired computer programers was developed. A list of subjects to be taught was developed, and a 21-month curriculum was designed. Recommendations were also made regarding entry-level criteria, special devices and equipment, personnel, building space requirements, special training for instructional personnel, special services for visually impaired students, job placement, and public relations. (Appendixes, amounting to well over one-half of the report, include instruments, a profile of a programer, data processing subject objectives, curriculum and catalog descriptions, entry-level criteria, a list of special devices and equipment, and two quarterly reports.) (YLB)

FINAL REPORT

FEASIBILITY STUDY

AND

DEVELOPMENT OF A PROGRAM TO TRAIN

VISUALLY IMPAIRED STUDENTS

IN

COMPUTER PROGRAMMING

DEVELOPED IN COOPERATION WITH THE

RESEARCH COORDINATING UNIT

DEPARTMENT OF OCCUPATIONAL EDUCATION AND TECHNOLOGY

TEXAS EDUCATION AGENCY

RAY BARBER, DIRECTOR

EXEMPLARY AND INNOVATIVE PROGRAMS

AND

SAN ANTONIO COLLEGE, SAN ANTONIO, TEXAS

BY

AL STEHLING, CDP

CHAIRMAN, DATA PROCESSING DEPARTMENT.

SAN ANTONIO COLLEGE

CONTENTS

ATTACHMENTS (continued):

I.   Data Collection Form

J.   First Quarterly Report

K.   Data Processing Subject Objectives

L.   Curriculum and Catalog Descriptions

M.   Entry Level Criteria

N.   Special Devices and Equipment

O.   Newspaper Articles

P.   Second Quarterly Report

DEFINITION OF TERMS

The following terms are defined for their usage in this report:

Advisory Committee -- An active Phase II committee established to develop the program to train visually impaired computer programmers.

Optacon -- (OPtical to TActile CONverter) converts the image of a printed letter (from paper or a CRT unit) into a vibrating tactile form that a blind person can feel with one finger.

Braille Terminal -- An on-line computer terminal which provides braille II coding as output and a keyboard for input.

CRT -- (Cathode Ray Tube) an on-line computer terminal containing a key board and a screen on which information is displayed.

Employers -- Data processing managers and supervisors who are responsible for the employment selection and the performance of the company's computer programmers.

Steering Committee -- A committee established early in the project to help identify resource people and materials, to provide direction in the Phase I data collection activities, to evaluate the data collected during Phase I, and to make recommendations at the conclusion of Phase I.

TSCB -- Texas State Commission of the Blind

Visually Impaired -- Describes the citizens who are blind, legally blind, or have a vision impairment.

Visual-Tek -- A special device that displays printed materials on a screen in a magnified form.

INTRODUCTION

In the Fall of 1977, several persons contacted the Director of Technical Education and the Chairman of the Data Processing Department at San Antonio College to encourage the college to provide training for blind/visually impaired computer programmers. Among the people to visit the campus to request specialized training for visually impaired were: Walter Musler, the director of the district's piano tuning program for the visually impaired; Bob Wiley, a blind computer programmer, and several representatives from the Governor's Coordinating Office for the Visually Handicapped. A primary concern expressed by the visitors was that the visually handicapped Texans were not reaping the benefits from the many good vocational programs offered by the public Texas Junior/Community Colleges. It appeared that many intelligent blind citizens were being routed into workshops or programs along with the low-ability and multi-handicapped blind, and were not receiving the opportunity to reach their potential. Additional observations made by the visitors were that some "gifted" or intelligent blind were sent out of state for specialized training (such as computer programming), and that others preferred to remain on welfare rolls rather than work in a position that was degrading to their educational and/or social background.

The visitors were familiar with the success of certain blind/ visually impaired computer programmers, and reasoned that since San Antonio College provided the largest and most recognized business

data processing program in Texas, it would be the logical campus
to provide computer programming training for the blind/visually
impaired Texans.

As follow-up to the visitors request for specialized training,
the department chairman made inquiries and read articles pertaining
to blind programmers. Several articles reported the success of blind
programmers. One of these was an article in Computerworld stating
that programming was a "natural" field for the visually impaired.
The article pointed out that the blind, because of their handicap,
are trained to organize and systematize every aspect of their lives.
This very orderly and systematic procedure is similar to the logical
procedures followed by good computer programmers (Attachment A).

Other things that indicated that San Antonio College should con-
sider training blind programmers was the success of two local blind
programmers (both trained in Cincinnati, Ohio) and the Data Process-
ing Department's success with the visually handicapped. However,
there were too many unknown variables to make possible an immediate
decision pertaining to the specialized training being requested.
Some of the unanswered questions related to the employment opportunities;
specialized training, equipment, and devices required; curriculum to
be offered; mainstreamed versus segregated instruction; number of
blind/visually impaired to be served; program costs; counseling,
tutoring, and placement problems; etc.

In summary, the request to train the intelligent blind/visually

··impaired to become computer programmers appeared to be justified, but the college was not prepared to commit itself without making a study. Permission was given to the chairman of the Data Processing Department to apply for state funds to make a feasibility study, and, if the results of that study were positive, to design a program to train blind/visually impaired programmers.

OBJECTIVES

The project was divided into two phases and each phase had a special set of objectives. The two-phase concept allowed for a logical check point where the study could be terminated in event the steering committee concluded that (1) employment opportunities did not exist, and/or (2) it was not considered practical for a junior college to offer the required training.

The established objectives were:

Phase I:

To conduct a feasibility study to determine:

1. The employment opportunities for visually impaired computer programmers

2. The type of training required (including curriculum content, special equipment and training devices, mainstreamed versus individualized instruction, etc.)

3. Whether San Antonio College should provide the required training.

Phase II:

To develop a program (AAS or Certificate of Completion) to train visually impaired computer programmers. The program package will:

1. List the proposed curriculum

2. Identify the length of the program, the mainstreamed

and segregated courses; and any special training

equipment and devices needed

3.   Identify the special faculty, counseling, tutoring,
      and job placement needs to serve the visually
      impaired students. '

The goal was to implement the program developed during Phase
II at San Antonio College when State or Federal funds became avail-
able to support the specialized training. The proposed target date
to offer the program was the Fall Semester of 1979.

PROJECT PROCEDURES

Listed below are the project procedures as they appeared in the
application for TEA funding for exemplary and innovative programs.
Some deviations were made to stated procedures and they are identified
in the following sections (Phase I and Phase II). The proposed pro-
cedures were:

Phase I, scheduled for three months (7-1-78 thru
9-30-78), will start with a steering committee seminar.
This steering committee will include members of the
Data Processing Department's Advisory Committee, blind
programmers in the San Antonio area, representative(s)
from the Governor's Coordinating Office for the Visually
Handicapped, TEA representative(s), San Antonio College
administrator(s), and the project coordinator. The pur-
pose of the seminar will be to identify resource people
and materials, and to determine which data gathering
tools should be employed during the feasibility study.
Next, selected local and state computer installations
will be surveyed to determine (a) the employment oppor-
tunities for visually impaired computer programmers, and
(b) the specific training which needs to be included in the
program. While this information is being gathered, the
project coordinator will visit segregated training centers
for blind programmers in the northern and western states,
computer manufacturers, consultants, and blind program-
mers to become familiar with the procedures and problems
dealing with the training of visually impaired students.
In addition to gathering data pertaining to the educational
process, statistics dealing with the teacher/student ratio,
tutoring and counseling services, instructional techniques,
cost per student, length of instruction, special teaching
aids, etc., will be accumulated.

The project coordinator will prepare a summary of the em-
ployment opportunities, the training requirements, estimated
costs, anticipated problems and possible solutions, etc. A
second seminar will be scheduled so that the results of the
feasibility study can be reviewed and analyzed by the steer-
ing committee. The purpose of this seminar will be to deter-
mine whether the need to train visually handicapped computer
programmers exists, and if so, whether San Antonio College

should provide this training.

If the seminar participants reach a negative decision, the project will terminate. In the event the decision is positive, the project will move into Phase II.

During Phase II, the project coordinator will develop the program. Additional input will be requested from the persons who attended the seminars and the resource people. Travel will be necessary to gather more detailed information, particularly in the area of mainstreaming techniques and special assistance for the visually handicapped students. Phase II is scheduled for four months (10-1-78 thru 1-31-79). An advisory committee of successful blind and sighted programmers will assist the project coordinator in the development of the proposed program.

STEERING COMMITTEE:

The steering committee was established and consisted of the following members:

1. Dr. Robert Bottenberg (blind)
   Chief Computational Sciences Division
   Air Force Human Resources Laboratory
   Brooks Air Force Base

2. O. C. "Bud" Davidson (visually impaired)
   Deputy Director of Individual Assistance Services
   Governor's Coordinating Office for the Visually
       Handicapped
   Austin, Texas

3. Robert M. Hackett (employer and member of D.P.
       Advisory Committee)
   Director, Application Services
   City Water Board
   San Antonio, Texas

4. Sharon Lynn Hill (counselor)
   Counselor/Coordinator for Handicapped Students
   San Antonio College

5. Dr. Max Jabs (administrator)
   Associate Dean of Instruction
   San Antonio College

6. Patricia F. Lindey (educational agency)
   Coordinator, Vocational Curriculum
   Texas Education Agency
   Austin, Texas

7. Edward Marquart (blind, retired)
   Computer Programming Instructor
   San Antonio, Texas

8. Walter Musler (legally blind)
   Program Director, Piano Tuning
   San Antonio College

9. Chester Neeley (blind programmer)
    Automation Officer, Systems Research
    Frost National Bank
    San Antonio, Texas

10. Charles Raeke (blind)
    Supervisor of Program Evaluation
    Planning and Development,
    Texas State Commission of the Blind
    Austin, Texas

11. Frank Sievers (employer and member of D. P. Advisory
        Committee) .
    Vice-President·
    Frost National Bank
    San Antonio, Texas

12. Al Stehling (project coordinator)
    Chairman, Data Processing
    San Antonio College

13. Bob Wiley (blind programmer)
    Programmer and System Analyst
    City Water Board
    San Antonio, Texas

Other persons invited to committee meetings were:

1. Ray Barber
    Director Exemplary and Innovative Programs
    Texas Education Agency
    Austin, Texas

2. Nellie Thorogood
    Director Occupational Education and Technology
    San Antonio College

EMPLOYERS SURVEY:

During the first steering committee meeting, Charles Raeke re-
ported that experiences in his office (TSCB) indicated that generally
only 15% of the population responded to mail-out questionnaires per-
taining to the blind. The committee agreed that a 15% response would

not provide valid results to determine the employment opportunities for visually impaired. The steering committee concluded that the employment opportunity data could best be gathered by personal interviews during which the project coordinator would complete a standardized questionnaire. The employers' population was defined as approximately fifty computer installations in San Antonio, and five each in Houston, Dallas, and Austin. The samples from Houston, Dallas, and Austin were used to validate the survey of the San Antonio employers.

Gathering employment information from employers instead of mailing out questionnaires was a major change in the proposed procedures. The project coordinator spent a great deal of time making appointments, waiting in employers' offices, and completing the questionnaires during the interviews. A three-day trip was made to gather employment opportunity data from employers in Houston, Dallas, and Austin. Forty-eight employers were interviewed in San Antonio, five in Houston, six in Dallas (one refused to answer the questions), and five in Austin.

The steering committee had proposed that employment opportunity data be gathered only from the medium to large size computer installations because many of the small shops employ operator/programmers instead of programmers. In addition, the programming tasks may be performed by the data processing manager in the small shops. Thirteen of the 64 installations contacted identified themselves as

"small" (an annual D.P. budget of less than $250,000), although they employed several programmers. The results of their input is included in the survey because they were not "small one-person shops."

The employers questionnaire appears in Attachment B and the summarized results are listed below (SA represents San Antonio, and H D A represents Houston, Dallas, and Austin):

Section One:

1. Size of installation based on D.P. budget:

	SA	H D A	TOTAL
Small (less than $250K)	12 (25%)	1 (7%)	13 (21%)
Medium ($250K - $1,000K)	22 (46%)	4 (26%)	26 (41%)
Large (Over $1,000K)	14 (29%)	10 (67%)	24 (38%)
TOTALS	48	15	63

2. Primary computer System in use:

MANUFACTURER	SYSTEM	SA	HDA	TOTAL
IBM	370s/155,158,168	7	6	13
AMDAHL	470		1	1
ITEL	470		1	1
Burroughs	6807,6811	1	1	2
AMDAHL	V-6		1	1
IBM	370s/145,148	4	1	5
Burroughs	3700,3800,4800	3		3
IBM	370s/125,138	5		5
Honeywell	6200	1		1
Datapoint	6600	1		1
NCR	Criterion 8570	1		1
IBM	360s	7	2	9
Honeywell	2015	1		1
NCR	Century 200,201,300	3		3
Burroughs	2800	1		1
Univac	9030	1		1
IBM	S/3	2		2
Burroughs	1700,1728	3		3
NCR	100,151	3		3
Datapoint	5500	3		3
Univac	1110	1		1
ITEL	84		1	1
Service work performed on many different systems			1	1

3. Two most commonly used languages and estimated percentage of total programming effort:

Language		# USERS	90-100	80-89	70-79	60-69	50-59	40-49	30-39	20-29	10-19	0-9
					Percentage of Total Effort							
COBOL	SA	40	16	5	2		6	3		3	3	2
	HDA	13	5	1	2	1	3				1	
Assembly	SA	15	1		1	1	1	1		2	1	7
	HDA	9		1			1		1	1	1	4
RPG II	SA	15	4	1		1	4	1		2	1	1
Neat/3	SA	6	4	1						1		
Data-share	SA	4	1	2			1					
PL/1	SA	3					1	1			1	
	HDA	2		1							1	
FORTRAN	SA	3									2	1
	HDA	4							1	3		
BASIC	SA	2									1	1
SYDOL	HDA	1						1				
CICS	SA	1							1			
Mark 4	HDA	1										1
Easy Coder	SA	1										1
MOBOL	SA	1										1

4. Type of formal in-service training for programmers:

	SA	HDA	TOTAL
Comprehensive	2(4%)	3(20%)	5(8%)
Limited	13(27%)	6(40%)	19(30%)
None	33(69%)	6(40%)	39(62%)
TOTALS	48	15	63

5. Are newly-employed programmers required to take in-service training?

	SA	HDA	TOTAL
Yes	9(18%)	4(26%)	13(21%)
Depends on previous experience	5(10%)	1(7%)	6(10%)
Depends on previous schooling	1(2%)	0	1(1%)
Depends on combination of things	1(2%)	4(27%)	5(8%)
No formal in-service trafning	32(68%)	6(40%)	38(60%)
TOTALS	48	15	63

6. Use of programming teams:

	SA	HDA	TOTAL
All programmers work in teams	9(19%)	2(13%)	11(17%)
Most programmers work in teams	8(17%)	7(48%)	15(24%)
Some programmers work in teams	16(33%)	4(26%)	20(32%)
Programming teams are not used	15(31%)	2(13%)	17(27%)
TOTALS	48	15	63

7. Employment of handicapped programmers:

	SA	HDA	TOTAL
Have employed visually handicapped programmers	7(15%)	2(13%)	9(14%)
Have employed other handicapped programmers	6(12%)	6(40%)	12(19%)

	SA	HDA	TOTAL
Have not employed handicapped programmers	37(77%)	8(53%)	45 (71%)

Note: Totals do not balance because several employers have hired visually and other handicapped programmers

8. Applications from handicapped programmers:

	SA	HDA	TOTAL
Have received applications from visually handicapped programmers	4(8%)	3(20%)	7(11%)
Have received applications from other handicapped programmers	7(15%)	5(33%)	12(19%)
Have not received applications from handicapped programmers	38(79%)	7(47%)	45(71%)

Note: Totals do not balance because one employer received applications from both visually and other handicapped programmers

9. Classification and number of programmers:

	1978			1983(Est.)			% Increase		
	SA	HDA	TOTAL	SA	HDA	TOTAL	SA	HDA	TOTAL
Classification									
Business Application	272	375	647	501	851	1352	84%	127%	109%
Scientific Application	8	53	61	15	88	103	88%	66%	69%
Programmer/ Systems Analyst	253	250	503	328	476	804	30%	90%	60%
System Programmer	96	63	159	178	152	330	85%	141%	108%
Others	191	18	209	454	28	482	138%	56%	131%
TOTALS	820	759	1579	1476	1595	3071	80%	110%	94%

Note: Several employers stated that their companies are planning to assign programming tasks to the user areas, thereby reducing the number of programmers under the supervision of the Data Processing Departments.

Section Two:

1. I would consider employing a visually handicapped programmer

	SA	HDA	TOTAL
DY (Definitely yes)	5(10%)	5(33%)	10(16%)
PY (Probably yes)	23(48%)	5(33%)	28(44%)
U (Undecided, unknown)	10(21%)	3(20%)	13(21%)
PN (Probably not)	10(21%)	2(14%)	12(19%)
DN (Definitely not)	0	0	0

2. I would consider employing a visually handicapped programmer if I had the opportunity to work with the student during an internship program.

DY	8(17%)	3(20%)	11(17%)
PY	19(40%)	6(40%)	25(40%)
U	11(22%)	5(33%)	16(26%)
PN	10(21%)	1(7%)	11(17%)
DN	0	0	0

3. Top management encourages me to hire visually handicapped employees.

DY	4(8%)	1(7%)	5(8%)
PY	7(15%)	0	7(11%)
U	32(67%)	13(86%)	45(71%)
PN	4(8%)	1(7%)	5(8%)
DN	1(2%)	0	1(2%)

		SA	HDA	TOTAL

4. All qualifications being equal, I would probably offer a vacant programming position to a visually handicapped applicant.

	SA	HDA	TOTAL
DY	4(8%)	0	4(6%)
PY	10(21%)	7(47%)	17(27%)
U	15(31%)	0	15(24%)
PN	19(40%)	7(47%)	26(41%)
DN	0	1(6%)	1(2%)

5. I would be willing to install a special device or terminal to assist the visually handicapped programmer.

	SA	HDA	TOTAL
DY	7(15%)	0	7(11%)
PY	17(35%)	9(60%)	26(41%)
U	14(29%)	3(20%)	17(27%)
PN	10(21%)	2(14%)	12(19%)
DN	0	1(6%)	1(2%)

6. My primary hesitation (if any) to employing a visually handicapped programmer deals with our physical facilities.

	SA	HDA	TOTAL
DY	17(35%)	4(26%)	21(33%)
PY	6(13%)	4(26%)	10(16%)
U	3(6%)	0	3(5%)
PN	7(15%)	2(14%)	9(14%)
DN	15(31%)	5(34%)	20(32%)

	SA	HDA	TOTAL

7. My primary hesitation (if any) to employing a visually handicapped programmer deals with attitudes and emotions.

	SA	HDA	TOTAL
DY	1(2%)	0	1(2%)
PY	7(15%)	2(14%)	9(14%)
U	2(4%)	1(7%)	3(5%)
PN	12(25%)	4(26%)	16(25%)
DN	26(54%)	8(53%)	34(54%)

8. I would be more inclined to employ a visually handicapped programmer if I had input to the training curriculum.

	SA	HDA	TOTAL
DY	8(17%)	0	8(13%)
PY	13(27%)	6(40%)	19(30%)
U	5(10%)	2(13%)	7(11%)
PN	14(29%)	2(13%)	16(25%)
DN	8(17%)	5(34%)	13(21%)

9. I feel that it is possible to train visually handicapped programmers for the position(s) in our installation.

	SA	HDA	TOTAL
DY	12(25%)	1(7%)	13(21%)
PY	19(40%)	7(47%)	26(41%)
U	11 (23%)	2(13%)	13(21%)
PN	5(10%)	5(33%)	10(15%)
DN	1(2%)	0	1(2%)

	SA	HDA	TOTAL
10. We have a detailed list of tasks or duties to be performed by firm's programmers.			
DY	20(42%)	4(26%)	24(38%)
PY	6(12%)	3(20%)	9(14%)
U	1(2%)	0	1(2%)
PN	8(17%)	1(7%)	9(14%)
DN	13(27%)	7(47%)	20(32%)

If yes, I feel that a visually handicapped programmer could satisfy the specified qualifications.

	SA	HDA	TOTAL
DY	4(8%)	1(7%)	5(8%)
PY	11(23%)	4(26%)	15(24%)
U	5(10%)	1(7%)	6(10%)
PN	7(15%)	1(7%)	8(13%)
DN	0	0	0

11. We have a written job qualification for our programming position(s).

	SA	HDA	TOTAL
DY	32(67%)	10(66%)	42(67%)
PY	2(4%)	1(7%)	3(5%)
U	0	0	0
PN	1(2%)	1(7%)	2(3%)
DN	13(27%)	3(20%)	16(25%)

	SA	HDA	TOTAL

If yes, I feel that a visually handicapped programmer can perform the specified tasks or duties.

	SA	HDA	TOTAL
DY	9(19%)	3(20%)	12(19%)
PY	15(31%)	4(27%)	19(30%)
U	4(8%)	2(13%)	6(10%)
PN	5(10%)	2(13%)	7(11%)
DN	2(4%)	0	2(3%)

12. We sometimes ▒ke "trade offs" between the ▒ired job qualifications and ▒ accomplishments (schooling, ▒p▒▒ence, etc.) when employing programmers.

	SA	HDA	TOTAL
DY	40(83%)	11(73%)	51(81%)
PY	7(15%)	3(20%)	10(16%)
U	0	0	0
PN	1(2%)	1(7%)	2(3%)
DN	0	0	0

13. Duties performed by programmers that employers felt could not be performed by a visually handicapped programmer were:

Number		Comments:
SA	HDA	
5	1	Coding (use coding sheets).
12	5	Read program listings and "dumps".
17	2	Read materials (hard copy, instructions, back-up procedures, labels, research materials, forms, reports, manuals, microfilm, specifications, test runs, etc.).

Number		Comments:
SA	HDA	
4	1	Key punching, data entry operations.
16	2	Program debugging, testing, maintenance, and modifications.
12	1	Back-up computer operations, computer operations, access to hardware, work with operator to debug programs, compiling.
1	0	Create JCL instructions.
14	12	On-line programming (use of CRT units, on-line coding, on-line testing, on-line verification, CRT program maintenance).
1		Locating logic errors.
8	1	Interface with users, presentations before groups, black board layouts, meet with users at odd locations, lack of mobility, visit out-of-town users, visit clients.
3	1	Work at night and week-ends.
6	6	Write documentations and specifications, draw layouts and flowcharts.
4	0	Balance test runs, sight verification, interface with other programmers' paperwork, interface with "memo" environment.
1	1	Install software packages, work with software.
4	1	Conduct interviews, self-training, supervision, function independently, system analysis.

14. Comments by (1) employers who would not consider hiring a
visually impaired programmer, (2) employers who felt that the
visually impaired programmers could not be trained to work in
their installations, (3) employers who felt that visually im-

paired programmers could not performed specified tasks, or (4) employers who felt that visually impaired programmers could not meet their job qualifications were:

Number		Comments:
SA	HDA	
5	6	Do not have and/or cannot afford special devices and other arrangements needs to accommodate blind programmers.
4	2	Do not understand blind programmers needs and abilities.
3	0	Programmers are required to operate hardware.
4	0	No back-up, no time to work with handicapped, cannot afford extra costs.
4	2	All things being equal, a sighted programmer would be more productive.
1	0	Several visually handicapped should be employed to justify added costs.
3	1	Programmers are required to work in the evenings. Blind cannot function independently, move out-of-town, visit customers.
2	1	Blind cannot handle source documents, printed information, reading assignments, and emergency procedures.
1	0	Most programming tasks deal with maintenance.
1	0	"Hard Pressed" to train personnel.
1	0	Blind programmers cost more than they produce.
0	1	Programmers must work with a large variety of software.
0	1	Programmers are required to take written aptitude tests.

DPMA SURVEY:

One of the steering committee members suggested that a short employment opportunity questionnaire be mailed to the presidents of the Texas Data Processing Management Association Chapters. Seventeen mini-surveys were mailed (see Attachment C) and seven presidents responded. Four of the seven mini-surveys were not filled out properly, and the others appeared to have a "follow the leader" type of response. The employment opportunity data gathered though this particular survey was not considered valid.

DEPARTMENT CHAIRPERSONS SURVEY:

Since non-data processing classes were to appear on the curriculum, a short questionnaire (see Attachment D) was sent to eight department chairpersons whose courses were likely to appear in the curriculum. The eight chairpersons included the Director of Learning Resources and the Chairman of the Orientation Program. Seven replies were received and were summarized as follows:

		Yes	Undecided	No
1.	Blind and visually impaired students can be "mainstreamed" into the classes taught by our department.	6		1
2.	Our department would be able to schedule special class sections to offer segregated instruction for the blind and visually impaired students.	2		5

		Yes	Undecided	No

3. Our department would be able to provide small classes (6 to 8 students), if necessary to serve blind and visually impaired students.

                                2   5

4. Our department would be able to provide special training devices to assist the blind and visually impaired students.

                                4   1   2

5. Arrangements could be made in our department to provide tutoring and other special services to insure that the blind and visually impaired can reach our course objectives.

                                4   3

6. Our department could provide courses that would meet longer than the normal class periods so the training could be completed before the end of the scheduled semester.

                                2   1   2

7. Our department could provide a faculty member who would serve as a liaison for the planning and instructional phases in the training of blind and visually impaired students.

                                6   1

BLIND PROGRAMMERS SURVEY:

The steering committee members agreed that data pertaining to the training requirements should be gathered from (1) visually impaired programmers and (2) schools that are currently training

visually impaired programmers. A lengthy questionnaire was prepared to gather data from visually impaired programmers. However, it proved difficult to obtain names and current addresses of visually impaired programmers, and only eighteen questionnaires were mailed. Of these, eight programmers completed the questionnaires, two replied that they were not blind, one replied that he was not a programmer, and one letter was returned as "no such street number."

Attachment E contains the cover letter and questionnaire mailed to the blind programmers. The summarized results are:

1. Age at which sight was lost:
   Birth (4), 8, 11, 15, and 33

2. Highest educational level before sight was lost:
   N/A (4), grades 2, 5, 8, and 12

3. Highest educational level after sight was lost:
   H/S, 2 years college, bachelor's (5), master's

4. Employment in data processing or related field before the loss of sight:
   None (8)

5. Primary occupation before loss of sight:
   N/A (7), crop duster pilot

6. Programming schooling at:
   On-the-job (2), trade school (4), college or university (2)

7. School or company that provided training:
   MedComp (4), New Mexico State University, University of Texas at Arlington, NASA, and EnTex, Inc.

8. Married at time of programming training:
   Yes (4), No (4)

9. Source and percentage of usage of out-of-classroom
    learning materials:
        Braille: 0% (3), 5%, 10% (2), & 61%
        Audio Tapes: 0% (3), 10%, 25%, 29%, 80% & 90%
        Readers: 0% (5), 10%, 15%, & 80%
        Tutors: 0% (6), 25% & 80%
        Magnifiers: 0% (7), 100%
        Own reading: 0% (6), 95% & 100%
        Fellow programmers: 0% (7) & 5%

10. Training school taught only blind students:
        Yes (4), No (4)

11. Blind students could be taught to program in schools
    for sighted:
        Yes (7), Unknown (1)

12. The blind should be trained to be:
        Business programmers (8), scientific programmers (7)
        and software programmers (6)

13. The size of programming staff in computer installation
    most likely to hire a blind programmer:
        0 - 5 (0), 6 - 15 (1), 16 - 30 (5), 31 - 100 (5),
        and over 100 (5).

14. Number of programmers at employment installation:
        22, 25 (2), 40, 50, 60, over 100, and 125

15. Work as part of a programming team at employment
    installation:
        Most of the time (3), sometimes (4), none of the
        time (1)

16. Blind programmer would be more productive if part of
    a programming team:
        Yes (6), no response (2)

17. Level of the blind programmer's educational level has
    a direct effect on employment opportunities:
        Yes (8)

    Level of education that provides best employment
    opportunities for blind programmers:
        One year program (2), bachelor's degree (4),
        master's degree (2)

18. Candidates for programming school should be screened by a panel of programmers:
Yes (3), No (3)

19. Special devices provided by employer to assist blind programmer:
LED 120 (braille terminal) (2), elastic tape for braille listings (2), flourescent lamp, telray CRT, braille writer (3), braille typewriter, and tape recorder.

20. Programming tasks performed by sighted programmer which blind programmer cannot perform:
Flowcharting (2), reading dumps (4), documentation, filing, reading inquiries, checking report output, TSO operations, working with microfiche, and CRT operations.

21. Services offered by blind programmers to "trade-off" for tasks they cannot perform:
Better checkout of programs, better attendance, better analysis and design, less distractions, excellent knowledge of programming languages (2), provide security by use of braille, better memory and recall, greater desire to prove himself, and better prepared for the unexpected.

22. The remaining statements, qualifications, and courses are rated as DI (definitely important, "must have" or "must know"); I (important, "should have" or "should know"); U (uncertain, undecided, "maybe"); NI (not important, can probably do without, "of little value"); and DU (definitely unimportant, "of no value").

STATEMENTS:	DI	I	U	NI	DU
Blind programmers must be better trained than most sighted programmers.	4	2		1	1
Internship (on-the-job training) should appear in the curriculum for blind programmers.	5	3			

	DI	I	U	NI	DU
The instructors who teach the blind programming students need special training.	3	1	3	1	
Student tutoring should be provided for the blind students.		3	2	3	
Faculty tutoring should be provided for the blind students.	1	1	3	2	1
Special counseling services should be provided for the blind students.	1	1	3	2	1
Very strict entry-level qualifications must be maintained for the blind students.	3	1	3		
Braille output of the students compile and test runs should be provided.	5	1	1		1

ENTRY LEVEL QUALIFICATIONS:	DI	I	U	NI	DU
Strong desire to be independent.	3	4	1		
Willingness and ability to relocate	1	6	1		
Good health	2	4		2	

ENTRY LEVEL QUALIFICATIONS:	DI	I	U	NI	DU
High school graduate	7	1			
Good grooming	2	6			
Good verbal communication	4	4			
Good mathematical background		3	3	3	
Proficiency in braille	2	4	1		
Mobility (independent movements, with or without a cane)	5	2	1		
IQ Above Average	1	1			
Strong desire to succeed	3				
Adaptability		1			
Work well with others	1				
Congeniality		1			
Accept help when needed	1				
Remember details	1				
Aptitude for logic	1				

Courses that should be offered:

Note: The two methods are M (mainstreamed) and S (segregated).

	Method		DI	I	U	NI	DU
	M	S					
Introduction to Computers	6	1	6	2			
BASIC Programming Language	2	2	1	2	3	2	
RPG II Programming (1st Semester)			3	2	3		
RPG II Programming (2nd Semester)	2	1			2	3	3
Job Control Language	3	4	6	2			
COBOL Programming (1st Semester)	4	3	4	4			
COBOL Programming (2nd Semester)	3	2	4	3	1		
System Design (1st Semester)	5	1	3	3	1	1	
Advanced System Design (2nd Semester)	4	1	2	2	2	1	1
FORTRAN Programming	4	1	2	3	2	1	

Data Processing courses:	Method		DI	I	U	NI	DU
	M	S					
Assembly Language (1st Semester)	4	3	3	4	1		
Mini-Computers	6	0		5	3		
Data Processing Applications	7	0	5	2	1		
Programming Techniques	1	0	1				
Software & Architecture	2	0			2		
SPSS	1	0		1			
Data Base Management	1	0		2			
Structured Methodologies	3	0	3				
User Interface Practices	1	0	1				
Advanced Assembly Language	1	0	1				

Support Courses:	Method		DI	I	U	NI	DU
	M	S					
English Composition (1st Semester)	6	0	1	5		2	
English Composition (2nd Semester)	4	0		4	2	2	

Support Courses:	Method		DI	I	U	NI	DU
	M	S					
College Algebra	5	1	2	5	1		
Statistics	3	1	1	6		1	
Accounting (1st Semester)	5	1	1	5	2		
Accounting (2nd Semester)	3	1	1	3	3	1	
State Government	2	0		1		4	2
Orientation to College	2	0		1	5	2	
Numerical Analysis	1	0	1				
Trigonometry & Calculus	1	0		1			
Typing	1	0	1				
Speech & Communication	2	0	2				
Business Administration	1	0	1				
Technical Writing	2	0	1	1			

An interesting observation is that the majority of the courses were tagged as mainstreamed although two-thirds of the respondents chose to go to a segregated school for their programming training.

RESOURCE PEOPLE AND ORGANIZATIONS:

The project coordinator wrote letters (requesting input to the study) to resource people and organizations which included: professional data processing organizations, employers of blind programmers, schools that train blind programmers, schools that used to train blind programmers, Ohio State University (task analysis), resource people listed in the 1977 Technology Transfer Directory, organizations that work with the blind, authors of articles in professional journals and newspapers, the Dean of the College, the campus coordinator of the handicapped, etc. Some of the resource people and organizations did not reply, some sent referrals to other resource people, some sent short and/or futile replies, and others supplied very meaningful contributions to the study. Two observations were: (1) Phase I may have been too short to locate and receive feed-back from resource people and organizations, and (2) very few resource people expressed their experiences and/or opinions in writing.

Attachment F is a summary of the resource people and organizations contacted for input to the study. Most of the replies received from these resources were packaged materials.

ROFILES AND TASK ANALYSIS:

Early in Phase I, the steering committee members requested a profile of a programmer." The project coordinator visited the ir Force Human Resource Laboratory at Brooks Air Force Base to eview literature pertaining to the data processing job clusters

and task analysis. Profiles of a programmer (Attachment G) and copies of the common tasks performed by Air Force programmers (Attachment H) were mailed to the steering committee members. Efforts to obtain task analysis for computer programmers from Ohio State University proved fruitless.

TRAINING CENTERS FOR BLIND PROGRAMMERS:

Literature pertaining to the training of blind programmers was obtained from various training centers including:

1. System Development Corporation
    San Monica, California

2. University of Manitoba
    Winnipeg, Manitoba, Canada

3. Columbus Tech
    Columbus, Ohio

4. Computer System Institute
    Pittsburg, Pennsylvania
    (Note: They no longer train blind programmers)

5. Arkansas Enterprises for the Blind
    Little Rock, Arkansas

6. MedComp Research Foundation
    Cincinnati, Ohio

Data pertaining to the above six training centers for visually impaired computer programmers was packaged and made available to the steering committee members. In addition to the above training centers, the Pitt Technical Institute in Greenville, North Carolina responded to our request for input. Their efforts to train blind computer programmers have been unsuccessful.

The project coordinator made a two-day visit to the Arkansas
Enterprises for the Blind in Little Rock, Arkansas and another
two-day visit to the MedComp Research Foundation in Cincinnati, Ohio.
A fourteen-page data collection form (Attachment I) was used to
record the data collected while interviewing administrators, in-
structors, and students at the two training centers. The data
collection forms were made available to the steering committee
members who were interested in the detailed analysis. The project
coordinator summarized key observations made during the visits to
the two training centers and distributed a copy of these observations
to all steering committee members. The major observations were:

1. The training centers are not schools per se.

2. Only a small number of students are enrolled in the programs.
   Normally only 4 to 8 programming students are enrolled at
   any one time.

3. Most students are "out-of-state" students who were referred
   to the training centers by an agency working with the blind
   and visually impaired.

4. Students enter the training centers at various times. It
   is possible that no two students are at the same stage of
   training at a given time.

5. Programs have a director or coordinator who works very
   closely with the students. The director is the only full-
   time instructor and he performs other computer-related
   duties in addition to teaching. The director receives
   part-time instructional assistance from programmers, blind
   off-premise programmers, and guest speakers.

7. Although the curriculum is described in class hours and/or class days, the students do not come in or leave at scheduled times. Programs use a self-paced, individualized instruction approach.

8. Other than internship, students are not employed while they are in the program. The better students devote most of their day to their programming studies.

9. The training is informal and unstructured. The instructor may spend hours discussing topics and techniques in which one or more student shows an interest.

10. Recorded tapes ("talking books") and braille books are available to the students. Lack of formal check-out and check-in procedures makes it difficult to locate a particular tape or braille book.

11. Few, if any, formal tests are administered. Students are graded on performance.

12. Training centers specialize in training the blind and visually impaired. Program directors are visually impaired or were selected because of their interest in working with handicapped persons.

13. Although the training centers have an impressive list of prerequisites, it appears that the entry level standards are being lowered for economical reasons.

PROSPECTIVE STUDENTS:

Short questionnaires were mailed to local and state offices for the State Commission of the Blind and to the Governor's Coordinating Office for Visually Handicapped. This questionnaire requested the estimated number of qualified blind Texans who would be likely to pursue a career in computer programming. The state office for the

TRAINING DEVICES:

The project director accumulated literature pertaining to special training devices used by blind programmers and/or blind programming students. Devices on which material was gathered included:

1. ARTS (Audio Response Time Sharing) System
2. Optacon
3. Audible Light Detector
4. Speech Plus (talking calculator)
5. Braille Display Terminal
6. Portable Braille Terminal
7. Triformation's LED-120 Braille Terminal
8. Triformation's LED-1 Brailling Device
9. Triformation's ISE-1 Braille Embosser
10. Triformation's BD-3 Braille Computer Terminal
11. Triformation's PBCE Reproduction System

The literature pertaining to the above devices was packaged and made available to the Steering Committee members. Several committee members checked out the various packaged materials (training programs, data collection forms, devices, etc.) to study the material at home.

ESTIMATED COSTS:

In order to give the steering committee members a general idea

Costs figures accumulated during Phase I are listed below: (additional cost input during Phase II resulted in more realistic cost estimates).

Estimated start-up costs:

LED 120 (braille terminal)	$ 16,740
Optacon	2,900
Visual-Tek (TV system to magnify printed materials)	1,750
Two Perkins braillers	300
Six tape recorders	300
Mechanical card reader	200
Student typewriter	500
Office furniture for program director	1,000
Furniture for two small student learning rooms	1,000
TOTAL Start-up Costs	$ 24,690

Estimated Annual Costs:

Program Director	20,000
Orientation and Mobility Specialist	16,000
Student tutors	3,302
Instructor (to be shared by the data processing department)	8,000
Secretary (to be shared by another department)	2,400
Software packages	2,000

BUILDING REQUIREMENTS:

At the end of Phase I, building (space) requirements appeared
to be:

1. A small classroom for segregated classes. This room
   was to be used as a conference room and study area for
   the blind when classes were not scheduled.

2. Two small lab areas to house (a) the tape and braille
   library, (b) special training devices, and (c) the
   braille terminal.

3. An office for the program director.

Other building (and grounds) considerations included the
installation of braille and "raised" room numbers, rails, buzzers at
the stairwells, provisions for seeing eye dogs, etc. Street crossings
(which serve as deep water run-offs when it rains) appeared to be a
major mobility barrier.

PHASE I RECOMMENDATIONS:

On September 27, the steering committee met for a one-day work-
shop to digest the data gathered and to make its recommendations.
Assisting the blind and visually impaired committee members were
four readers and the data processing department's secretary. Each
steering committee member was given a packet of summarized data,
and packages of detailed data were issued to members on a sign-out
basis. The committee was divided into small groups and (with assist-

After all committee members' questions were answered, the group:
(1) agreed that there were employment opportunities for visually
impaired computer programmers in Texas, (2) recommended that San
Antonio College provide a program to train visually impaired
programmers, and (3) recommended that the project move into Phase II.
The committee felt that the type of training offered by other
training centers could be matched and surpassed by San Antonio
College.

Phase I concluded with a quarterly report to Ray Barber,
Director of Exemplary and Innovative Programs, Texas Education
Agency. A copy of this report appears in Attachment J.

PHASE II ·

ADVISORY COMMITTEE:

The advisory committee for Phase II consisted of:

1. Donald Douglas
   Vice-President, Data Processing
   Frost National Bank

2. John P. Merritt
   Assistant Data Processing Manager
   San Antonio Light

3. Chester Neeley, (blind)
   Automation Officer, System Research
   Frost National Bank

4. Annette Ratcliffe
   Data Processing Laboratory Technician
   San Antonio College

5. Jimmy R. Sparkman
   Programmer Analyst
   Tesoro Petroleum Corp.

6. Bob Wiley, (blind)
   Programmer/Procedures Analyst
   City Water Board

7. Al Stehling (project coordinator)
   Chairman, Data Processing Department
   San Antonio College

The advisory committee met ten times and proved to be an active "working committee" from the very start. During the first meeting, the advisory committee was briefed on (a) the objectives of the total project, (b) Phase II objectives, (c) the results of the Phase I studies, and (d) data collection efforts. Materials distributed to

- of four schools that train visually impaired programmers. In addition
advisory committee members "checked-out" packets containing detailed
information about training devices and schools that train visually
impaired computer programmers.

Committee members agreed that:

1. Rehabilitation training must be completed before the
   students qualify for computer programming training.

2. The curriculum must be flexible in the sense that
   the program director can alter the curriculum to
   suit the employment opportunities for a particular
   student.

3. An associate degree program would offer the best
   employment opportunities.

4. The students should be offered more advanced programmin
   techniques and studies, but in fewer areas (as compared
   to the current AAS programs in computer programming).

5. The program would be designed for employability,
   not transferability.

SUBJECTS TO BE TAUGHT:

Beginning with the very first meeting, the committee members
developed a list of "subjects" (data processing and support subjects)
to be included in the program. Each proposed subject was justified
by one or more members and discussed in detail. During the next
weeks, subject areas were modified, added, and in some cases, deleted
or combined. Objectives were written for every data processing
subject. These objectives were also discussed in great detail and

Subjects were then translated into courses. Some subjects can be taught as one course, other subjects will have to be covered in two courses (example: the COBOL programming subject objectives are reached after the student completes the second COBOL course). Attachment K contains the data processing subject objectives.

Committee members reviewed existing course syllabuses to determine which existing courses (offered by the data processing and supporting departments) would fulfill the stated subject objectives. A memo was sent to those departments that offered the required support courses to double-check the departments' willingness to mainstream the visually impaired students into their classes. Only one department indicated that it could not accommodate blind students. The committee found a similar course offered by another department and modified the curriculum accordingly.

CURRICULUM:

A 16-month curriculum was prepared and studied. As the subject objectives were strengthened, the curriculum was redesigned and extended to a 21-month program. Courses in the program were classified as segregated and mainstreamed, and an estimated number of weekly home-work hours was assigned to every course.

For the purpose of this project, mainstreamed means that the visually impaired students will register for a course along with

visually impaired students. Sighted students may register for
segregated classes, but only after they are fully aware that (1) the
class presentations are geared towards unsighted students and (2) that
traditional training aids will not be utilized. In addition, the
committee agreed that in some cases, courses identified as main-
streamed could be segregated--if the number of visually impaired
students justified a separate class.

Catalog descriptions were developed for the "new" data pro-
cessing courses (courses that are not currently listed in the college
catalog) and forwarded to the Dean's office for presentation to the
college's Academic Council. The new data processing courses were
approved and will appear in the 1979-80 San Antonio College catalog.
Modifications to the proposed curriculum were continuous as the
program was streamlined. Subject objectives, course titles, course
descriptions, and course numbers were changed as committee members
proposed modifications to strengthen the program.

The curriculum (Attachment L) is designed to produce COBOL
programmers with a solid foundation in JCL and Assembly Language.
The student will receive four semesters of COBOL training (COBOL
Programming, Structured COBOL Programming, COBOL Programming
Applications and Programming Applications). The visually impaired
programming students will receive twice as much exposure to JCL
and Assembly language compared to the current programming student

have one semester of Teleprocessing Programming which is rarely
offered on the sophomore level. The curriculum offers less ex-
posure to a spectrum of programming languages, but zeroes in on
skills in the greatest demand by the medium and large-size computer
installations. The advisory committee feels that this specialized
in-depth training will equip the visually impaired programmers with
skills that the sighted computer programming graduates cannot offer
the employers.

Briefly, the rationale for the courses in the curriculum to
train visually impaired computer programmers is:

First semester: Orientation will include campus mobility
training and an introduction to the special services available
to the visually impaired in addition to the general orientation
to the college policies, procedures, general services, and
facilities. English and basic accounting courses are the support
courses. Data Processing skills will include training on data
entry devices, introduction to electronic data processing, and
BASIC programming. BASIC programming will be "blocked" with
the introduction to EDP class. By the time students move into
their BASIC programming studies they will be far enough along
in the data entry training to utilize the computer terminals.

Second semester: Support courses include business communications
and technical mathematics. Data processing courses will intro-

Third and fourth semesters: (summer semesters) The support course is logic. Data processing courses are structured COBOL programming; system design; plus a seminar designed to expose the visually impaired programmer to "real world" problems and solutions, and to allow the students to become "involved" in the data processing community.

Fifth semester: Students move into advanced programming studies including COBOL applications, Assembly Language, teleprocessing programming, and advanced system analysis and design.

Sixth semester: The support course is Texas Government (a college requirement for an Associate in Applied Science Degree). Data processing courses are advanced Assembly Language, programming applications (a combination of system design and COBOL programming), on-the-job programming experiences (15 hours per week), and a special seminar to prepare the visually impaired for employment as programmers.

Several important points pertaining to the curriculum were studied at length and these observations were made:

1. About 40% of the students entering the program will probably have a bachelor's degree. About 70% of the entering students will have had some previous college work, and will not have to take all of the prescribed courses.

2. Some students, because of their strong academic back-

in place of the prescribed courses. For example,

a student may take statistics in place of technical

mathematics.

3. The program director may substitute courses in lieu

of the prescribed courses if it enhances the student's

employment opportunities. (This does not include

courses that the college specifies as requirements

for an AAS).

4. Some incoming students may not qualify for the

program because of weak academic backgrounds. Those

students may be directed to remedial-type courses.

Once the students meet the entry level qualifications

they can join the program with the next group.

5. It will be in the best interests of the students to

train one group of visually impaired students at a

time.

CONSECUTIVE TRAINING:

"Consecutive training" was coined by the committee to describe

a program that would serve one group of students to completion

before starting the next group. The primary reason for con-

secutive training rather than "concurrent" (starting a few more

visually impaired students into the program every semester) is

to avoid the necessity of many very small segregated classes. In

classes would cause instructor load and classroom scheduling problems.
In effect, consecutive training means that the first group of visually
impaired students would start the program in the Fall of 1979. The
next group would start in the Fall of 1981.

Exceptions to the consecutive training approach can be made by
the program director because:

1. A particular student's educational and/or job data
    processing experience may justify the exception.

2. Student who meet the college's entrance requirements and
    course prerequistites can enroll in any D. P. classes -
    following the established registration procedures.

ENTRY LEVEL STANDARDS:

Entry level standards used by other schools that train visually
impaired programmers, plus those recommended by the blind programmers
surveyed during Phase I were studied. This input, plus the committee's
guideline to develop a program to train the "intelligent" blind resulted
in the entry level criteria (Attachment M). Committee members looked
ahead while designing the entry level criteria and tried to make the
criteria strong enough to insure that the selected students could
and wanted to master the skills, gain employment, and retain em-
ployment as computer programmers.

Screening of students applying for admission to the program

students are allowed into the strenuous training. The selection committee will use the entry level criteria listed on Attachment M, but will have the flexibility to consider other abilities and aptitudes that would supplement or replace a particular criterion.

It is proposed that the selection committee be composed of four members including a visually impaired programmer, an employer, and the program director. Screening activities will involve reviewing the student applications and transcripts, interviewing the prospective students, and evaluating autobiographies written by the students. The personal interviews will not be formally structured. The interviews are to be tailored to the students, and the selection committee chairman will be responsible for steering the committee to objective decisions.

SPECIAL DEVICES AND EQUIPMENT:

After reviewing reports and literature pertaining to training devices for visually impaired programming students and employed programmers, the committee recommended devices and equipment for the program. The primary factor in device and equipment selection was maximum training effectiveness. Secondary concern was the availability of the devices to visually impaired programmers after employment. Some of the recommended devices are not standard equipment in programming installations

to install special devices (such as braille terminals) if the visually impaired programmer(s) have mastered their operation and can vouch for their usefulness. Attachment N contains a listing of the special devices and equipment recommended for the program.

PERSONNEL:

To be effective, three persons are required to implement the program to train visually impaired computer programmers. Each of these persons would be employed on a 12-month contract because the program continues through the summer months. An exception is at the end of the first 21-month program (scheduled to begin in September 1979 and end in May 1981). The summer months following this first program should be used to evaluate and modify the program before the second 21-month program begins in the Fall of 1981. After the second group is trained, the third group may be started in the Summer instead of waiting until the following Fall.

Personnel requirements and qualifications are listed below:

1. Program Director: This person will oversee the program and report to the chairman of the Data Processing Department. The program director will teach at least one three-hour course per semester and will be responsible for all administrative and reporting activities. The director will have to

advantages of services and support for the visually
impaired students. Included in the services for the
visually impaired are counseling, tutoring, trans-
portation, financing, orientation, etc. The director's
qualifications are:

    A. A bachelor's degree (a master's degree is
       preferred).

    B. Three years experience in the data processing
       profession.

    C. Experience in computer programming (preferrably
       COBOL, JCL, and Assembly Language).

    D. Administrative experience.

    E. Schooling or experience in counseling and
       education.

    F. Approval by the Texas Education Agency and
       the college district.

2. Instructor: The instructor will teach two courses
for the program and be available to the visually
impaired students for out-of-classroom assistance.
The instructor will be shared by this program and by
the data processing department. The committee felt
that it would be to the students' advantage if the

A. A bachelor's degree (a master's degree
    is preferred)

B. Three years experience in the data
    processing area and proficiency in COBOL,
    JCL, and Assembly Language.

C. Approval by the Texas Education Agency
    and the college district.

3. <u>Clerk/Typist</u>: This person will perform all of the
    secretarial tasks related to the program. In addition,
    the clerk/typist will assist the visually impaired
    students in the tape and braille library. The
    qualifications for the clerk/typist are defined by the
    college district.

Assisting the director and the instructor will be a student
assistant (a second-year data processing student) and student tutors.
The visually impaired students are expected to remain on campus
(probably in the lab area) much longer than the sighted students.
It will be necessary to have a qualified instructor, student assistant,
or student tutor available to assist them long after their scheduled
class hours.

BUILDING SPACE REQUIREMENTS:

The building space requirements were finalized (and changed

recommended the following space requirements:

1. An office for the program director.

2. An office for the clerk/typist and instructor.

3. A classroom/lab area. This room would serve as classroom for the segregated classes. When segregated classes are not scheduled, the room will serve as an open lab for the visually impaired students. Special training devices and equipment will be housed in the perimeter of the room.

4. A small room to store the tapes ("talking books") and braille materials that will be checked-out to the students. Extra tape recorders, Perkins braillers, and other materials will also be housed in this library. If the clerk/typist's working area is large enough to store the materials, then this room may not be necessary.

SPECIAL TRAINING FOR INSTRUCTIONAL PERSONNEL:

The director and instructor will need specialized training in the area of counseling and teaching techniques for visually impaired students. This training may be offered on-campus by one of the agencies supporting the visually impaired or it may be off-campus courses or seminars.

Other personnel who should attend all or part of these training sessions include the clerk/typist, the chairman of the data processing

SPECIAL SERVICES FOR VISUALLY IMPAIRED STUDENTS:

The project coordinator, in gathering information, interviewed the Director of Special Services, San Antonio College; the Coordinator of Handicapped Student Services, San Antonio College; the Employment Development Specialist, TSCB (San Antonio Office); and the Supervisor of Program Evaluation and Development, TSCB. Services for the visually impaired students available on campus include: orientation, tutoring, readers, counseling, on-campus transportation, conversion to braille, conversion to tapes ("talking books"), and note takers. Services provided by TSCB include readers, purchase of special student equipment (based on the economic needs of the students); conversion to braille and tapes; counseling and guidance; and transportation.

The committee reviewed the available services and concluded that they will meet the needs of the visually impaired students. Some improvements may have to be made to the buildings, but these should be minor changes.

JOB PLACEMENT:

The project coordinator interviewed the Job Placement Counselor, San Antonio College; the Data Processing Placement Committee Chairman, San Antonio College; and representatives from TSCB to gather job placement information. The Job Placement Office at San Antonio

offers such services as transportation to job interviews; licenses, tools, and equipment for vocational placement; post-employment services; contacting prospective employers; and the introduction of students to prospective employers. At this stage, no additional job placement services appear to be necessary to place the visually impaired programmers into the job market.

PUBLIC RELATIONS:

During Phase II, public relations efforts resulted in news releases in the San Antonio daily and weekly newspapers. In addition, the campus newspaper, The Ranger, reported on the progress of the project several times. Attachment O contains some of the newspaper articles pertaining to the proposed program to train visually impaired computer programmers.

The college district's public information office released news and feature stories which resulted in radio announcements informing citizens of the proposed training for the visually impaired. Organizations working with the visually impaired also informed (directly or indirectly) prospective students of the program. Blind Texans are hearing about the program as evidenced by local and long distance telephone calls from prospective students and their friends.

POTENTIAL UTILIZATION OF RESULTS OF STUDY:

The post-secondary curriculum developed to train visually im-

to seek employment as an entry level computer programmer (sometimes classified as a computer programmer trainee or Junior Computer Programmer). Although several Texas community junior colleges have the computer hardware and expertise to implement the proposed AAS program, San Antonio College is the logical choice to offer the training because of its involvement in this study. Visually impaired citizens from the local area, from throughout the state, and from out-of-state will be attracted to the program since it will offer unique training in the southern states.

The advisory committee is anxious for the program to materialize. However there are many variables and unknowns which makes it diffi-cult to propose that a junior college offer the training without a few words of caution. Few (if any) Texas junior colleges have on-campus AAS programs training visually impaired students. Many problems pertaining to counseling, teaching, tutoring, placement, etc. are bound to surface once the specialized training begins. Although cost estimates were prepared, there are still many variables which can affect a rather expensive program designed for a small number of students. It is unlikely that the administrators of a Texas community/junior college will agree to offer the program to train visually impaired computer programmers without more definite cost figures. This is especially true at a time when state educational funds are being challenged by the politicians and the

Considering the factors named above, the committee recommends that the best approach to implement the program is to apply for state funds for a two-year pilot program to train twelve visually impaired computer programmers. During the pilot program, cost figures will be accumulated and the difference between the actual program costs and the contact-hour revenue will be calculated. Beginning with the third year, a vocational training fee will be charged to offset the difference between contact-hour revenue and actual cost.

PILOT PROGRAM:

The advisory committee recommends that San Antonio College apply for state funds to implement the program to train visually impaired computer programmers effective in the Fall 1979 semester. For training to begin in September, the program director, instructor, and clerk/typist will have to be employed on June first. Although the subject objectives and the curriculum have been developed, many details need to be completed before the program can be placed into operation. Selecting text books; purchasing and/or leasing of special devices and equipment; locating offices, a classroom, and lab space; organizing the screening committee; screening the prospective students; converting text materials into braille and "talking books"; writing and redesigning of detailed course syllabuses; etc., are some of the many tasks that will require a great deal of

closely with the various agencies and organizations that serve

visually impaired Texans so that prospective students can be made

aware of the program. In addition, activities have to be coordinated

with other departments on campus. 'While all of this preparatory

work is being carried out, the director, instructor, and clerk/typist

will receive special training to work with visually impaired students.

At the end of the pilot program, the program results will be

evaluated and recommendations will be made to the state and to the

college district pertaining to the continuation of the program.

CONCLUSIONS

The conclusions reached in this study are that there are indeed employment opportunities for visually impaired computer programmers and that they can be trained at a community/junior college. The best training program is a 21-month AAS curriculum as outlined in Attachment L. San Antonio College would be a logical choice to provide the training, starting in the Fall of 1979. Due to the lack of experience in implementing and administering such a program, plus the lack of funds to justify an expensive program for a small number of students, a state-funded pilot program is recommended as a follow-up to this study.

ATTACHMENT A

PROGRAMMING; A "NATURAL" FIELD FOR THE BLIND.

ogramming Called 'Natural' Field for Blind

By Mary Kincaid
Special to CW

puter programming is a natural
r blind students to enter," ac-
to Joyce Van Tuyl, a
nia transcriber whose braille
ptions have launched a number
d students into advanced math

uyl, along with a band of other
ers, has been a member of the
nia Sixth District State PTA
Transcription Project since
graduate of the University of
n College of Engineering, her
nies lie with the thousands of
ntelligent blind young people
e inclined toward math and
This is a group often turned
om their field of interest by
ers, who themselves may find
nd science "impossibly dif-
nd, therefore, unappealing.

uyl, who is fully sighted,
p for the first adult education
braille offered in Palo Alto in
was a providential choice. The
nvolved were intellectually
ng and rewarding, and the
trained personnel to learn the
and the technique of
ing it by machine was urgent.

15% Know Braille

gh braille transcriptions ena-
lind to read textbooks, enrich
s by reading the world's best
, or follow new recipes from
cookbooks, only 15% of the
pulation knows how to read

re several reasons for this sur-
tatistic. Those who become
adults are often defeated by

the enormity of their misfortune. They
simply don't have the will to try to
learn. On the other hand, the optimists
don't want to learn because they be-
lieve their blindness is temporary.

In addition, many blind people are
diabetic. They often have a reduction
of the sensation of touch, preventing
them from using their fingertips
quickly to sense the pattern of raised
dots that form the braille alphabet and
other braille symbols.

During the '50s, better braille code
was designed for math. The old math
symbols, with positions both above
and below line, and the incorporation
of several foreign alphabets had pre-
vented transcribers from using them in
the rigidly coded single-line braille
system used for text.

In 1952, Dr. Abraham Nemeth, now
a mathematics professor at the Univer-
sity of Detroit, devised a way to adapt
the existing braille system to incor-
porate modern math symbols.

Logical Link

"Computer programming," Van
Tuyl said, "is a natural field for intel-
ligent blind students, because from
childhood on they have had to or-
ganize and systematize every aspect of
their lives: Socks, kitchen utensils and
furniture are all placed in specific
places for ordered and efficient use.
This is exactly the systemized pro-
cedure in which computer program-
mers must be trained to think. That
practice sometimes even puts them
ahead of sighted programming stu-
dents."

A number of young Californians for
whom Van Tuyl had transcribed text-

books have grown up and gone on to
study advanced math. One boy re-
ceived his BA in math at Stanford Uni-
versity, then took a Masters in opera-
tional research." Another of her stu-
dents is now doing graduate work in
computer science at Georgia Tech.

The Braille Transcription Project,
sponsored by the Sixth District
California State PTA, has been in
operation for 21 years, not only train-
ing volunteers in transcription, but
also in recording texts on tape.

Before a transcription is begun, a
search is made with the American
Printing House for the Blind, in Louis-
ville, Ky., to see whether the requested
text is already available. If not, a
volunteer is assigned to the task.

Volunteers work at home on small
machines that transform printed
words into the raised dot patterns on
paper. If that material is to be made
into a book, these pages are duplicated
a second time on more durable plastic
sheets that will withstand the pressure
of the readers' fingertips for a longer
time.

Understandably, more pages and
more labor hours per page are required
to produce a book in braille than in
print. The Transcription Project has
produced such time-consuming
volumes as Roget's *Thesaurus*, that in
braille requires 45 volumes. A special
system is used to transcribe music.

The project receives no funds from
any governmental source. The
thousands of hours per book are
donated entirely by volunteers except
for the paid work done by the blind
proofreaders.

The Education for All Handicappe
Children Act, passed in 1975, grant
all children the right to a free publi
education. The federal governmer
will now underwrite only 5% of thes
costs, but by 1982 will supply 40%. I
the meantime, volunteers are needed.

Those interested in contributing t
the cause may write to the Nationa
Braille Association, 85 Godwin Ave.
Midland Park, N.J. 07432, or to th
California Transcribers and Educator
of the Visually Handicapped. Gift
and Tributes Chairperson for the latte
is Margaret Parenty, 1103 Ortega Rd
Pebble Beach, Calif. 93953.

*Kincaid is a freelance writer from
Ann Arbor, Mich.*

63

ATTACHMENT B

EMPLOYERS QUESTIONNAIRE

(Employment Opportunities for Visually Impaired Computer Programmers)

Employment Opportunities
for
Visually Handicapped Computer Programmers

A Feasibility Study Conducted by San Antonio College and Funded by
The Texas Education Agency

SECTION ONE: Demographic Data

1. Size of installation (use your annual D. P. budget as a guideline):

_____ _____ _____
Small (less than $250 K)   Medium ($250 K-$1,000 K)   Large (over $1,000 K)

2. Primary computer system(s) in use:

_____ _____
    Manufacturer/System   Manufacturer/System

3. Two most commonly used languages and estimated percentage of total programming
    effort:

_____ _____
    Language / %   Language /   %

4. Type of formal in-service training for programmer:

_____ _____ _____
    Comprehensive   Limited   None

5. If formal in-service training is provided, are newly-employed programmers
    required to take this training?

_____ Yes
_____ Depends on previous programming experience
_____ Depends on previous programming schooling
_____ Depends on a combination of things

6. Use of programming teams:

_____ All programmers work in teams
_____ Most programmers work in teams
_____ Some programmers work in teams
_____ Programming teams are not used

Employment of handicapped programmers.

_____ Have employed visually handicapped programmers
_____ Have employed other handicapped programmers
_____ Have not employed handicapped programmers

8. Applications from handicapped programmers:'

      _____ Have received applications from visually handicapped
               programmers

      _____ Have received applications from other handicapped
               programmers

      _____ Have not received applications from handicapped
               programmers

9. Classification and number of programmers:

CLASSIFICATION	1978	1983 (Est.)
Business Applications Programmer		
Scientific Applications Programmer	_____	_____
Programmer/System Analyst	_____	_____
System (Software) Programmer	_____	_____
List classifications that cannot be included in the above:	_____	_____
_____	_____	_____
_____	_____	_____
TOTAL	_____	_____

TWO: Research Date

Rate the following Statements:

	Definitely Yes	Probably Yes	Undecided, Unknown	Probably No (Not)	Definitely No (Not)
...uld consider employing a visually ...dicapped programmer.					
...uld consider employing a visually ...dicapped programmer if I had the ...ortunity to work with the student ...ng an internship program.					
...management encourages me to hire ...ally handicapped employees.					
...qualifications being equal, I ...d probably offer a vacant pro-...ming position to a visually ...icapped applicant.					
...uld be willing to install ...ecial device or terminal ...ssist the visually handicapped ...rammer.					
...rimary hesitation (if any) to ...oying a visually handicapped ...rammer deals with our physical ...lities.					
...rimary hesitation (if any) to ...oying a visually handicapped ...rammer deals with attitudes ...emotions.					
...ld be more inclined to employ ...sually handicapped programmer ...had input to the training ...culum.					

73

(over)

	Definitely Yes	Probably Yes	Undecided, Unknown	Probably No (Not)	Definitely No (Not)
...eel that it is possible to train ...ally handicapped programmers for ...position(s) in our installation.					
...ave a detailed list of tasks or ...es to be performed by firm's pro- ...mers.					
...es, I feel that a visually ...icapped programmer can perform ...specified tasks or duties.					
...ave a written job qualification ...our programming position(s).					
...es, I feel that a visually ...icapped programmer could satisfy ...specified qualifications.					
...ometimes make "trade offs" between ...required job qualifications and ...r accomplishments (schooling, ...rience, etc.) when employing ...rammers.					

...se list those duties (if any) performed by your programmers that you feel could not be performed by a
...ally handicapped programmer.

...ou answered no (probably not or definitely not) to statements numbered 1, 4, 9, 10b, and 11b please
...ent on your reactions.

te the following Statements:

	Definitely Yes	Probably Yes	Undecided, Unknown	Probably No (Not)	Definitely No (Not)
d consider employing a visually apped programmer.					
d consider employing a visually apped progr er if I had the unity to work with the student an internship program.					
nagement encourages me to hire ly handicapped employees.					
alifications being equal, I probably offer a vacant pro- ng position to a visually apped applicant.					
d be willing to install ial device or terminal st the visually handicapped mmer.					
nary hesitation (if any) to ing a visually handicapped mmer deals with our physical ties.					
nary hesitation (if any) to ing a visually handicapped mmer deals with attitudes otions.					
be more inclined to employ lly handicapped programmer d input to the training lum.					

77

(over)

ATTACHMENT C

MINI SURVEYS OF TEXAS DATA PROCESSING MANAGEMENT ASSOCIATION CHAPTERS

73

SAN ANTONIO COLLEGE

1300 SAN PEDRO • (512) 734-7311 • SAN ANTONIO, TEXAS 78284

DEPARTMENT OF DATA PROCESSING

August 17, 1978

TO: Texas DPMA Chapter Presidents

FROM: Steering Committee
       Feastibility Study to Investigate the Employment Opportunities
       for Blind and Visually Impaired Computer Programmers

SUBJECT: Input to Study by Texas DPMA Chapters

San Antonio College is conducting a Texas Education Agency funded
project pertaining to the employment opportunities for blind and
visually impaired programmers. Most of the detailed data for the
study is being gathered in the San Antonio area. In order to
obtain state wide opinions, we are asking the DPMA presidents to
make a mini-survey at their next membership meeting.

Please ask your DPMA members to respond to the three questions
on the attached form and return it in the stamped, self-addressed
envelope. Thank you very much for your cooperation and a speedy
reply!

                        Sincerely,

                        Al Stehling, CDP
                        DPMA Member, San Antonio Chapter

DPMA Survey

Instructions: Only those DPMA members and guests who supervise (manage) programmers are to respond and <u>only one</u> respondent per installation. Supervisors (managers) are to answer questions with a show of hands. After each question count the raised hands and record totals in the appropriate spaces. Thank you!

1. Do you have any vacancies for programmers at this time?

   Yes_____   No_____   Uncertain_____

   <u>If yes</u>, how many vacancies?

   1   to   3   _____
   4   to   6   _____
   More than 6   _____

2. Would you <u>consider</u> hiring a blind or visually impaired programmer?

   Yes_____   No_____   Uncertain_____

   <u>If No or Uncertain</u>, would you be willing to talk to an employer of a blind or visually impaired programmer to become more familiar with the advantages and disadvantages of blind and visually impaired programmers?

   Yes_____   No_____   Uncertain_____

3. Do you feel that a program to train blind and visually impaired programmers should be offered in Texas?

   Yes_____   No_____   Uncertain_____

Chapter:_____Date:_____

   Do you want a summary of the results of this mini-survey? (check one)

                    Yes_____   No_____

   Please return promptly to:

   Al Stehling
   San Antonio College
   1300 San Pedro Avenue
   San Antonio, Texas 78284

ATTACHMENT D

QUESTIONNAIRE TO DEPARTMENT CHAIRPERSONS

SAN ANTONIO COLLEGE

DEPARTMENT OF DATA PROCESSING

September 6, 1978

TO: Chairpersons

        Business Administration Department
        Business Technology Department
        English Department
        Government Department
        Mathematics Department
        Orientation Department
        Reading Department
        Library

FROM: Al Stehling

SUBJECT: Request for Input to Study

We are nearing the completion of Phase I of a TEA funded
feasibility study to determine the employment opportunities
and the training requirements for blind and visually impaired
computer programmers. Although all departments on campus
have some of our data processing majors in their classes, the
aboved named departments are most likely to work with our
computer programming majors. We feel that our study would be
incomplete without input from your office because the blind
and visually impaired students (if a program to train blind
programmers were to materialize) would probably sign up for
your courses or use your facilities.

Please complete the very brief questionnaire on the attached
page and return to us promptly. Your individual reactions
will be kept confidential!

Thank you for a speedy reply.

eck the column which best describes your honest reaction to the following statements.

	Yes	Undecided	No
d and visually impaired students can be "mainstreamed" into classes taught by our department.			
department would be able to schedule special class sections ffer segregated instruction for the blind and visually ired students.			
department would be able to provide small classes (6 to 8 ents), if necessary, to serve blind and visually impaired ents.			
department would be able to provide special training ces to assist the blind and visually impaired students.			
ngements could be made in our department to provide oring and other special services to insure that the blind visually impaired can reach our course objectives.			
department could provide courses that would meet longer the normal class periods so the training could be leted before the end of the scheduled semester.			
department could provide a faculty member who would serve liaison for the planning and instructional phases in the ning of blind and visually impaired students.			

Date: _____

o Al Stehling, Box 40. Thank you for a speedy reply.

84

ATTACHMENT E

QUESTIONNAIRE TO BLIND PROGRAMMERS

SAN ANTONIO COLLEGE

1300 SAN PEDRO • (512) 734-7311 • SAN ANTONIO, TEXAS 78284

DEPARTMENT OF DATA PROCESSING

August 11, 1978

The Texas Education Agency has funded a study by San Antonio College to investigate the employment opportunities and training of visually handicapped computer programmers. As part of this study, we are surveying employeers of computer programmers to determine their attitudes towards the employment of blind and visually impaired programmers. While this information is being gathered, we are asking blind programmers to provide their expertise pertaining to the training requirements.

I'm sure you can recall those training subjects and techniques which proved very meaningful. And you can probably list a few subjects that you feel should have been included in your schooling. This is your opportunity to provide input for a proposed curriculum for blind programmers.

In event San Antonio College does provide training for the blind and visually impaired programmers, the curriculum will be based on feed-back from you and other concerned blind programmers. Since we have a limited number of names and addresses of blind programmers, it is important that we receive a response from you to make this study valid.

Please ask your reader to record your answers on the attached questionnaire and return it in the enclosed stamped, self-addressed envelope. A speedy reply is necessary to make up for the delays in obtaining the names and addresses of employed blind programmers.

Thank you very much for sharing your time and opinions with us. All returned questionnaires will be kept confidential and respondents will receive a summary of the questionnaire results.

Sincerely,

Al Stehling, CDP
Project Director

86

NAME: _____ DATE: _____

Please ask your reader to fill in the blank spaces to record your honest reactions.

1. At what age did you lose your sight?_____

2. What was the highest educational level you reached before you lost your sight?_____

3. What is the highest educational level you reached after you lost your sight?_____

4. Were you employed in the data processing or a related field before you lost your sight?_____

5. What was your primary occupation before you lost your sight?

   _____

6. Where did you receive your programming schooling? (check one)
   ___on-the-job training
   ___trade school
   ___college or university

        What was the length of programming training at the above?_____months

        What was the length of schooling per school day?
        _____hours

        Was the above training sufficient to qualify you
        for an entry-level programming position?_____

7. What was the name of the school or company that trained you?

   _____

8. Were you married at the time you received your programming training?_____

9. What were your most commonly used source of out-of-classroom learning materials. If more than one, list the estimated per cent of usage.

                 Braille materials   _____%
                 Audio tapes   _____%
                 Readers   _____%
                 Tutors (other than readers _____%
                 Others (please list)

                 _____

                 _____

87

10. Did you receive your training at a school that taught only blind students?_____

11. Do you feel that blind students could be taught how to program if they enrolled in schools primarily for sighted students?_____

12. For what particular programming positions should the blind be trained? (check all appropriate positions)

    ___business programmer
    ___scientific programmer
    ___software programmer
    ___others (please list)

    ___ _____
    ___ _____
    ___ _____

13. What is the size of the programming staff in the computer installations that you feel would be most likely to hire a blind programmer? (check appropriate sizes)

    ___ One to five programmers
    ___ Six to fifteen programmers
    ___ Sixteen to thirty programmers
    ___ Thirty-one to one hundred programmers
    ___ Over one hundred programmers

14. How many programmers are employed by your installation?___

15. Do you work as part of a programming team? (check one)
Yes, most of the time____ Yes, sometimes____ No____

16. Do you feel that blind programmers would be more productive if they worked as part of a programming team?_____

17. Do you feel that the level of education a blind programmer has reached, has a direct effect on his employment opportunities?
_____

    If yes, what level of education would provide best employment opportunities for the blind programmer? (check one)

    ___High school
    ___One-year training program
    ___Two year of college
    ___Bachelor's degree
    ___Master's degree

18. Do you feel that blind candidates for a programming school should be screened by a panel of programmers before they are allowed to enter the school?_____

19. What special devices (if any) does the employer furnish so you can perform your programming duties? (please list).

_____

_____

_____

20. What programming tasks (if any) are being performed by sighted programmers which you cannot perform? (please list)

_____

_____

_____

_____

_____

21. What services can you offer to the employer to "trade-off" for the programming tasks (if any) you cannot perform? (please list)

_____

_____

_____

_____

_____

the following statements the reader to record your the appropriate column. every entry.	Definitely Important (must have)	Important (should have)	Uncertain Undecided (maybe)	Not Important (Can probably do without)	Definitely Unimportant (of no value)
programmers must be better d than most sighted pro- r.					
ship(on-the-job training) appear in the curricu- r blind programmers.					
structors who teach the programming students ecial training.					
tutoring should be pro- or the blind students.					
tutoring should be provided blind students.					
counseling services should ided for the blind students.					
rict entry-level qualifica- ust be maintained for the tudents.					
output of the students and test runs should be d.					

OVER

...vel qualifications for ...ogramming students should	Definitely Important (must have)	Important (should have)	Uncertain Undecided (maybe)	Not Important (Can Probably do without)	Definitely Unimportant (Of no value)
...ong desire to indepen- ...t.	●				
...lingness and ability to ...ocate.			●		
...l health					
...school graduate					
...l grooming					
...verbal communication					
...l mathematical back- ...nd.					
...iciency in braille					
...lity (independent move- ...s, with or without a ...)					
...rs (please list)					93
●					
92					

METHOD	DATA PROCESSING COURSES: (Continued)	Definitely Important ("Must Know")	Important ("Should Know")	Uncertain, Undecided	Not Important (of little value)	Definitely Unimportant (of no value)
	SUPPORT COURSES:					
	English Composition (1st Sem.)					
	English Composition (2nd Sem.)					
	College Algebra					
	Statistics					
	Accounting (1st Sem.)					
	Accounting (2nd Sem.)					
	State Government					
	Orientation to College					

96

97

Step Two:

Add the data processing and support courses you feel should be included in the program by listing those courses on the blank lines provided. Rate the courses by their importance to the blind programming students.

Step Three:

The classes can be presented to the students in one of two methods. The blind student can be mainstreamed into the regularly scheduled classes along with the sighted students. Traditional teaching methods utilizing lectures, blackboards, overhead projectors, and films are common in these classes. Or the blind student can be placed into segregated or special classes for the blind. Please classify those classes you rated as "very important" and important" into the method of course presentation by printing an M (mainstreaming) or S (Segregated) in the method column to the left of the course listing.

Return To:

Al Stehling
San Antonio College
1300 San Pedro Avenue
San Antonio, TX 78255

ATTACHMENT F

RESOURCE PEOPLE AND ORGANIZATIONS

SUMMARY OF RESOURCE PEOPLE
and
ORGANIZATIONS CONTACTED

Information Requested	Resource	Feed Back
Training Procedures	University of Manitoba	Package
	Manufacturers Hanover Trust	Package
Names and addresses of schools that train blind programmers	Texas State Commission of the Blind	Letter
Task analysis, employment statistics of handicapped programmers, job forecasts, etc.	Educational Director, AEDS	No Data available
	Educational Director, ICCP	None
	Educational Director, DPMA	No Data available
	Educational Director, AFIPS	None
	Educational Director, ACM	None
	Philip Gensler	No Data available
Problems involved with training Blind Programmer	Williard Finch, Director of Pitt Technical Institute	Letter
Copy of report on Selection Training, and Placement of Blind Programmers and ACM Reports	Association for Computing Machinery	None
Statistics, Reports	System Development Corp.	Package
	MedComp Research Foundation	None
Task Analysis & Statistics	Ohio St. University	None

Information Requested	Resource	Feed Back
Training, employment opportunities, statistics, reports	R. E. Taylor	None
	L. J. Wilson	None
	Richard Roth	None
	W. R. Schaefer	None
	Bob Wallace (Resource people listed in 1977 Technology Transfer Directory)	None
Number of Blind, Post-Secondary training for the Blind, Data pertaining to Blind Programmers	Texas Society for Prevention of Blindness	Statistics
Handbook of demographic data	Governors Coordinating Office for the Visually Handicapped	Handbook
Name and addresses of Blind Programmers	Visually Impaired Data Processors, International	None
	Texas State Commission of the Blind	Letter
Selection, training, placement, costs, special training devices length of program, etc.	MedComp Research Foundation	None
	System Development Corp.	Package
	Arkansas Enterprises for the Blind	None
	Columbus Technical Inst.	None
	Baruch College	Package

Information Requested	Resource	Feed Back
Selection, training, placement, costs, special training devices length of program, etc.	Computer Systems Institute	None
	Hadley School for the Blind	None
Information about Arts Services	Arts Service Bureau	None
Number of prospective blind Texans qualified to enter training for Computer Programming	S. A. Commission for the Blind	None
	State Commission for the Blind	Letter
	Governor's Coordinating Office for the Visually Handicapped	None
Reactions to additional cost to train Blind Programmers	Dean of San Antonio College	Note
Services for blind, costs to user department, etc.	Counselor for Handicapped, San Antonio College	None
Reasons for discontinuing training of blind programmers	Computer Systems Institute	None

ATTACHMENT G

PROFILE OF A PROGRAMMER

PROFILE OF A PROGRAMMER

Source: <u>Encyclopedia of Careers and Vocational Guidance</u>, 1975

Definition of Programmer:

It is their job to write and to code the instructions which control the work of a computer.

Nature of Work:

1. A programmer analyzes the request which is being made of the instrument, obtains from the persons who make the request information about the kinds of results which they want, discovers the kinds of data which will be needed in order to attack the problem, and plans the way in which the machine will have to respond in order to produce the information which is required of it.
2. He prepares a flow chart which will show the steps in sequence which the machine must make.
3. He must pay attention to minute detail and instruct the machine in each step of the process.
4. When the program is completed, he tests its working practicality by having it perform on simulated data.
5. If the machine responds according to expectations, actual data will be fed into it and the program will be activated. If it does not respond as anticipated, the program will have to be "debugged", or examined for errors which must be eliminated.

Requirements:

1. Most employers of programmers specify that they prefer college graduates. However, employers have been known to take persons as programmers who have attended college but who have not graduated.
2. Personal qualifications such as a high degree of reasoning ability, patience, and persistence and an aptitude for mathematics are often as influential as formal training in obtaining entry positions with data systems.
3. Employers usually send the new employee to a computer school before he will be qualified to assume programming responsibilities. He is usually sent to school at company expense; the training period may last as long as five weeks.
4. It generally takes a year or more before a programmer can master all aspects of his job.

Special Requirements:

Ability to solve difficult problems in a logical and
objective manner is the programmer's official requirement.
There are no special license he must hold.

Employment Outlook:

For the decade, employment opportunities for programmers,
both men and women, should be excellent. A rapid increase
in employment is expected as the increasingly complex
demands of our economy result in the necessity of computer
usage.

Conditions of Work:

Most programmers work under pleasant conditions. The
machines require an atmosphere which is dust free and in
which the temperature is constant both in summer and in
winter. Those who work with the machines benefit from
such requirements.

Since machine operations are usually fairly new in most
agencies and firms, the offices in which they are housed
are usually newly designed and decorated. Although most
of the facilities are not luxurious, they are clean,
modern, and well equipped.

The work week for the average programmer is between 35 to
40 hours. However, the circumstances surrounding each
job make for variations in the specified pattern. In some
job situations, the programmer may have to work some nights
or weekends when the program is going through its trial
runs, or when there are many demands for additional services.

Most programmers receive adequate vacation and sick leave,
and are included in such company benefits as group in-
surance and retirement benefit plans.

Source: Introduction to Data Processing, 1977, Gary S. Popkin
           and Arthur H. Pike

Programmers, at the beginning level:

1.   Assist in converting the specifications of systems
     analysts into detailed, logical flowcharts for coding
     into a computer programming language.

2.   Often confer with computer users to find out (a) exactly
     what the user expects the program to do, (b) exactly what
     the output is supposed to be, and (c) what the input to
     be supplied is.

3.   Supply the internal checks and controls in the programs
     they write that will ensure that data will be properly
     processed into information.

4.   Make up sample data to use as input to determine if a
     newly written program does indeed work properly.

5.   Write clear instructions to the other humans involved in
     the human-machine relationship.

6.   Seek out and correct whatever is wrong until the program
     runs without any apparent errors.

ATTACHMENT H

COMMON TASKS PERFORMED BY AIR FORCE PROGRAMMERS

COMMON TASKS PERFORMED BY

AIR FORCE PROGRAMMERS

COMMON TASK PERFORMED	PERCENT MEMBERS PERFORMING
DESK CHECK PROGRAMMING LOGIC	84
ISOLATE AND CORRECT PROGRAM LOGIC ERRORS	77
ISOLATE AND CORRECT SYNTAX ERRORS	74
DESK CHECK PROGRAM DECK FOR KEYPUNCHING ERRORS	72
CODE COBOL ROUTINES	65
REVIEW COMPILATION OR ASSEMBLY OUTPUTS FOR ERRORS	64
READ COMPUTER DUMPS FOR PROGRAM BUGS	61
CONDUCT OPERATIONAL FIELD TESTS OF NEW OR REVISED PROGRAMS	55
WRITE OR UPDATE DOCUMENTATION FOR PROGRAMS	51
PREPARE SYSTEM OR PROGRAM TEST DATA	51
PREPARE CHANGES TO CORRECT ERRORS OR IMPROVE OPERATIONAL PROGRAMS	50
DESIGN RECORD FORMATS	less than 50
DESIGN REPORT FORMATS	less than 50
PREPARE DETAILED PROGRAM FLOW CHARTS	less than 50

ATTACHMENT I

DATA COLLECTION FORM

(Used at on-site visits to training centers
for
visually impaired computer programmers)

Data Collection Sheet
Training of Blind and Visually
Impaired Computer Programmers

Section I -- Curriculum

1. Courses Taught:

| SUBJECTS | HOURS | | |
	CREDIT	CLASS	LAB	HOMEWORK
A.				
B.				
C.				
D.				
E.				
F.				
G.				
H.				
I.				
J.				
K.				
L.				
M.				
N.				
O.				

2. Presentation of Material:

A. Lecture: _____

_____

B. Tapes: _____

_____

D. Braille: _____

_____

E. Hands-on (Labs) _____

_____

F. Internship: _____

_____

G. Others: _____

_____

_____

3. Student Text Materials: (Type, cost, advantage, disadvantage, comments)

A. Braille _____

_____

_____

_____

B. Tapes _____

_____

_____

_____

C. Others _____

_____

_____

_____

4. Training Aids: (Use and cost)

    A. Braille Printer _____

    _____

    _____

    _____

    B. Braille Terminal _____

    _____

    _____

    _____

    .   Audio Terminal _____

    _____

    _____

    _____

    D. CRT Optacon _____

    _____

    _____

    _____

    E. Others _____

    _____

    _____

    _____

    _____

5. Comments: _____

    _____

Section II -- <u>Students</u>

   1. <u>Recruitment</u>

   2. <u>Previous Schooling</u>

   3. <u>Prequisities</u>

   4. <u>Selection (Screening)</u>

5. Profile of Average Student

A. Age _____

B. Sex _____

C. Educational Background _____

D. Health _____

E. Degree of Visual Impairment _____

F. Financial Background _____

G. Marriage Status _____

H. Age Sight Was Lost _____

I. _____

J. _____

K. _____

L. _____

M. _____

N. _____

Section III - Faculty

1. Director (Coordinator) _____

_____

_____

2. Faculty:

A. Special Training _____

_____

B. Sighted or Unsighted _____

_____

C. Programming Experience _____

D. Educational Background

_____

E. Faculty/Student Ratio

_____

F. Working Hours

_____

G. Work Schedule

_____

H. Faculty Tutoring

_____

I. Out of Classroom/Lab Contact with Students

_____

_____

_____

J. Other Faculty Considerations (Number, Salary, Age, etc.)

_____

_____

_____

_____

_____

Section IV ---Counseling

1. Special Counselors (number, Duties, Hours, etc.)

_____

_____

_____

_____

2. Special Training Requirements for Counselors

_____

_____

_____

3. Other Counseling Considerations (Sighted vs Unsighted, etc.)

_____

_____

_____

_____

Section V -- Laboratory Assistants

1. Need for Aides

_____

_____

_____

2. Qualifications, Hours, Salary, Duties, etc.

_____

_____

_____

Section VI -- Tutoring

1. Student Tutoring

_____

_____

2. Faculty Tutoring

_____

3. Tutoring by Blind Programmers

4. Hours of Tutoring

5. Cost of Tutors

6. Other Tutoring Considerations

Section VII -- Mainstreaming

1. Comments

Section VIII - Special Instruction

1. Individualized Instruction

2. Size of Classes

3. Segregated Classes

_____

_____

_____

_____

4. Repeating all or Part of A Class

_____

_____

_____

5. Other Considerations

_____

_____

_____

Section IX -- Program Structure

1. Length of Program

_____

_____

2. Length of School Days

_____

_____

3. Breaks, Holidays, etc.

_____

_____

_____

4. Program Completion Certificate or Degree

_____

_____

_____

Section X -- Non-Data Processing Courses

1. Which are most important? (Why?)

_____

_____

_____

2. Which are least important? (Why?)

_____

_____

_____

3. Other Considerations: _____

_____

_____

_____

Section XI -- Costs

  1. On-Going Costs (Annual Budget) _____

    _____

    A. Faculty _____

    _____

    B. Hardware/Software (Type and costs) _____

    _____

    C. Special Devices for Blind _____

    _____

    _____

    _____

    D. Counseling _____

    _____

    E. Tutoring _____

    _____

    F. Learning Materials (List) _____

    _____

    _____

G. Overhead

H. Other On-Going Costs

2. One-Time Costs

A. Modifications to F   ties

B. Purchase of Special Devices

C. Other One-Time Costs

3. Costs Per Student

4. Costs Per Student Contact Hour

Section XII -- Student Costs

1. Who Pays?

2. How much? _____

_____

3. Student Cost Items: (List) _____

_____

_____

_____

_____

4. Other Student Cost Considerations _____

_____

_____

Section XIII -- Revenues

1. Tuition _____

_____

2. State Funding _____

_____

3. Local Funding _____

_____

4. Federal Funding _____

_____

5. Funding From Organizations _____

_____

_____

_____

6. Other Revenues _____

Section IX -- Problems?

1. Students With Different Educational Background

2. Different Degrees of Visual Handicap

Section X -- Opinions

1. Can Training Be Performed on College Campus?

A. Semester Lengths

B. Class Periods

C. Class Days Lengths

D. Holidays, Spring Breaks, Breaks between Semesters, etc.

E. Rush From Class to Class

F. Five Subjects At One Time

G. Comments _____

_____

_____

_____

_____

Section XI -- Other Observations

_____

_____

_____

_____

_____

_____

_____

_____

_____

School _____

Director _____

Address _____

_____

_____

ATTACHMENT J

FIRST QUARTERLY REPORT

SAN ANTONIO COLLEGE

DEPARTMENT OF DATA PROCESSING

October 5, 1978

TO: Ray Barber, Director, Exemplary and Innovative
        Programs, TEA

FROM: Al Stehling, Project Coordinator

SUBJECT:Quarterly Progress Report; Feasibility Study and
        Development of a Program to Train Visually
        Impaired Students in Computer Programming

The original application for funds for exemplary and innovative
programs was submitted on March 17, 1978. A revised proposal
was submitted on April 4, 1978. Authority to start the project
was received by San Antonio College on July 3, 1978.

The following persons were contacted and agreed to serve on the
steering committee for Phase I of the project:

  1. Dr. Robert Bottenberg (blind)
     Chief Computational Sciences Division
     Air Force Human Resources Laboratory
     Brooks Air Force Base

  2. O.C. "Bud" Davidson (visually impaired)
     Deputy Director of Individual Assistance Services
     Governor's Coordinating Office for the Visually
        Handicapped
     Austin, Texas

  3. Robert M. Hackett (employer)
     Director, Application Services
     City Water Board
     San Antonio, Tx

  4. Sharon Lynn Hill (counselor)
     Counselor/Coordinator for Handicapped Students
     San Antonio College.

  5. Dr. Max Jabs (administrator)
     Associate Dean of Instruction
     San Antonio College

6. Patricia F. Lindey (educational agency)
   Coordinator, Vocational Curriculum
   Texas Education Agency
   Austin, Texas

7. Edward Marquardt (blind, retired)
   Computer Programming Instructor
   San Antonio, Texas

8. Walter Musler (blind)
   Program Director, Piano Tuning
   San Antonio College

9. Chester Neeley (blind programmer)
   Automation Officer, Systems Research
   Frost National Bank
   San Antonio, Texas

10. Charles Raeke (blind)
    Supervisor of Program Evaluation,
    Planning and Development
    Texas State Commission for the Blind
    Austin, Texas

11. Frank Sievers (employer)
    Vice-President
    Frost National Bank
    San Antonio, Texas

12. Al Stehling (project coordinator)
    Chairman, Data Processing
    San Antonio College

13. Bob Wiley (blind programmer)
    Programmer and System Analyst
    City Water Board
    San Antonio, Texas

Other persons who were invited to attend all committee meetings
were:-

1. Ray Barber, Director
   Exemplary and Innovative Programs
   Texas Education Agency
   Austin, Texas

2. Nellie Thorogood, Director
   Occupational Education and Technology
   San Antonio College

The first steering committee meeting was held in the Madrid Room
at San Antonio College on July 11, 1978. Members and guests
present were Barber, Hill, Jabs, Marquardt, Musler, Raeke, Sievers,
Stehling, Thorogood, and Wiley. Based on a report by Raeke that
experiences in his office indicated that only a 15% response to
mail-out questionnaires pertaining to blind could be expected, the
committee agreed that the best way to gather employment opportunity
data was thru personal interviews. The committee determined that
the employer's population be San Antonio, with five samples each
from Houston, Dallas, and Austin. Hill, Sievers, and Jabs agreed
to meet with Stehling to develop the employment opportunity ques-
tionnaire.

Committee members agreed that data pertaining to the training
requirements could best be gathered from blind programmers and
schools that train blind programmers. All committee members were
given resource sheets and self-addressed envelopes so they could
mail "leads" to the project coordinator as they happened to come
across resource people, materials, and organizations. About half
of the committee members sent resource leads to the project coor-
dinator during Phase I.

Minutes of the first steering committee meeting were mailed to
all members. Members who were not present at the meeting were
mailed a packet (copy of the approved project, list of members,
data sheets and resource forms) distributed at the meeting.

On July 14, Stehling and Jabs' (Hill and Sievers were unable to attend) met to develop the questionnaire to gather employment opportunity data from the employers. Copies of the proposed questionnaire were mailed to all steering committee members on July 18 with a cover letter requesting suggestions for improvements. Several committee members submitted good suggestions and the questionnaire was modified to include the proposed changes.

During the month of August, the project coordinator visited San Antonio employers (data processing managers) and completed the employment opportunities (or employers) questionnaires during personal interviews. Gathering the employment data by personal interviews proved very time consuming (calling for appointments, waiting in offices, appointment cancellations, travel and parking delays, etc.). On August 22, 23, and 24 the project coordinator made a three day trip to interview employers in Houston, Dallas, and Austin. Because the original proposal did not plan for personal interviews, this part of the study (1) required a great deal of the project coordinator's time and (2) resulted in in-city and out-of-city travel expenses that had not been pre-planned.

The results of the employers interviews were summarized in three groups, namely: San Antonio employers (48), samples from Houston, Dallas, and Austin (15), and all employers (63). Only one employer refused to share his opinions with the project coordinator.

In July, the project coordinator developed a proposed questionnaire to be mailed to the blind programmers. Samples were mailed to blind programmers on the steering committee asking them for their comments and suggestions for improvements. On August 2, the project coordinator met with Mr. and Mrs. Chester Neeley to modify the form. On August 14, eleven questionnaires were mailed to blind programmers. Ten of these names and addresses were supplied by Charles Raeke. Between August 15 and mid-September, seven more questionnaires were mailed to blind programmers as the project director found their names in resource materials and news articles.

Several of the questionnaires to the blind were returned due to incorrect mailing addresses, or with notes stating that the person

was not blind or that the person was not a computer programmer.
Six questionnaires were completed and summarized for the steering
committee. Since that time two more completed questionnaires have
been received from blind programmers.

Frank Sievers submitted a proposed DPMA (Data Processing Manage-
ment Association) questionnaire to the project coordinator in mid-
July. The project coordinator made minor changes to the question-
naire and sent a copy to all steering committee members. There
was no response or feed-back concerning the DPMA questionnaire
from the steering committee. On August 17, the project coordinator
mailed seventeen DPMA questionnaires to the Texas chapter presidents
with instructions to survey the membership at the next regular meet-
ing. Four of these questionnaires were returned prior to the
steering committee's September meeting. Two of these questionnaires
were completed incorrectly. A fifth DPMA questionnaire was returned
in early October, and it too was filled out incorrectly.

On September 6, the project coordinator mailed a questionnaire to
eight department chairpersons at San Antonio College. These de-
partments would be likely to have the blind computer programming
students in one or more of their department classes. Seven chair-
persons questionnaires were returned and summarized for the
steering committee.

During Phase I, the project coordinator wrote letters requesting
input to the study to resource people and organizations which in-
cluded: professional data processing organizations, employers of
blind programmers, schools that train blind programmers, schools
that used to train blind programmers, Ohio State University (task
analysis), resource people listed in the 1977 Technology Transfer
Directory, organizations that work with the blind, authors of arti-
cles in professional journals and newspapers, the dean of the college,
the campus coordinator of the handicapped, etc. Some of the resource
people and organizations did not reply, some sent referrals to other
resource people, some sent short and/or futile replies, and some
returned very meaningful contributions to the study. Two observations
should be pointed out: (1) Phase I may have been too short to locate
and receive feed-back from resource people and organizations, and
(2) very few resource people expressed their experiences and/or
opinions in writing. Most replies were copies of printed materials.

At the first steering committee meeting members requested a "profile of a programmer." In early July the project coordinator visited the Air Force Human Resource Laboratory to review literature pertaining to the data processing job clusters and task analysis. Copies of the common tasks performed by Air Force Programmers were mailed to the steering committee members on July 24. Efforts to obtain task analysis for computer programmers from Ohio State University proved fruitless.

Literature pertaining to the training of blind programmers was obtained from various training centers including:

1. System Development Corporation
   Santa Monica, California

2. University of Manitoba
   Winnipeg, Manitoba, Canada

3. Columbus Tech
   Columbus, Ohio

4. Computer System Institute
   Pittsburg, Pennsylvania
   (Note: They no longer train blind programmers)

5. Arkansas Enterprises for the Blind
   Little Rock, Arkansas

6. Medcomp Research Foundation
   Cincinnati, Ohio

Data pertaining to the above six training centers for visually impaired computer programmers was packaged and made available to the steering committee at the September 27th meeting. In addition to the above training centers, the Pitt Technical Institute in Greenville, North Carolina responsed to our request for input. Their efforts to train blind computer programmers have been unsuccessful.

On September 11 thru September 14, the project coordinator made a four-day trip to visit two schools that train blind/visually impaired computer programmers. A two-day visit was made to the Arkansas Enterprises for the Blind in Little Rock, Arkansas and another two-day visit was made to the Medcomp Research Foundation in Cincinnati, Ohio.

The project coordinator interviewed administrators, instructors, and
students at these two training centers. A fourteen-page data
collection form was used to record the data collected during these
visits. The data collection forms were available to the steering
committee members at the September 27th meeting. In addition, the
project coordinator summarized key observations made during the
visits. These observations were distributed to the steering comm-
ittee members.

In early September, the project coordinator mailed a short question-
naire to local and state offices for the State Commission of the
Blind and to the Governor's Coordinating Office for Visually Handi-
capped. This questionnaire requested the estimated number of pros-
pective blind Texans who would be likely to pursue a career in
computer programming. The state office for commission of the blind
reported that there are ten blind Texans who have a vocational goal
of computer programming.

The project director accumulated literature pertaining to special
training devices used by blind programmers and/or blind programming
students. Devices on which material was gathered included.

1. ARTS (Audio Response Time Sharing) System

2. Optacon

3. Audible Light Detector

4. Speech Plus (talking calculator)

5. Braille Display Terminal

6. Portable Braille Terminal

7. Triformation's LED-120 Braille Terminal

8. Triformation's LED-1 Brailling Device

9. Triformation's ISE-1 Braille Embosser

10. Triformation's BD-3 Braille Computer Terminal

11. Triformation's PBCE Reproduction System

The literature pertaining to the above devices was packaged and
made available to the Steering Committee at the September 27th
meeting.

The steering committee was notified of its' second meeting
(scheduled from 9 a.m. to 4 p.m. on September 27) on September 8.
Members and guests who participated in the September 27th meeting
were: Barber, Davidson, Lindey, Marquardt, Musler, Raeke, Rice,
Stehling, Thorogood, and Wiley. In addition the project coordinator's
secretary (Hernandez) and four readers (Felan, Patterson, Ramos, and
Wallace) attended the meeting. Each member and guest was presented
a packet of summarized data (see attached). The committee was divided
into small groups and, with assistance from the readers, all research
material was reviewed before noon. After lunch, the committee dis-
cussed the results of the study at length. By a show of hands, the
committee voted that (1) there were employment opportunities for
blind/visually impaired computer programmers in Texas, (2) San Antonio
College should provide a program to train blind visually impaired
computer programmers, and (3) that the project move into Phase II.

This report covers the period of July 1, 1978 thru September 30, 1978.
Only minor problems have been encountered and they have been resolved.
These minor problems deal with approval of indirect costs and out-
of-city travel. In addition, the amount of secretarial help was
underestimated, and the personal interviews (in place of mail-out
questionnaires to the employers) resulted in additional travel expense
and time. The secretary is on a eleven-month contract and went out
of town in August. Part-time assistance was employed to perform the
secretarial duties in August. In September, the department experienced
a 23% growth in enrollment, and additional part-time lecturers were
employed. The increase in the secretary's work load did not allow her
to spent 25% of her regular working hours on the project. Beginning
in September, the secretary had to work on the project on an overtime
basis.

With a few exceptions, the steering committee was not a "working
committee." The persons invited to serve on the advisory committee
to develop the program to train blind programmers (Phase II) are
informed that it will be a "working committee", demanding much of
their time as well as their expertise. Activities planned for Phase II
are outlined in the proposal.

For additional information, please call or write the project coordinator.

Sincerely,

ATTACHMENT K

DATA PROCESSING SUBJECT OBJECTIVES

SUBJECT OBJECTIVES

Subject objectives for the following data processing courses were developed because:

(1) They are new courses or
(2) The existing course objectives did not meet the requirements for the program to train visually impaired computer programmers:

DP 402--Introduction to Electronic Data Processing and Programming

DP 202--BASIC Programming

DP 300--Specialized Data Entry Training

DP 302--Utilities and JCL

DP 316--COBOL Programming

DP 317--COBOL Programming

DP 307--File Processing

DP 313--Structured COBOL Programming

DP 304--System Analysis

DP 312--Advanced System Analysis and Design

DP 322--Data Processing Applications (Seminar)

DP 305--System/370 Assembly Language

DP 306--Advanced System/370 Assembly Language

DP 325--Teleprocessing Programming

DP 324--Programming Practicum

D. P. 402

Introduction to EDP and Programming

1. The student will define and differentiate between:

   A. Digital and analog computers

   B. Business and scientific applications

   C. Real-time and batch processing

   D. On-line and off-line processing

   E. High-level and low-level languages

   F. Source and object programs

   G. Software and hardware

   H. Primary, secondary, and auxiliary storage

   I. Random and Sequential processing

   J. Fields, records, and files

   K. Bits, bytes, and "K"

   L. Transaction and master files

   M. Input editing and output editing

   N. Multiprocessing and multiprogramming

   O. I/O media and I/O devices

   P. First, second, and third generation computers

2. The student will name, describe, and explain the relationships between:

   A. Five elements of a computer system

3. The student will describe the purpose and operations of the parity check.

4. The student will describe the common computer coding systems including:

   A. BCD (4 bits)

   B. Extended BCD (6 and 7 bits)

   C. EBCDIC (9 bits)

   D. ASCII

   E. Hollerith

5. The student will define and differentiate between:

   A. Numeric and alphabetic fields

   B. Signed and unsigned fields

   C. Low order and high order positions

   D. Packed and unpacked data

   E. Words, half-words, and double-words

   F. Random, sequential, and keyed files

   G. Timesharing and distributed processing

6. The student will define, differentiate, describe the advantages and necessities of using the following numbering systems: binary, octal, decimal, and hexadecimal.

7. The student will perform arithmetic operations and conversions in binary, octal, decimal, and hexadecimal.

8. The student will name and describe popular types of input and

I/O media include punched cards, paper tape, magnetic tape, magnetic disks, keyboards, line printers, MICR, OCR, CRT, audio, COM, POS, plotters, and portable terminals.

9. The student will name and explain the parts of a computer instruction, the classifications of instructions, and parts of a program loop.

10. The student will define and differentiate between:

    A. System and program flowcharts

    B. Flowcharts and decision tables

    C. Programs and subroutines

    D. Conditional and unconditional branches

    E. Data and instruction names (labels, numbers)

    F. Storage address and address contents

    G. Assembler and compiler

    H. Debugging and program testing

    I. Milliseconds, microseconds, and nanoseconds

11. The student will explain the purpose and use of address modification.

12. The student will develop a pre-coding aid (flowchart, decision-table, etc.) to illustrate the program logic for a program with three control breaks plus run-out totals.

13. The student will develop a pre-coding aid (flowchart, decision-table, etc.) to illustrate the program logic to update a master

14. The student will define and discuss the advantages of documentation and structured programming.

15. The student will modify a flowchart prepared by the instructor.

16. The student will develop the logic (flowchart or other means.) and illustrate the use of a closed subroutine that is used at least three times within the main program.

17. The student will develop input and output layouts.

18. The student will define and explain the advantages of mnemonic operation codes and symbolic addresses.

19. The student will define and give examples of macro instructions, and machine language instructions.

20. The student will describe and give examples of the following types of software: manufacture supplied, user developed, and utilities.

21. The student will identify coding statements from the popular programming languages such as COBOL, FORTRAN, and Assembly Language.

All of the above objectives are to be judged 90% correct and complete by the instructor.

D. P. 202

BASIC Programming

The student will demonstrate the ability to:

1. Log-on and Log-off on an on-line terminal, load a BASIC
    program previously written, modify the program, compile,
    and test the program with 95% accuracy.

2. Write a BASIC program to read and write to a disk file
    using information from both data statements and a stored
    array. Use the input statement to enter one or more
    responses. The program will be written, compiled, debugged,
    and tested within two weeks and judged 95% correct and
    complete by the instructor.

3. Write a BASIC program to include a loop utilitizing the
    "next" statement. The program will be written, compiled,
    debugged, and tested within one week and judged 95%
    correct and complete by the instructor.

4. Write a BASIC program to include the "IF - THEN, GO TO"
    statement. Accumulate totals for at least three control
    breaks plus the final totals. The program will be written,
    debugged, and tested within two weeks and judged 95%
    correct and complete by the instructor.

5. Write a BASIC program to utilize a sub-routine (use
    GOSUB and RETURN statements). The program will be written.

D. P. 300

Specialized Data Entry Training

Prerequiste: Typing 35 WPM

The student will demonstrate the ability to:

1. Operate the card punch without assistance.' Performance will be judged 90% correct by the instructor.

2. Punch and desk check source program cards with 95% accuracy.

3. Operate an on-line terminal without assistance. Performance will be judged 90% correct by the instructor.

4. Enter and desk check a source program on an on-line terminal with 95% accuracy.

5. In some way, verify the printed output from the data entry operations to insure that the data has been entered correctly. This input verification will be judged 95% correct by the instructor.

D. P. 302

Utilities and JCL

The student will demonstrate the ability to:

1. Use IEBCOPY to copy a 3-member partitioned data set ex-
    cluding one member. The work is to be completed within
    3 days and judged 95% correct by the instructor.

2. Run a three-step job to: (A) use SORT/MERGE to sort a
    sequential file on 2 keys, (B) use IEFBR14 to cause al-
    location and cataloging of a partitioned data set, and (C)
    use IEBGENER to create 2 members of the data set. Last
    record in member 'A' has 'END-of-1' and last record in 'B'
    has 'END-of-2', (D) use IEBGENER to print all the records
    with editing to (1) insert blanks between fields (2) insert
    a '$' in a specified column and (3) replace all blanks with
    '*' in a field. Delete (uncataloging) the data set. Work
    is to be completed within 2 weeks and judged 95% correct
    by the instructor.

3. Use IEBUPDTE to delete records positionally (ex. fifth
    thru tenth records from a sequential disk file, renumber
    sequence numbers, in bytes 73-80 of the remaining records).
    Sequence numbers will be in increments of 100. Work is to
    be completed within one week and judged 95% correct by the
    instructor.

instructor.

5. Use LINKAGE EDITOR to (a) store two sub-modules as members of a partitioned data set on disk and (b) execute the job consisting of the two sub-modules and a source deck of the main section. Work is to be completed within 2 weeks and judged 95% correct by the instructor.

6. Run a multi-step job to (a) use IEBCOMPR to determine whether corresponding members of two different partitioned data sets are the same and (b) if the records match, use IEBPTPCH to print records 6 thru 30 of one of the members. The member to be printed is to contain more than 30 records and the data set containing it is to be passed from the first step. Printing is to be conditioned on the return code from Step 1. Print no more than 30 lines per page. Work is to be completed within 2 weeks and judged 95% correct by the instructor.

7. (A) Write a PROCEDURE to be stored as a member of a partitioned data set. Use symbolic data set names in the procedure and pass the data sets. Use backward references in later steps. (B) Use the procedure supplying the data set names and add a condition parameter on one job step, delete a condition parameter on another step, change a block size and record length on one data set and change the

D. P. 316 and D. P. 317

COBOL Programming

The student will demonstrate the ability to:

1. Write a COBOL program to (A) edit random transactions
   and produce an error list, (B) sort the valid transactions
   using the COBOL sort feature, and (C) utilize the Report
   Writer feature to list the valid transactions.
   The input payroll file will include at least 100 records,
   each record containing at least six numeric fields and four
   alphabetic fields. Edit procedures will include range
   check, and batch control balancing.
   The valid transactions are to be sorted on at least two
   keys. Output procedures will include data compression on
   at least three alphabetic fields (for example: first name,
   middle name, last name). Printed output will include con-
   trol breaks on the key fields.
   The program will be written, compiled, debugged, and tested
   within three weeks; and judged to be 95% correct and com-
   plete by the instructor.

2. Debug a COBOL program using the COBOL Debugging features.
   The student will locate 95% of the program errors within
   two days.

3. Write a "structured" COBOL program that is judged to be

turing. The program is to be written, debugged, and
tested within two weeks.

4. Modify a COBOL program written by another programmer.
The student will complete the modification within two days
and his modification will be judged 95% complete and
correct by the instructor.

5. Write a COBOL program to build a table, match records, and
perform a binary search. Three files will be used, (A) the
customer master record, (B) the saving accounts transaction
file, and (C) the control records file. The master and
transaction file is in sequence by customer number and
the control records file is in random sequence. Read the
control records file and build a table by customer number.
Match transaction and master files and locate the control
information thru a binary search of the control table.
The control table will supply the annual interest rate.
Print a report including the customer number, the name
and address from the master file, the savings amount from
the transaction file, and the annual interest rate from the
control table. The program will be written, compiled, and
debugged within three weeks and judged to be 95% correct
and complete by the instructor.

D. P. 307

File Processing

1. The student will describe the advantages and necessities
   for using various types of files (sequential, random, VSAM,
   ISAM, direct, and partitioned). The instructor will judge
   that the student's explantions are 90% correct and complete.

2. The student will explain the data base concepts to the
   instructor. The instructor will judge that the explanation
   is 90% correct and complete.

3. The student will differentiate between variable length and
   fixed length records. The instructor will judge that the
   explanation is 90% correct and complete.

4. The student will write a program to process variable length
   records (records will contain variable length fields). The
   program will be written, compiled, debugged, and tested
   within three weeks; and judged to be 95% correct and
   complete by the instructor.

D. P. 313

Structured COBOL Programming

1. Given a Visual Table of Contents, representing an in-
   formation processing system, the student will prepare
   HIPO (Hierarchal Input Process Output) charts for that
   portion of the Visual Table of Contents which represents
   a program. The HIPO charts will be prepared within two
   weeks. The instructor will judge that the number of charts
   is 95% correct, and that the format and content is 90%
   correct.

2. The student will write a COBOL program following the HIPO
   charts. The program will conform to the following:

   a. Use 88 condition tests

   b. the procedure division will be in levels corresponding
      to the HIPO charts

   c. A routine will have only one entrance and one exit

   d. no GO TO verbs

   e. no compound IF statements

   f. use nested IF's in the "IF ... ELSE ..." format

   g. use indentation to pair the IF with its ELSE

   h. use structured periods

   The program will be written, compiled, debugged, and tested

   within one week and judged 95% correct and complete by the

   instructor.

D. P. 304 and D. P. 312

System Analysis

1. The student will design a small business subsystem that
   will demonstrate the students' ability to comprehend,
   analyze, and evaluate situations (problems) presented by
   the instructor, and synthesize these into logically sound
   solutions. The designed subsystem will include document-
   ation in the form of system flowcharts and Hierarchical
   Input Process Output charts; classification of records;
   encoding of information; input and output layout designs;
   file and record designs; data controls; run controls; audit
   trails; and file organization. The designed subsystem will
   by judged 95% correct and complete by the instructor.

D. P. 322

Data Processing Applications

1. The student will participate (attendance, note-taking, and verbal communications) in 90% of the scheduled seminars.

2. The student will submit at least three topics for seminar meetings, assist in making the arrangements for at least one guest speaker, introduce one speaker or topic, and dictate at least one "thank you" letter to one of the seminar speakers. The students' performance will be judged 90% correct and effective by the instructor.

3. The student will develop a resume according to the format described by the instructor. The resume will be judged 90% correct and complete by the instructor.

4. The student will apply for a programmer trainee position at an off-campus computer installation. The student will make all necessary arrangements including the appointments and transportation, and apply for the position without assistance. The instructor will discuss the interview with the student and with the employer. The student will earn a 90% rating for his efforts as judged by the instructor.

5. The student will research a computer related topic and make a presentation at one of the scheduled seminars. The student's presentation will be judged 90% correct and complete by the instructor

D. P. 305 and D. P. 306

Sys tem/370 Assembly Language

The student will demonstrate the ability to:

1. Write an Assembly Language program to (A) read a quarterly
   payroll file of at least 75 records by social security
   sequence, (B) accumulate the FICA field by department and
   grand total, (C) calculate the percent of the payroll cost
   represented by FICA, and (D) print an edit detail report
   including the department and grand FICA and percentage
   totals. The program will be written, assembled, and
   tested within two weeks and judged 95% complete and correct
   by the instructor.

2. Write an Assembly Language program to read a transaction
   file (of at least 75 records in random sequence) and build
   a table including the key field plus an amount field.
   Read a second transaction file in name sequence, perform
   a binary search to determine if the key field is located
   in the table. List the key field, name, and amount of matched
   records. Do not use utilities. The program is to be
   written, compiled, and debugged within three weeks and
   judged 95% correct and complete by the instructor.

3. Debug an Assembly Language "dump" provided by the in-

errors so the program will run to completion.

4. Write an Assembly Language program that includes the CALL macro and passing parameters to the CALLED subroutine which returns controls to the calling program. The program will be written, compiled, debugged and tested within two weeks; and judged 95% correct and complete by the instructor.

D. P. 325

Teleprocessing Programming

The student will write a COBOL or Assembler quasi-reentrant program to process transactions entered through a CRT and update a master file. The updated master file is to be printed. Mapping is to be done according to specifications in the problem assignment and will include: (A) at least one numeric field, (B) an alpha-numeric field, (C) a right-justified field, (D) a protected field, (E) a non-display (masked) field, and (F) a hi-lighted field; and will use assigned screen positions. CICS will be set up so that more than one transaction can be processed thru the student's program concurrently. The program will be written, compiled, debugged, and tested within three weeks; and judged to be 95% correct and complete by the instructor.

<u>D. P. 324</u>

<u>Programming Practicum</u>

<u>Prerequisite</u>:   Successful completion of the Advanced COBOL course.

1.   The student will write and/or modify computer programs in
     a production environment. This on-the-job assignment will
     preferably be off-campus. The student will achieve pro-
     gramming competence and productive skills equal to those
     achieved by sighted trainees as judged by the programming
     supervisor and the course instructor.

2.   The student will arrange for transportation to and from
     the programming installation, and take whatever measures
     necessary to insure prompt and regular attendance. The
     student's attendance will be equivalent to the attendance
     standards established for the company's employees (as
     judged by the programming supervisor).

ATTACHMENT L

CURRICULUM AND CATALOG DESCRIPTIONS OF COURSES IN THE CURRICULUM

Proposed Curriculum
Associate Degree in Applied Science
Computer Programming for the Visually Impaired

Courses	Type *	Hours		
		Credit	Contact Per Wk.	Est. H/W Per Week
Freshman Year, Fall Semester:				
DP 402 Introduction to EDP & Programming	S/M	4	4	12
DP 202 BASIC Programming	S/M	2	2	6
DP 300 Specialized Data Entry Training	S	3	6	0
ENG 601 English Composition	M	3	3	9
BT 317 Elementary Accounting	M	3	3	9
ORI. 101 Orientation to College	M	1	1	0
Totals		16	19	36
Freshman Year, Spring Semester:				
DP 302 Utilities and JCL	S	3	6	15
DP 316 COBOL Programming	S	3	4	10
DP 307 File Processing	M	3	4	9
BT 314 Business Communication	M	3	3	9
TM 300 Technical Mathematics	M	3	3	6
Totals		15	20	49

Courses	Type *	Credit	Hours Contact Per Wk.	Est. H/W Per Week
Sophomore Year, 1st Summer Semester:				
DP 313 Structured COBOL Programming	S	3	13**	19**
PHIL 312 Introduction to Logic	M	3	10**	19**
Totals		6	23	38
Sophomore Year, 2nd Summer Semester:				
DP 304 System Analysis	M	3	10**	19**
DP 322 Data Processing Applications	S	3	10**	10**
Totals		6	20	29
Sophomore Year, Fall Semester:				
DP 317 COBOL Programming Applications	M	3	4	12
DP 305 S/370 Assembly Language	M	3	4	12
DP 325 Teleprocessing Programming	S	3	4	12
DP 312 Adv. System Analysis & Design	S	3	3	12
Totals		12	15	48

Courses	Type *	Hours		
		Credit	Contact Per Wk.	Est. H/W Per Week

Sophomore Year, Spring Semester:

Courses	Type *	Credit	Contact Per Wk.	Est. H/W Per Week
DP 324 Programming Practicum	M	3	16	0
DP 306 Adv. S/370 Assembly Language	S	3	4	12
DP 321 Programming Applications (COBOL)	S	3	3	12
DP 322 Data Processing Applications	S	3	3	3
GOV 305 Texas Government***	M	3	3	3
Totals		15	29	30
Degree Totals		70	126	N/A

*   M   =   Mainstreamed
    S   =   Segregated
    S/M =   Segregated if possible, mainstreamed otherwise

**   Divide by 3.2 is course is taken during a long semester

*** Texas Government should be removed from the curriculum when it is no longer a college requirement for an Associate in Applied Science Degree.

CATALOG DESCRIPTIONS
of
Courses in Proposed Curriculum

Data Processing Courses: (Listed in the sequence as they appear in

the curriculum).

1. DP 402 INTRODUCTION TO ELECTRONIC DATA PROCESSING AND PROGRAMMING
                                                    4 Semester Hours

    Digital computer systems, input/output media and devices, primary
    and secondary storage, numbering systems, computer logic,
    program flowcharting, and an introduction to programming languages.
    Four lecture hours per week.

2. DP 202 BASIC PROGRAMMING   2 Semester Hours

    Writing and debugging business and mathematical type problems
    in the Basic language. Entering programs via a CRT terminal or
    card reader on-line to the IBM System/370.

3. DP 300 SPECIALIZED DATA ENTRY TRAINING   3 Semester Hours

    Conversion of source data into computer input media utilizing
    the card punch and specialized input devices. Three lecture
    hours and three laboratory hours per week.

.4. DP 302 UTILITIES AND JCL   3 Semester Hours

    Prerequisite: Data Processing 402. Utility programs, job
    control language, control of devices and resources, file and
    storage management, communications with the supervisor.
    Students write, test, and debug JCL procedures utilizing the
    IBM System/370. Three lecture hours and three laboratory hours
    per week.

5. DP 316 COBOL PROGRAMMING   3 Semester Hours

    Prerequisite: Data Processing 402. American National Standard
    COBOL (Common Business Oriented Language.) Students write and
    debug programs using the COBOL verbs and their variations.
    Programs are compiled and tested on the IBM System/370. Three
    lecture hours and one laboratory hour per week.

6. DP 307 FILE PROCESSING   3 Semester Hours

   Sequential, random, VSAM, ISAM, direct, and partitioned file
   processing techniques. Data base and variable length concepts.
   Students write, compile, test, and debug programs utilizing the
   IBM System/370. Three lecture hours and one laboratory hour
   per week.

7. DP 313 STRUCTURED COBOL PROGRAMMING   3 Semester Hours

   Prerequisite: Data Processing 316. Structured program design
   based on Hierarchical Input Process Output charts. Students
   write, compile, test, and debug structured COBOL programs
   utilizing the IBM System/370. Three lecture hours and one
   laboratory hour per week.

8. DP 304 SYSTEM ANALYSIS   3 Semester Hours

   Prerequisite: Data Processing 402. System investigation and
   design of computerized business applications. System flow
   charting; source documents; input and output forms design;
   types of computer runs; concurrent computer processing; types
   of files; and systems study through implementation. Three
   lecture hours per week.

9. DP 322 DATA PROCESSING APPLICATIONS   3 Semester Hours

   Specialized training for Data Processing students and/or
   professionals. The subject of the course is announced prior
   to registration. May be repeated for credit when training
   varies.

10. DP 317 COBOL PROGRAMMING APPLICATIONS   3 Semester Hours

   Prerequisite: Data Processing 316. Continuation of American
   National Standard COBOL Programming; more advanced techniques
   such as table handling, file sorting, report writing, and
   processing techniques for the various file organizations under
   the Operating System. Students write, compile, test, and debug
   programs utilizing the IBM System/370 computer. Three lecture
   hours and one laboratory hour per week.

11. DP 305 SYSTEM/370 ASSEMBLY LANGUAGE   3 Semester Hours

Prerequisite: Data Processing 402. Assembly Language, a review
of the numbering systems; data formats; instruction formats;
instruction sequencing and branching; interrupts; decimal and
fixed-point instructions; and the use of registers. Writing,
compiling, testing, and debugging programs utilizing the IBM
System/370 computer. Three lecture hours and one laboratory
hour per week.

12. DP 325 TELEPROCESSING PROGRAMMING   3 Semester Hours

Prerequisite: Data Processing 305 or 316. On-line programming
techniques, CICS concepts, and basic mapping. Students write,
test, and debug quasi-reentrant on-line programs utilizing the
IBM System/370. Three lecture hours and one laboratory hour
per week.

13. DP 312 ADVANCED SYSTEM ANALYSIS AND DESIGN

       3 Semester Hours

Prerequisite: Data Processing 304. An advanced study of
system design including system analysis, evaluation design,
and documentation. Proper implementation and use of digital
computer and accounting controls. The student designs a sub-
system through the use of a case study. Three lecture hours
per week.

14. DP 324 PROGRAMMING PRACTICUM   ,   3 Semester Hours

Prerequisite: Grades of B or better in 3 of the following
languages: RPG II, COBOL, FORTRAN, Assembly, or PL/1. Actual
programming experience in a commercial installation. Student
assignments may be off-campus. Fifteen hours per week of on-
the-job training plus a one-hour weekly meeting.

15. DP 306 ADVANCED SYSTEM/370 ASSEMBLY LANGUAGE

       3 Semester Hours

Prerequisite: Data Processing 305. A continuation of Assembly
Language. Input/output techniques. Writing, compiling, testing
and debugging programs utilizing the IBM System/370 computer.
Three lecture hours and one laboratory hour per week.

16. DP 321 PROGRAMMING APPLICATIONS   3 Semester Hours

Prerequisite: Data Processing 312 and one of the following programming languages: COBOL, RPG II, Assembly Language, FORTRAN, or PL/1. The student designs a subsystem under the supervision of the instructor. The student writes and debugs the programs within the subsystem. Some of the projects assigned to students may require off-campus work. Primarily a laboratory course for training application programmers.

Support Courses: (Listed by department).

1. Business Technology 314 BUSINESS COMMUNICATIONS
                                        3 Semester Hours

   Practical psychology, good business judgement, and clear, forceful English in writing business letters.

2. Business Technology 317 ELEMENTARY ACCOUNTING
                                        3 Semester Hours

   Record keeping and accounting procedures used business. Practice in entering daily transactions, using standard accounting records and preparing financial statements.

3. English 601a ENGLISH COMPOSITION   3 Semester Hours

   A study of the principles of cor???? and effective oral and written Standard English express ?? . Much practice in reading and writing of prose, chiefly expository.

4. Government 305 AMERICAN GOVERNMENT   3 Semester Hours

   Comparison of the Texas and U.S. Constitutions, federalism, citizenship, voting, and local government.

5. Orientation 101 ORIENTATION TO COLLEGE   1 Semester Hour

   The new student adjusting to the college - its staff, facilities, services, policies, and procedures; motivation academically; the get-acquainted process; stimulate continued personal growth. Three lecture hours per week; sixteen total contact hours. Required of Day Division students enrolled for nine or more semester hours.

6. Philosophy 312 INTRODUCTION TO LOGIC   3 Semester Hours

    An examination of the laws of deductive and inductive reasoning
    and their application to various fields of investigation.

7. Technical Math. 300 TECHNICAL MATHEMATICS I

                                               3 Semester Hours

    Practical applied mathematics for engineering shop, construction
    site, design and drafting rooms. Arithmetic fundamentals, basic
    algebra, geometry, and metrication, development of "number sense"
    and employment of the electronic calculator.

ATTACHMENT M

ENTRY LEVEL CRITERIA

Entry Level Criteria

For

Students Applying for Admission for

Training for Visually Impaired Computer Programmers

A selection committee of at least four persons (including a visu-
ally impaired programmer, an employer, and the program director)
will screen the prospective students. Screening will include (1)
a personal interview that will be tailored to the individual
applicant and (2) an evaluation of an autobiography prepared by the
student.

The purpose of the selection committee's activities is to insure
that only qualified students enter the strenuous training program.
Students recommended for acceptance should have the qualifications
to complete the program, and to gain and to retain employment as
computer programmers. In evaluating the student, the committee will
have the flexibility to consider other abilities and aptitudes that
would supplement or replace the criteria listed below:

1. Meet college admission requirements.

2. Test score(s) of: SAT: Eng. 14 and Math. 18

    <u>OR</u>

    ACT: Eng. 380 and Math.

    <u>OR</u>

    IQ : 120

3. Qualifications for enrollment into the freshmen English
   composition course.

4. Ability to perform basic arithmetic operations.

5. Good school grades.

6. 20 WPM typing speed with a high degree of accuracy.

7. Ability to read 100 WPM and write 12 WPM in Braille or
   print.

8. Successful completion of "independent living skills"
   training.

9. Acceptable keys on an "interest inventory".

10. Good mobility.

11. Good grooming.

12. Strong desire to be independent.

13. High level of motivation.

14. Good general health.

15. Ability to cope with the frustrations normally associated with programming tasks.

16. Strong desire to gain employment in the programming profession.

ATTACHMENT N

SPECIAL DEVICES AND EQUIPMENT

Special Devices and Equipment

List below are the recommended special devices and equipment requirements to train twelve visually impaired computer programmers. Although brand names are given in some cases, similar devices may be purchased or leased from a competitive manufacturer.

Special Devices:

Three (3) IBM 3278 CRTs

Three (3) Optacons

One (1) LED-30 Braille Terminal

One (1) IBM 029 Card Punch

One (1) Visual-Tek

Equipment:

One (1) Magnifying Lens (for CRT)

Three (3) Tape Recorders

Two (2) Perkins Brailler

One (1) Paperless Brailler

ATTACHMENT O

NEWSPAPER ARTICLES

S.A.C. will offer computer class for blind

San Antonio College will offer the first training in Texas for visually impaired computer programmers under a new program being developed to begin August 1979.

Al Stehling, data processing department chairman and project coordinator, says this training will not be for the average blind person.

"It will probably be a state-wide program for high achievers. A person will need a lot of motivation to get into the program. There will probably be a selection committee to insure those who begin the program can complete it."

To be accepted for this specialized computer programmer training, Stehling says a visually impaired person will need to be highly motivated, intellectually gifted and have completed a rehabilitation program to be able to get from class to class.

The decision to develop this program was preceded by three months of fact-gathering under a two-phase feasibility study funded by the Texas Education Agency.

Under Phase I of the project, conducted July 1 to Sept. 31, a steering committee surveyed employment opportunities and training requirements. The committee concluded that a need exists for computer programmer training for the visually impaired in Texas.

Represented on the steering committee were the Texas Commission for the Blind, Governor's Coordinating Office for the Visually Handicapped, employers of visually impaired programmers (City Water Board and Frost National Bank), Texas Education Agency, local blind programmers and San Antonio College.

The Texas Education Agency is anxious for SAC's program to begin because the state now sends visually impaired Texans to Cincinnti for programmer training.

Stehling said the requirements for blind programmers will differ somewhat from those for sighted persons.

"The committee agreed that a blind programmer needs to be better trained thanb a sighted programmer, but in fewer areas."

The Phase I survey data revealed it takes a blind person longer to prepare a computer program, but he makes fewer mistakes, so he does less debugging and error correction and, therefore, can put a computer program into operation as soon as a sighted person.

Stehling says there is strong agreement that the blind, through necessity, have to organize their thoughts and daily lives in logical sequence.

"That's what a computer programmer does — organize and put everything in systematic sequence."

Stehling explained that a sighted programmer uses a flow chart to graphically present the program sequence.

"The visually impaired write the program in large letters on large paper. A blind programmer relies on his memory. He works out the program sequence in his mind."

He said blind programmers use two devices to present the program sequence. They either type it or key punch it directly into the computer.

To develop the specialized curriculum, Stehling has been working with an advisory committee of successful blind and sighted programmers since mid-October.

Committee members are Don Douglas and Chester eley of Frost Bank, John P. Merritt of San Antonio Light, Anette Ratcliffe of San Antonio College, Jimmy R. Sparkman of Tesoro Petroleum Corporation and Bob Wiley of City Water Board.

Stehling says the committee plans to get a two-year curriculum in final form before Christmas.

"In January we will develop the course syllabus. To obtain funds to implement the program, we will present the package to state and federal agencies.

"We expect the initial training program, proposed for fall 1979, will be small — about 12 students."

SAC debuts new course

Texas' first training program for visually impaired computer programmers will debut at San Antonio College in August.

According to Al Stehling, data processing department chairman and project coordinator, the program "probably will be a statewide program for high achievers. There probably will be a selection committee to insure those who begin the program can complete it."

The Texas Education Agency is especially eager for the program to begin because currently, the state sends visually impaired Tex to Cincinnati for programmer training.

Decision to develop the program was preceeded by three months of fact gathering under a two year feasibility study funded by the Texas Education Agency.

A steering committee surveyed employment opportunities and training requirements and concluded a need exists for computer programmer training for the blind in Texas.

Stehling said only visually impaired persons who are highly motivated, intellectually gifted, and who have completed a rehabilitation program will be accepted into the program.

Stehling has been working with an advisory committee of successful blind and sighted programmers since mid-October. They are helping him develop the specialized curriculum.

They plan to submit a two year curriculum before Christmas, develop a course syllabus in January and present the proposal to state and federal agencies to obtain funds to implement the program, Stehling said.

Saturday, Dec. 23, 1978

Bexar Today

TRAINING. San Antonio College will offer the first training program in Texas for visually impaired computer programmers. The new program will begin in August 1979. To participate in the program, a visually impaired person must be highly motivated, intellectually gifted and have completed a rehabilitation program to be able to get from class to class, said Al Stehling, data processing department chairman.

17ᵢ

SAC making plans to offer computer training for blind

San Antonio College will offer the first training in Texas for visually impaired computer programmers under a new program being developed to begin August, 1979.

Al Stehling, data processing department chairman and project coordinator, says this training will not be for the average blind person.

"It will probably be a state wide program for high achievers. A person will need a lot of motivation to get into the program. There will probably be a selection committee to insure those who begin the program can complete it."

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The decision to develop this program was preceded by three months of fact-gathering under a two-phase feasibility study funded by the Texas Education Agency.

Under Phase I of the project, conducted July 1 to Sept. 31, a steering committee surveyed employment opportunities and training requirements

The committee concluded that a need exists for computer programmer training for the visually impaired in Texas

Represented on the steering committee were the Texas Commission for the Blind, Governor's Coordinating Office for the Visually Handicapped, employers of visually impaired programmers (City Water Board and Frost National Bank), Texas Education Agency, local blind programmers and San Antonio College.

The Texas Education Agency is anxious for SAC's program to begin because the state now sends visually impaired Texans to Cincinnati for programmer training.

Stehling said the requirements for blind programmers will differ somewhat from those for sighted persons.

"The committee agreed that a blind programmer needs to be better trained than a sighted programmer, but in fewer areas."

The Phase I survey date revealed it takes a blind person longer to prepare a computer program, but he makes few mistakes, so he does less debugging and error correction and, therefore, can put a computer program into operation as soon as a sighted person.

Stehling says there is strong agreement that the blind, through necessity, have to organize their thoughts and daily lives in logical sequence.

"That's what a computer programmer does--organ-

ize and put everything in systematic sequence."

Stehling explained that a sighted programmer uses a flow chart to graphically present the program sequence.

"The visually impaired write the program in large letters on large paper. A blind programmer relies on his memory. He works out the program sequence in his mind."

He said blind programmers use two devices to present the program sequence. They either type it or key punch it directly into the computer.

To develop the specialized curriculum, Stehling has been working with an advisory committee of successful blind and sighted programmers since mid-October.

Committee members are Don Douglas and Chester Neeley of Frost Bank, John P. Merritt of San Antonio Light, Anette Ratcliffe of San Antonio College, Jimmy R. Sparkman of Tesoro Petroleum Corporation and Bob Wiley of City Water Board.

"In January we will develop the course syllabus. To obtain funds to implement the program, we will present the package to state and federal agencies

"We expect the initial training program, proposed for fall 1979, will be small-- about 12 students."

ogram to begin in fall

Computer course helps blind

first training in Texas under a program developed for y-impaired computer pro- rs may begin here in August. s training will be for above- e blind persons. It will be a de program for high rs," Al Stehling, data sing department chairman oject coordinator, said.

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decision to develop this was preceded by three of fact-gathering under a se feasibility study funded by the Texas Education Agency (TEA).

Under Phase I, conducted July 1 -Sept. 30, a steering committee surveyed employment opportun- ities and training requirements. A 13-member committee concluded a need exists for computer programer training for the visually impaired in Texas.

Represented on the steering committee with this college were Texas Commission for the Blind, Governor's Coordinating Office for the Visually Handicapped, employ- ers of visually-impaired programers at City Water Board and Frost National Bank, TEA and other blind programers.

"Texas Commission for the Blind is anxious for the program to begin here because the state sends visually-impaired Texans out of state for programer training," Stehling said.

He said entry level requirements for blind programers will be higher than for sighted persons.

"The committee agreed that a blind programer needs to be better trained than a sighted programer, but in fewer areas. The proposed curriculum will cover fewer programing languages, but will move toward more advanced studies," Stehling said.

He explained the Phase I survey data revealed it takes a blind person longer to prepare a computer program, but he makes fewer mistakes. So he does less debugging and error correction and, therefore, can place a computer program into production as quickly as a sighted programer.

Stehling said committee mem- bers concluded the blind organize their thoughts and daily lives in logical sequence.

"That's what a computer pro- gramer does — organizes and places everything in systematic sequence," he observed.

He said some visually-impaired persons write the program in large letters on large paper. Blind programers use two devices to present the program sequence. They either key punch or key it directly into the computer.

To develop the specialized curriculum, Stehling has worked with an advisory committee of blind and sighted programers since mid-October.

Committee members are Don Douglas of Frost Bank, John P. Merritt of San Antonio Light, Anette Ratcliffe of data processing, Jimmy R. Sparkman of Tesoro Petroleum Corp., and Bob Wiley a blind employee of City Water Board.

Stehling said the committee will prepare a two-year curriculum before Wednesday and submit it to TEA.

"Additional funding will be requested for a pilot project to implement the two-year associate degree program," Stehling said.

"Ideally, that pilot study should begin June 1 to allow time to hire a qualified program director and to make arrangements to lease special training devices," Stehling pointed out. "However, if the project is approved, funding will not be available until July 1."

Stehling said committee mem- bers are optimistic. They have received verbal support and encouragement from Texas Com- mission for the Blind.

Stehling and the department will update the curriculum for the associate degree in computer programming and computer opera- tion to add new courses for sighted persons.

"We expect to limit the initial training program proposed for fall to 12 students," Stehling said.

174

visory board approves computer program

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1," Stehling said.

He said TEA officials are
encouraging.

"They seem very optimistic and
very pleased with the results of the
study and encouraged us to
continue with the program," he
said.

Stehling said the curriculum was
designed to allow the program
director to alter it to suit the
employment opportunities for a
particular student.

"The program will be geared at
employability, rather than transfer-
ability," he said.

Some of the courses also will be
offered to sighted students.

"These courses, however, will be
indentified as mainstreamed,"
Stehling said. "And courses
designed for unsighted students
will be identified as segregated."

Stehling said unsighted students
will register for mainstreamed
courses with sighted students.

"Sighted students may register
for segregated courses only after
they are fully aware that the class
presentations are geared toward
unsighted students. Traditional
training aids will not be utilized,"
he said.

Stehling said the committee also
agreed that in some cases, courses
identified as mainstreamed could
be segregated when the number of
blind students justified a separate
class.

The new program will require
three full-time employees — a
program director, a faculty member
to be shared with the data

processing department and a clerk
typist.

The program will require also one
additional classroom/laboratory.

"This room should house the
special training devices and should
serve as an open laboratory for the
unsighted students whenever
segregated classes are not sche-
duled in the room," Stehling said.

Stehling said the committee
agreed students would be next if
the director or faculty member were
visually impaired.

"To begin the program in the fall,
the three staff members should be
in place June 1," Stehling said.

"Since this would be a unique
program in Texas, out-of-state
students would be attracted also,"
Stehling said.

176

ATTACHMENT P

. SECOND QUARTERLY REPORT

177

SAN ANTONIO COLLEGE   1300 SAN PEDRO · (512) 734-7311 · SAN ANTONIO, TEXAS

DEPARTMENT OF DATA PROCESSING

February 6, 1979

TO: Ray Barber, Director, Exemplary and Innovative
       Programs. TEA

FROM: Al Stehling, Project Coordinator

SUBJECT: Quarterly Progress Report: Feasibility Study and
            Development of a Program to Train Visually
            Impaired Students in Computer Programming

Phase I was completed on schedule, and results of the feasibility
study were reported on the quarterly report dated 10-5-78.

The following persons were invited to serve on the advisory
committee to develop the program to train blind and visually
impaired computer programmers. All committee members. except
Chester Neeley, were active:

1. Donald Douglas
   Vice-President, Data Processing
   Frost National Bank

2. John P. Merritt
   Assistant Data Processing Manager
   San Antonio Light

3. Chester Neeley, (blind)
   Automation Officer. System Research
   Frost National Bank

4. Anette Ratcliffe
   Data Processing Laboratory Technician
   San Antonio College

5. Jimmy R. Sparkman
   Programmer Analyst
   Tesoro Petroleum Corp.

6. Bob Wiley (blind)
   Programmer/Procedures Analyst
   City Water Board

7. Al Stehling (project coordinator)
   Chairman, Data Processing Department
   San Antonio College

The first advisory committee meeting was held on Oct. 18, 1978 in
room 208 of the Nail Technical Center. Subsequent meetings were
held on Oct. 25, Nov. 1, Nov. 8, Nov. 15, Nov. 22, Nov. 29, Dec. 13,
and on Jan. 10, 1979. A final meeting was held on Jan. 29 to allow
committee members to review the proposed quarterly report.

During the first advisory committee meeting, members were informed
of the seven activities to be included in Phase II (curriculum
development). Committee members were briefed on the objectives and
the progress of the project, and were given materials to familiarize
themselves with the projects effort up to that point. Materials
included the Phase I Progress Report, comparison of curricula of four
schools that train blind programmers, and a listing of the Phase II
activities. In addition, material packets pertaining to special
devices and schools that train blind programmers were made available
to committee members on a sign-out basis.

Early in Phase II, committee members agreed that: (1) rehabilitation
training must be completed before the students qualify for computer
programming training, (2) the curriculum must be flexible in the
sense that the program director can alter the curriculum to suit the
employment opportunities for a particular student, (3) an associate
degree program would offer the best employment opportunities,
(4) the students should be offered more advanced programming tech-
niques and studies, but in fewer areas (as compared to the current
AAS programs in computer programming), and (5) the program would be
designed for employability, not transferability.

Beginning at the very first meeting, the committee members developed
a list of "subjects" to be included in the program. Each proposed
"subject" was justified by one or more members, and discussed in
detail. During the next few weeks, subject areas were modified,
added, and, in some cases, deleted or combined. Objectives were
written for each "subject". These objectives were also discussed
in great detail and most subject objectives were re-written three
or four times. "Subjects" were then translated into courses. Some
subjects can be taught as one course, other subjects will have to be
covered in two courses (example: the COBOL programming subject ob-
jectives are reached after the student completes the second COBOL
course).

Committee members reviewed existing course syllabuses to determine
which existing courses (offered by the data processing and supporting
departments) would fulfill the stated subject objectives. A memo
was sent to those departments that appeared to offer the required

support courses to double-check the departments' willingness to
mainstream the blind/visually impaired students into their classes.

Only one department indicated that it could not accommodate blind
students. The committee found a similar course offered by another
department and modified the curriculum accordingly.

A proposed 16-month curriculum was prepared and studied in detail.
The proposed curriculum was redesigned and extended to a 21-month
AAS program. Support courses (non-data processing courses) were
selected on the merits of their contents rather than transferability.

Next the committee, with much input from a blind programmer, estimated
the number of weekly study/home-work hours for each course in the
curriculum. Then the courses were classified as "segregated" or
"mainstreamed". For the purpose of this project, mainstreamed means
that the unsighted students will register for that course along with
the sighted students. Segregated classes are special classes for
the unsighted students. Sighted students may register for segregated
classes, but only after they are fully aware that (1) the class
presentations are geared towards unsighted students and (2) that
traditional training aids will not be utilized. In addition, the
committee agreed that in some cases, courses identified as "mainstreamed"
could be segregated---if the number of unsighted students justified
a separate class.

During the next few weeks the curriculum was modified and adjusted
to: (1) strengthen the program and (2) agree with the college's re-
quirements for an AAS degree. In late November, the Dean informed
the project director that new courses would have to be listed in the
catalog before they could be taught. The project director drafted
proposed catalog descriptions for the new "first year" courses. The
committee reviewed and modified the course descriptions, and the new
course descriptions were presented to the Director of OET in time
for presentation to the December 1978, Academic Council meeting. Since
the final decision to offer a special curriculum to train blind pro-
grammers had not been made, the catalog descriptions were written
without reference to the blind or visually impaired. New courses in-
cluded in the "second year" of the curriculum will be added to the
catalog in 1980.

Modifications to the proposed curriculum were continuous as the
program was streamlined. Subject objectives, course titles, course
descriptions, and course numbers were changed as committee members
proposed adjustments to strengthen the program. Whenever possible,

existing courses were used to avoid duplication and to reduce the
demand for new catalog courses. The current catalog description
for DP 322---Date Processing Applications was changed so that the
proposed seminars for the visually impaired could be offered under
that existing course number.

The project director gathered information pertaining to existing
services for the visually impaired students from the college's
Special Service Division and the Coordinator for the Handicapped.
In addition, the director gathered data from local and state
representatives of the State Commission of the Blind. Job place-
ment service information was gathered from the college's placement
director and the local representative of the State Commission of the
Blind. Based on the counseling, tutoring, and job placement services
already available to unsighted students, the committee saw no need
for additional studies in these areas. All of the divisions and
organizations contacted foresaw no problems in handling 10 to 15
additional unsighted students.

As the committee's studies progressed, it became easier to determine
the ideal number of unsighted students to be placed into the program.
The final recommendation is to start 12 students in the Fall, 1979
semester.

At this stage, the committee feels that the visually impaired can
best be trained by serving one group at a time. Therefore. it is
suggested that the second group of visually impaired students start
in the Fall of 1981. The reason for proposing a "consecutive"
program (working with a group of students to completion before
starting the next group) rather than a "concurrent" program (starting
a few more students every semester) is to avoid the need for many
very small segregated classes. A large number of small classes
would cause instructors load and classroom/lab scheduling problems.

The committee realizes that exceptions to the above "consecutive"
approach can still be made because: (1) the program director can
make an exception based on the merits of a particular student's
educational and/or job experience background and (2) student's who
meet the college's entrance requirements and course prerequisites
can enroll in D.P. classes following the established registration
procedures.

The entry level standards established by other schools that train
blind programmers were studied. Slowly the entry level criteria to
be used by the selection committee were developed. Each criterion

181

was discussed in detail and most were modified several times. Bearing
in mind that the original assignment was to develop a program to
train the "intelligent" blind, the final criteria are meant to be strict
enough to insure that selected students can master the subjects, gain
employment, and retain employment as computer programmers.

Prospective students are to be screened by a selection committee
composed of at least four persons including the program director, a
visually impaired computer programmer, and an employer. The selec-
tion committee will have the flexibility to consider other abilities
and aptitudes that would supplement or replace the established
criteria.

After reviewing literature pertaining to (1) training devices for
blind programming students and (2) training devices used by other
schools for visually impaired computer programmers, the committee
selected the devices which would provide maximum training effective-
ness. An area of much concern and discussion centered on the type
of devices available to the unsighted programmers after employment.
Very few employers have braille output devices and virtually none
have braille terminals. The majority of the committee members felt
that the devices and equipment used during the training period should
be selected on their merits of providing maximum training effective-
ness and not only the probability of their use after employment. In
addition, employers are more apt to purchase braille terminals if
the unsighted programmers have mastered their operation and can vouch
for their usefulness.

The training program would require three 12-month employees; namely, a
program director, a faculty member (who would be shared by the data
processing department), and a clerk-typist. Office space and furniture
would be required to house the three persons.

One additional classroom/lab would be required. This room would house
the special training devices and would serve as an open lab for the
unsighted students whenever segregated classes were not scheduled in
the room. Assisting the director would be the instructor, one student
assistant (a second-year data processing major), and student tutors.

The qualifications for the director and the faculty member were out-
lined. The committee agreed that it would be to the students' advantage
if the director or faculty member were visually impaired. The director
and the faculty who teach the visually impaired need specialized train-
ing (in-house or off-campus) in the areas of teaching techniques and
counseling.

During Phase II, public relations efforts resulted in news releases
in the San Antonio's daily and weekly newspapers, and the college's
newspaper. Unsighted Texans are hearing about the project's studies
as evidenced by long distance telephone calls from prospective
students and interested organizations.

The advisory committee feels that the attached curriculum will provide
unsighted students the skills required to seek employment as entry-
level computer programmers. Although the subject objectives and the
curriculum have been developed, many details need to be completed
before the program can be placed into operation. Selecting text book
leasing of special devices and equipment, locating offices and classroom/
lab space, establishing a screening committee, screening the prospective
students, converting text materials into braille and "talking books",
writing and redesigning of detailed course sylabuses, etc., are some
of the tasks that will require a great deal of attention. In view of
the amount of time that it takes to accomplish these tasks through the
proper channels, the personnel should be hired at least three months
before the program begins. The program staff will have to communicate
and work closely with the various agencies and organizations that serve
visually impaired Texans so that prospective students can be made aware
of the program. Out-of-state students will also be attracted to the
program since it will be unique for the Southern States. In order to
begin the program in the Fall 1979 Semester, the program director, the
faculty member, and the clerk-typist should be employed no later than
June 1, 1979.

Since there are many variables (some of them yet unknown) that could
effect the cost and operations of the training program, the committee
agreed that a good approach would be to apply for state funds for a
two-year pilot program to train 12 unsighted students. During this
period the program would be modified to strengthen the training
process, and the costs per student would be calculated. Beginning
with the third year, an additional training fee could be charged to
offset the difference between the contact-hour revenue and the actual
costs to train a blind/visually impaired computer programmer.

This report covers the period of October 1, 1978 thru January 31, 1979.
Minor problems were encountered and action was taken to resolve them.
One problem dealt with charges to the project's budget. Although the
project's account number was used on all orders and requisitions, most
expenditures were charged to the Data Processing Department. The
project coordinator met with the district's Director of Finance and
adjustments were made to route the charges into the proper budget
accounts.

A disappointing aspect of the study was that agencies and organizations hedged when asked what specific services and financial support that they could contribute to the program and/or the students. Most agencies and organizations were friendly and cooperative, although they appeared to be more willing to outline what others could do, rather than to commit themselves.

The Advisory Committee for Phase II was an active "working committee". In addition to attending the meetings, committee members faithfully reviewed the many handouts developed by the project coordinator, and in some cases researched materials pertaining to devices and course contents on their own. The committee members were dedicated to the project and are anxious for the program to materialize.

For additional information, please call or write the project coordinator.

Attachments: Subject Objectives
                Proposed Curriculum
                Entry Level Criteria
                Special Devices and Equipment
                Personnel Qualifications

184

Subject Objectives

Subject objectives for the following courses were developed because:

(1) they are new courses or
(2) the existing course objectives did not meet the requirements
   for the program to train visually impaired computer programmers:

1. DP 402--Introduction to Electronic Data Processing
   and Programming

2. DP 202--BASIC Programming

3. DP 300--Specialized Data Entry Training

4. DP 302--Utilities and JCL

5. DP 316--COBOL Programming

6. DP 317--COBOL Programming Applications

7. DP 307--File Processing

8. DP 313--Structured COBOL Programming

9. DP 304--System Analysis

10. DP 312--Advanced System Analysis and Design

11. DP 322--Data Processing Applications (seminar)

12. DP 305--System/370 Assembly Language

13. DP 306--Advanced System/370 Assembly Language

14. DP 325--Teleprocessing Programming

15. DP 324--Programming Practicum

Notes: DP 402 and DP 202 will be taught as a "block" which means
   that the two courses will be combined and taught as one
   large six-hour course. This allows the student to master
   computer concepts before moving on to the BASIC programming
   language.

The COBOL programming subject objectives cover two courses, namely
DP 316 and DP 317.

The system design objectives cover two courses, namely DP 304 and
DP 312.

The System/370 Assembly Language objectives cover two courses,
namely DP 305 and DP 306.

DP 322 (seminar) is offered twice in the curriculum. The objectives
will be identified in the seminar title.

Existing course objectives meet the requirements for the remaining
classes in the curriculum.

186

Proposed Curriculum

Associate Degree in Applied Science

Computer Programming for the Visually Impaired

Courses		Type *	Credit	Hours Contact Per Wk.	Est. H/W Per Week
Freshman Year, Fall Semester:					
DP 402 Intro. to EDP & Programming Block		S/M	4	4	12
DP 202 BASIC Programming		S/M	2	2	6
DP 300 Specialized Data Entry Training		S	3	6	0
ENG 601 English Composition		M	3	3	9
BT 317 Elementary Accounting		M	3	3	9
ORI. 101 Orientation to College		M	1	1	0
Totals			16	19	36
Freshman Year, Spring Semester:					
DP 302 Utilities and JCL		S	3	6	15
DP 316 COBOL Programming		S	3	4	10
DP 307 File Processing		M	3	4	9
BT 314 Business Communication		M	3	3	9
MT 300 Technical Mathematics		M	3	3	6
Totals			15	20	49
Sophomore Year, 1st Summer Semester:					
DP 313 Structured COBOL Programming		S	3	13**	19**
PHIL 312 Introduction to Logic		M	3	10**	19**
Totals			6	23	38

Courses	Type*	Cr.	Hours Contact	H/W
Sophomore Year, 2nd Summer Semester:				
DP 304 System Analysis	M	3	10**	19**
DP 322 Data Processing Applications	S	3	10**	10**
Totals		6	20	29
Sophomore Year, Fall Semester:				
DP 317 COBOL Programming Applications	M	3	4	12
DP 305 S/370 Assembly Language	M	3	4	12
DP 325 Teleprocessing Programming	S	3	4	12
DP 312 Adv. System Analysis & Design	S	3	3	12
Totals		12	15	48
Sophomore Year, Spring Semester:				
DP 324 Programming Practicum	M	3	16	0
DP 306 Adv. S/370 Assembly Language	S	3	4	12
DP 321 Programming Applications (COBOL)	S	3	3	12
DP 322 Data Processing Applications	S	3	3	3
GOV 305 Texas Government***	M	3	3	3
Totals		15	29	30
Degree Totals		70	126	N/A

*   M = Mainstreamed
    S = Segregated
    S/M = Segregated if possible, mainstreamed otherwise

** Divide by 3.2 if course is taken during a full semester

*** Texas Government should be removed from the curriculum when it is no longer a college requirement for an Associate in Applied Science Degree.

188

Entry Level Criteria
for
Students Applying for Admission for
Training for Visually Impaired Computer Programmers

A selection committee of at least four persons (including a visually
impaired programmer, an employer, and the program director) will screen
the prospective students. Screening will include (1) a personal interview
that will be tailored to the individual applicant and (2) an evaluation
of an autobiography prepared by the student.

The purpose of the selection committee's activities is to insure that only
qualified students enter the strenuous training program. Students re-
commended for acceptance should have the qualifications to complete the
program, and to gain and to retain employment as computer programmers.
In evaluating the student, the committee will have the flexibility to
consider other abilities and aptitudes that would supplement or replace
the criteria listed below:

1. Meet college admission requirements.

2. Test score(s) of: SAT: Eng. 14 and Math. 18

                             OR

                     ACT: Eng. 380 and Math. 390

                             OR

                     IQ :   120

3. Qualifications for enrollment into the freshmen English composition
   course.

4. Ability to perform basic arithmetic operations.

5. Good school grades.

6. 20 WPM typing speed with a high degree of accuracy.

7. Ability to read 100 WPM and write 12 WPM in braille or print.

8. Successful completion of "independent living skills" training.

9. Acceptable keys on an "interest inventory".

10. Good mobility.

Special Devices and Equipment

The advisory committee recommends that the following special devices and equipment be purchased or leased in order to train twelve blind/ visually impaired computer programmers.

Special Devices:

	Estimated Costs	
	Per Unit	Extended Cost
Three (3) IBM 3278 CRTs	$ 2,400	$ 7,200
Three (3) Optacons	3,000	9,000
One (1) LED-30 (on-line braille terminal)	9,500	9,500
One (1) IBM 029 Card Punch	2,100	2,100
One (1) Visual-Tek	2,000	2,000

Special Equipment:

One (1) magnifying lens for CRT unit	40	40
Three (3) tape recorders	50	150
Two (2) Perkins Braillers	150	300

Optional Equipment:

One (1) paperless brailler (this piece of equipment has been announced, but has not been placed on the market)	2,400	2,400

Notes: (1) Due to inflation, a 10% increase in price should be expected every year. (2) Delivery schedules and new products announcements may prompt the program director to purchase or lease similar devices in lieu of the devices and equipment listed above.

Personnel Qualifications

In addition to meeting the established TEA and college employment qualifications, program personnel should have these additional qualifications:

Program Director:

1. Experience in computer programming (preferrably COBOL, JCL, and Assembly Language)

2. Administrative experience

3. Schooling in the areas of education and/or counseling.

Instructor:

1. Experience in COBOL, JCL, and Assembly Language programming.

Note: It would be to the students' advantage if the program director or the instructor was visually impaired.

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