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COMPUTER-ASSISTED VOCATIONAL COUNSELING*

ABSTRACT: A random sample ($N = 36$) of students with equal numbers of males and females from each of the three grade levels, ten, eleven, and twelve, used the Computer-Assisted Vocational Counseling System (CAVCS). Each student had four, 25-minute terminal sessions over a 13 week period. Using the criterion of usage as evidenced in the number of jobs examined, an analysis of covariance with IQ score as covariate indicated that there were no significant differences in system usage across grade levels or between sexes within grade levels. Kruskal-Wallis analysis of variance testing did not reveal any significant differences in the amount of usage of the two modes of operation available. Evidence was found to indicate that a system such as the CAVCS could be of benefit to senior high school students during their preliminary efforts in vocational or career exploration.

PROBLEM

Due to an ever increasing array of vocational and educational opportunities, many students in senior high schools are facing serious difficulties in their vocational exploration efforts. One difficulty is related to the increased demands and needs of students for career information. Along with the need for an increased volume of career information is the need for accessibility of relevant up-to-date career information. A computer system which can provide increased access to continuously up-dated career information could be a part of the solution to counselor and student difficulties encountered in career or vocational explorations. Another difficulty is produced by student/counselor ratios which do not readily lend themselves to the type of interaction required for adequate vocational exploration. A computer terminal with access to a computer-assisted counseling system is in effect decreasing the student/counselor ratio by giving students access to procedures and activities that a counselor would provide during preliminary vocational exploration counseling (Gallo, 1971).

An important area within the realm of vocational counseling is the facilitation of decision-making skills (Gelatt, 1962). In many

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ways, students require experiences in the making of decisions related to vocational exploration. The counselor in present vocational counseling settings is very limited in the amount of individual interaction that he can provide. A computer system can be so designed that the user is not only presented with career information but is also involved in a form of interaction that will facilitate decision-making. The interaction can be of such a nature that the experience will facilitate the clarification of interests and help the student focus upon career or educational goals.

Several systems designed to assist in vocational counseling processes have been attempted; the major ones are:

1. Educational and Career Exploration System (ECES) F. J. Minor, R. A. Myers, and D. E. Super (1969)
D. E. Super (1970)
2. Computer-Assisted Occupational Guidance Program (CAOG)
J. T. Impelletteri (1969)
3. Information System for Vocational Decisions (ISVD)
D. V. Tiedeman (1965, 1967, 1968)
4. Computer-Based Course Selection and Counseling
M. Tondow and M. L. Betts (1967)
5. Autocoun: A Computer-Based Automated Counseling Simulation System.
J. W. Loughary, D. Friesen, and R. Hurst, 1966
6. A Man-Machine Counselling System.
J. F. Cogswell, C. P. Donahoe Jr., D. J. Estavan and B. A. Rosenquist (1968)

There did not appear to be any serious attempt made, in 1969-70, to create an on-line computer-assisted vocational counseling system in Canada. Thus there was a need for a research effort to design, develop, and implement a computer system for use in vocational counseling efforts.

Since 1969-70 there have been reported efforts in computer-assisted counseling research in Canada. One attempt, reported by Sankey, (1971) is called Computer Assisted Occupational Exploration and another effort, reported by Romaniuk (1970), is called Computer Assisted Guidance.

METHOD

Design and Development of CAVCS

From an extensive review of the literature pertaining to vocational counseling efforts, two specific areas of activity were identified: the clarification of counselee's interests, and his/her focus upon career or educational goals.

A review of the career information available in Calgary public high schools revealed that the Career Information Services area of the Calgary School Board Guidance Department provided a locally relevant publication. The publication, *Career Trends (1970-71)*, was used as a basis for the data in the job data file.

Several interest inventories were examined and finally 11 interest

titles and definitions were created. The 11 titles were chosen so that persons familiar with Safran or Kuder Interest Inventories would be able to utilize the system. The 11 interest titles and definitions are:

1. *Economic-Clerical-Computational*: Interested in office work which requires precision and accuracy; likes working with numbers.
2. *Economic-Sales-Distributive*: Interested in promoting projects or things to sell; likes to meet and deal with people.
3. *Outdoor*: Interested in nature; likes outdoor activities.
4. *Professional Service*: Interested in providing a personal service to others based upon highly specialized skills.
5. *Scientific (Theoretical-Research)*: Interested in seeking explanations for events; likes to conduct experiments and discover facts.
6. *Technical (Applied-Scientific)*: Interested in mechanical processes; likes to work with machines and tools.
7. *Service Occupations*: Interested in performing duties to meet the immediate needs of individuals or the community; likes to work for the benefit of others.

Creative Arts: Interested in activities which allow expression of creativity, imagination and sensitivity to beauty; likes to participate in activities for which he/she has special talents; likes to stimulate imagination and move the feelings of others. This area has been divided into four subtitles as follows:

8. *Art*: Interested in activities that involve design, color, and materials.
9. *Music*: Interested in playing musical instruments, singing, conducting, writing musical compositions, or listening to music.
10. *Drama*: Interested in acting or performing for an audience.
11. *Literary*: Interested in reading and writing.

Seven levels of educational or training aspiration were created. The seven levels followed the predominant pattern of education or training available to students in Alberta. The seven levels are:

1. Less than High School Diploma
2. Apprenticeship
3. High School Diploma (Vocational, Business, General)
4. Senior Matriculation
5. Technical Institute
6. College
7. University

Each of the job titles in Career Trends, some 209 titles, was classified according to interest and predominant level of education or training required.

Two data files were created, a Job Information file and a Student Information file.

The Job Information data file was comprised of 209 job information records. Each record contained specific information such as: description of job activity; predominant interest; ability or aptitude exhibited by workers in the job; educational or training prerequisites; length of training or education program; any special abilities required; any special physical requirements; minimum age requirement; employment opportunities; salary levels and trends; and one other information

source. Magnetic tape facilities could accommodate about 725 job records on one five-inch tape.

The student data file could accommodate about 1200 student records. Each student record contained information such as: age of student; student surname and initials; student computer ID number; student program identification; sex of student; present grade enrolled in; past academic record of courses and course grades; present courses enrolled in; latest IQ score; latest interest inventory scores from either Kuder or Safran Inventories; and latest DAT scores.

Each data file was placed upon a five inch magnetic tape. The tapes were under control of the computer program. The TSS8/I time-sharing PDP-8 of the Computer Applications Unit, Department of Educational Psychology, University of Calgary, was used. The programming language "SCROLL" was used (Pymm, 1971).

Interaction with CAVCS

The student would sit at a student station which included a teletype device and a rear image slide projector. After the student typed in his ID number the computer would first ascertain if the correct individual was requesting use of the system.

Your ID Number?

00012

..... indicates user input

Are you

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? YES

Upon typing in "Yes" to the identity question the computer would then present a slide which contained the system modes of operation, titles, and definitions. The student would then choose to use either the Exploration mode or the Index mode. Choice of the Exploration mode would cause the computer to present, via slide, a list of 11 interest titles and definitions and to request the student to choose one. Upon choosing an interest title and following the typing in of a number from one to 11 the student would then similarly be presented with a list of educational or training aspiration levels. With the typing in of a number from one to seven the computer would present, via slide, a list of job titles that had been previously classified as to interest and aspired education or training level. At this point the student would read over the job titles and if there were any of interest he could then type in a job ID number and receive a printout of the chosen job record. The individual could retrieve as many job records as he desired or could choose to go back and change interest or education/training aspiration level to have a different slide of job titles presented. As an additional alternative, the individual could choose to use mode two, the direct index mode of operation.

In mode two the student is presented with a slide which indicates an alphabetic listing of job titles available for examination. If, for example, the student was interested in Architecture this title would be

on slide one; to have slide one presented the user would type in a number one via the teletype device. Upon receiving the slide presentation the student could then choose the job title of interest and type in the system job ID number. As in mode one, the job record would be printed out via teletype.

An individual user had control of the system and could terminate a session at any time.

The job record printouts could be taken by the student to use as a basis for further exploration or interaction with others: parents, teachers, counselors, or peer group members.

Two other features were built into the system, one to aid the counselor while maintaining confidentiality of student records, and another to help facilitate the processes related to student clarification of interests and focus upon career or educational goals.

The information contained on the student file magnetic tape was only accessible to specific ID number holders. A counselor could retrieve a student record for pre-interview purposes or during a vocational counseling interview. Such a facility provided via the computer could be of assistance to counselor efforts.

After each job record was printed out the system automatically began comparing specific areas of the student's record and the job record just typed out. The comparison section would generate several statements, printed out following each job record output, concerning the areas of the two records:

1. age of student — minimum entrance age
2. grade level completed — minimum entrance grade level
3. sex — predominant sex of occupational group
4. specific courses completed — specific courses and grade
and grade levels levels required for entrance
5. number of high school credits — high school credit requirement.

For example, if the student was 17 years of age and the job was commercial truck driving for which the minimum entrance age is 25, then the statement typed out after the job record would be:

minimum entrance age is 25

The areas compared via the comparison section were chosen so that the student would be less likely to over-estimate his or her potential for entry into a job area. Through reviewing the comparison section output, it was hoped that each student would be able to view his or her abilities and capacities more realistically.

Field Trial of CAVCS

A random sample of students was chosen from one Calgary Public High School. Twelve students, six males and six females, were chosen from each of the three grade levels, ten, eleven, and twelve. Each student was assigned to four terminal sessions of 25-minute duration over a period of about 13 weeks. A mobile trailer with four student stations from the computer applications unit was situated at the high school. Two student stations were used during the trial period.

The student stations provided access via telephone line to the TSS8/I computer situated at the University of Calgary. Being a time-sharing

system, the TSS8/I offers what appears to terminal users as instantaneous service. Thus two users will receive output from the computer with only a delay of microseconds between outputs.

For each subject, data were gathered from cumulative folders, recorded experiences on the computer system, testing via a Questionnaire, and the administration of the Eysenck Personality Inventory (EPI). Data gathered included:

1. Total number of jobs examined in four terminal sessions (TJE).
2. Total number of jobs examined via mode one (M1JE).
3. Total number of jobs examined via mode two (M2JE).
4. A measure of extraversion via EPI Form A (E).
5. A measure of IQ, Otis Quick Scoring — Form Gamma (IQ).
6. Questionnaire responses.
7. Student descriptive paragraph of experience.
8. Selected DAT variables: Mechanical Reasoning (MR), Clerical Speed and Accuracy (CSA), and Language Usage-Spelling (LUSP).

RESULTS

To determine whether there were differences in the amount of usage, as evidenced by total number of jobs examined, between grade levels or between sexes a 2 x 3 analysis of covariance with IQ score as covariate was performed. There was revealed no significant difference, .05 level, in usage attributable to grade level or to the sex of the student.

Table 1
Analysis of Covariance

Source of Variation	df	Sum of Squares	Mean Squares	F Ratio
(1) Sex.....	1	215.112	215.112	2.673
(2) Grade.....	2	504.000	252.000	3.1318
(1) (2).....	2	102.889	51.444	0.639
Within Replicates.....	30	2,413.986	80.466	

Preliminary data analysis and testing revealed that some of the variables of interest would not lend themselves to parametric statistical analysis. Thus, examination of the usage of modes one and two was performed by means of Kruskal-Wallis, non-parametric analysis of variance tests (Ferguson, 1966, pp. 362-3). Both Kruskal-Wallis tests revealed non-significant results; thus there were no attributable differences in system modes of operation usage due to grade level.

A product-moment correlation matrix revealed that there were several significant relationships among the eight major variables measured. Number of mode one, Exploration, jobs examined correlated significantly with Extraversion (.413) and mode two, Index, jobs examined correlated significantly with IQ (.361) and Mechanical

Reasoning (.408). IQ was chosen as a covariate in the first data analysis because IQ correlated significantly with the total number of jobs examined (.428). A non-significant relationship which was revealing was the correlation between total jobs examined and language usage-spelling (.101).

DISCUSSION

There would appear to be ample evidence for some tentative conclusions. The CAVCS would seem to be a system that students in grades ten through twelve find acceptable for use in career explorations. The extraverted student would appear to prefer mode one, the Exploration mode. Mode one gives the user more opportunity to interact with the program and may be more suited to persons who do not feel threatened by such interaction. Students with above average IQ and Mechanical Reasoning aptitude would appear to prefer the Direct Index mode, mode two. Mode two was by design a less time-consuming access to career or vocational information and thus would most likely appeal to those students who may have already clarified their interests and focused upon a specific career or educational goal.

From student questionnaires there generally appears to be strong acceptance of the CAVCS. Not all students were "turned-on" by the computer experience. One student indicated in her descriptive paragraph that she preferred a flesh-and-blood counselor to talk to and one other student indicated a general dislike for technological devices which would appear to take away jobs from men.

The non-significant relationship between language-usage-spelling and total number of jobs examined reveals that, as intended, the system use of a language level comprehensible to high school students was successful. Use of the system was not related significantly to the variable of clerical speed and accuracy. A high degree of typing skill or machine handling ability was not required by system users.

Two areas of limitation which may have led to some bias in the trial results were:

1. four compulsory terminal sessions, and;
2. a set terminal session time limit.

To be a more realistic and fulfilling experience, the system should be offered to students on a voluntary basis similar to their vocational or career explorations and encounters with present counselors. Students should be allowed to have as many sessions as they require and within certain constraints the session length should not be limited to 25 minutes duration.

The acceptability and use of computer assisted counseling systems have been demonstrated both in Canada and the United States. Future efforts in Canada should involve the testing of several dimensions, such as amount of career knowledge gain and change in vocational maturity. The use of such a system as the CAVCS should promote an increase in student knowledge of careers and of vocational or educational training opportunities. It would appear that a computer assisted

vocational counseling system could be designed to afford the user an opportunity to enhance his/her development of vocational maturity.

The development of computer systems to assist counselors and students would not appear to negate the need for counselors to be warm, genuine, and empathic individuals. The CAVCS program was not designed to replace senior-high-school counselors; rather, it was designed to provide them with a tool that would benefit students and free counselors to interact with more students.

A statement by Loughary, Friesen, and Hurst (1966) seems to be applicable to today's research efforts in computer-assisted counselling:

"In our judgement, it is of the utmost importance that those of us who have assumed the responsibilities and privilege of helping others with their personal problems and aspirations become well enough informed regarding man-machine systems to participate intelligently and sensitively in their development. It is only in this way that one can assure that automated systems contribute to, rather than inhibit, the freedom of the individual (p. 15)."

RESUME: On a utilisé un système de counseling-d'orientation-aidé-de-l'ordinateur (CAVCS) avec un échantillon constitué d'un nombre égal d'étudiants et d'étudiantes des trois dernières années du niveau secondaire. Chaque étudiant a été exposé à 4 sessions de 25 minutes sur une période de 13 semaines. En utilisant le critère de l'utilisation, c'est-à-dire en se basant sur le nombre d'emplois examinés, une analyse de covariance avec le Q.I. a montré qu'il n'y avait pas de différences significatives dans l'utilisation du système entre les diverses classes ou entre les sexes. L'analyse de variance de Kruskal-Wallis n'a montré aucune différence significative dans la façon d'utiliser les deux modes d'opération disponibles. Les données indiquent qu'un système comme le CAVCS pouvait être utile aux étudiants de fin de secondaire dans leurs efforts préliminaires pour explorer leur cheminement vocationnel.

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