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ABSTRACT

This report covers three time periods during which students in five New York City high schools had use of a Computer Assisted Guidance (CAG) system. The basic objectives of the CAG project were to demonstrate the feasibility of using an automated system to provide high school students with factual and current information on colleges and careers, to assess the effects of such a system on student choice, and its effects on the allocation of staff time. The project concentrated on students in Grades 11 and 12. This report is divided into the following parts: (1) Background; (2) Project Environment; (3) Evaluation Methods; (4) Project Implementation; (5) Analysis of the GIS Data Files; (6) Student Use of the Computerized System; (7) Outcomes: Analysis of College Applications; (8) Outcomes: Impact of CAG on Student Users; (9) Participants' Reactions and Dissemination Activities; and (10) Summary, Conclusions, and Recommendations. (Author/JLL)

COMPUTER-ASSISTED GUIDANCE IN NEW YORK CITY HIGH SCHOOLS: A DEMONSTRATION OF FEASIBILITY AND IMPACT ON STUDENTS

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Report No. CASE-41-76

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First National City Bank

FOREWORD

Citibank's history of contribution to the quality of life in New York City is extensive, and needs no wordy comment here. When, however, early efforts to improve counseling services in the city's high schools resulted in data bearing upon the need for information services to students, Citibank undertook to sponsor a project of considerable magnitude and direct service to the public schools unequalled by any one agency in the private sector.

The CASE Institute for Research and Development in Occupational Education (IRDOE) is proud to have been chosen the project manager of the undertaking--a computerized information delivery system--and presents herewith the final report of the activity and findings. Of special note in this highly successful demonstration of computer-assisted guidance is that it represents the first attempt at service to high-density, urban populations. With feasibility proven, there is every reason to believe that the tool of automated information delivery will ultimately free counselors to perform the more professional tasks for which their training has prepared them and thereby improve the quality of service to students.

Lee Cohen
Director, IRDOE

ACKNOWLEDGMENTS

The report that follows contains much data--numbers, percentages, and statistical comparisons. It does not include the names of the many, many people who took part in some aspect of the CAG project during its duration. In some sense, the numbers provide the proof of the great effort made by:

- The high school administrators. We would like to acknowledge the generous and warm cooperation of Mr. Murray A. Cohn, Principal of Louis D. Brandeis High School, and Ms. Hannah Lewis, Acting Principal during his leave; Mr. Noel Louis, Principal of Herbert H. Lehman High School, and Mr. Kenneth Tewel, Assistant Principal; Mr. Leonard J. Harrison, Principal of Midwood High School; Mr. Melvin Serisky, Principal of Francis Lewis High School, and Ms. Pauline Weinstein, Assistant Principal; Mr. Herbert Balish, Principal of Port Richmond High School, and Mr. Bernard C. Fettman and Ms. Ethel Van Horne, Assistant Principals.

- The site liaisons. It is with deep feelings of respect and friendship that we thank the five primary liaisons to whom this report is dedicated: Ms. Tina Houck (Brandeis), Mr. Ron Kutscher (Lehman), Ms. Maureen McGinniss (Midwood), Ms. Marlene Buckley (Francis Lewis), and Ms. Alice Farkouh (Port Richmond). Without their interest and high ideals, the CAG project would not have been as profitable an experience.

- The professional and administrative staff of the five high schools who worked with us. At Brandeis--we would like to thank Mr. Danny Grossman, co-liaison; Mr. Jimmie E. Warren, Mr. Peter Steinberg, Ms. Rebecca Dall, and Ms. Nancy Moccaldi of the College Office, and Ms. Florence Shapiro and Ms. Ethel Elkin. At Midwood--we acknowledge the work done by Ms. Barbara Venito, co-liaison; and Dr. Sollis Schub and Ms. Lillian Sapirstein of the College Office; and the help provided by Ms. Sybil Del Gaudio. At Francis Lewis--the efforts of Ms. Mollie Levine and Ms. Lillian Pollack are gratefully noted. At Port Richmond--we publicly thank Ms. Ethel Bergman and Ms. Marion Johnson of the College Office, Mr. John Gino, Librarian, and Ms. Cathy McGovern.

- The Division of High Schools of the Board of Education of the City of New York. In addition to in-kind support of the CAG Project, Mr. Samuel Polatnick, Director, and Dr. Filmore Pelz and Mr. Arthur Auerbach, provided leadership and support which was invaluable. We were encouraged by their interest and helpfulness during the darker days.

- The IRDOE project staff. The patience and perseverance of the project staff was noteworthy. As a team, we learned from one

another and shared our ideas, responsibility, and work. We tested, observed, scheduled, tallied and re-tallied, counted and totalled, delivered rolls of paper, trained staff and students, analyzed and interpreted the results, and wrote several reports describing our progress and problems. Mr. Arnold Jaffe, who worked with the project team from its earliest days through the final year when he took over the day-to-day operation; and Ms. Pearl Beck, Mr. Larry Killian, and Mr. Joseph Perlman who also assisted with all the aspects and contributed to all the decisions.

- IRDOE staff and consultants. Ample and complete backup was provided by several staff members and consultants, whose contributions were over and above that expected: Mr. Russell Nutter, project administrator whose duties ranged from secretarial to editorial and production activities; Ms. Valentine Michielini, IRDOE secretary, who was always there just before she was needed; Ms. Melanie Bentley, who often volunteered to help with the more repetitive tasks; Dr. Rita Senf, whose statistical and editorial talents were so valuable.

- CASE, IRDOE Directors. Dr. Lee Cohen, Director of IRDOE, maintained a high level of interest and commitment to the project goals and permitted us the latitude to pursue them. Dr. Max Weiner, Director of CASE, fiercely and loyally supported our research interests. Both Drs. Cohen and Weiner provided the necessary critical climate as well as the resources of the Graduate School and University Center at those times when the need was most crucial.

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- Time Share Coroporation. The attentive concern of Mr. Charles A. Morrissey and Mr. Herb Cornell in overseeing delivery of all contracted services bodes well for good future relationships between the public and private sectors. Their availability to us and the quality of the services they provided warrants our faith in similar endeavors.

- The students in the New York City public high schools. Several thousand young women and men took our tests, answered our questions with care, and gave us worthwhile, serious and unsolicited suggestions and advice. They are the beneficiaries or victims of all our experimental demonstrations. All good go with you!

Barbara R. Heller
Principal Investigator

Linda Chitayat
Project Associate

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CHAPTER I

BACKGROUND

Introduction

In December 1973, First National City Bank (Citibank) awarded a contract to the CASE Institute for Research and Development in Occupational Education (IRDOE) for its proposal to conduct a demonstration and evaluation of a computer-assisted counseling project in New York City public high schools. The request for proposals from Citibank reflected their long-standing concern with urban educational affairs, as well as the interest and support of the Board of Education's Division of High Schools and Bureau of Educational and Vocational Guidance with whom they had been associated as members of the New York City Guidance Advisory Council. The Council, composed of leaders from the public and private sectors, was formed in 1971 to "broadly assess existing guidance services in the public high schools with a view toward recommending improvements in the practice." As one part of their researches, the Guidance Advisory Council staff was introduced to several computer-assisted counseling programs being tried in other school systems around the country.

In the early 1970s in New York City, the ratio of counselors to students averaged approximately 1-to-1200, resulting in "crisis intervention counseling" which reinforced students' stereotypes that counseling and disciplining were fairly synonymous. Both the shortage of trained counselors and the steady increase in the number and complexity of educational and vocational opportunities for students taxed even the most qualified counselors' time and skill. "Computerized counseling" as an adjunct service, is a compelling concept: Computers' capacity to store, collate, retrieve, and select from a vast store of information--and to present the information back rapidly and attractively--enables access to more information, relieves the counselor of the burden of collecting and sorting the information, and thus allows him/her to spend more time interacting with the student. Computers could provide needed information to many more students, and even the hypothesized "impersonality" of the exchange between the student and the computer might, under certain sets of circumstances, be considered an asset. Despite the preconceived benefits, all parties agreed that the first computer-assisted guidance project in New York City schools should be introduced with care and monitored with concern.

During the months Citibank was reviewing plans and proposals they also met with several R & D agencies and with vendors of computerized programs. Several high school principals, together with the Director of the Division of High Schools, attended a demonstration of a computer system. By the end of 1973, when the contract was formally awarded to IRDOE, the five pilot high schools that were to participate in the demonstration had been selected, and a computer "guidance" system had been chosen.

Originally proposed to start with the beginning of the academic year, Citibank's grant to IRDOE covered the period from November 1973 through July 1975. November-December 1973 and January 1974 comprised the Planning Phase in which negotiations with the pilot schools, installation of equipment, and training of school staff would take place. Phase II, the operational phase, extended from late January-early February through December 1974. During this interval, students were to have access to the computerized program. Priority use of the computer between February and June 1974 was established for 11th grade students to engage in occupational exploration; the September-December 1974 period was to be reserved for 12th grade students' use of college information. The post-operational phase of the initial contract period, January-June 1975, was to be devoted to data tabulation, analysis, and reporting. Due entirely to the enthusiasm of the pilot high schools, Citibank extended the operational phase through June 1975 so that students' use of the system was continued for an additional six months.

The extension of the operational phase served another purpose, permitting additional study of the effects of the computer experience. Prior to this, IRDOE had two roles--program manager and evaluator. In our managerial role, we contracted for hardware and software services, oversaw the installation and maintenance of equipment, oriented and trained school personnel, ordered and frequently hand-delivered supplies and materials, and performed a public information function. As evaluators, we were responsible for monitoring the progress of the project, including maintaining records of the number and types of students who made use of the computer, the procedures the schools established for implementing the new project into existing educational programs, and so on. We also attempted to ascertain whether the system facilitated college applications and whether it increased the number of students receiving counseling.

The extension of the operation to June 1975 provided us the opportunity to collect data describing the direct impact of the computer experience on student knowledge, attitude, and behavior. Such data was requested by both the Division of High Schools and Citibank as a basis for considering a course of action for the September 1975 through June 1976 school year.

As a result of the impact study findings demonstrating that use of the computer benefited students, both the Board and Citibank decided to continue the project, with modified levels of support, for the 1975-76 year. The Division of High Schools of the Board of Education continued to absorb the costs of the telephones linking the five teletypewriter terminals to the central computer and the allocation of a portion of a teaching allotment to each of the pilot schools: Prior to the 1975 school year, each of the pilot schools had received a teaching unit (a one-teacher equivalent) to staff the project; the allotment was halved for the 1975-76 year. For this latter period, Citibank continued to finance all computer-related costs, and reduced their grant to IRDOE to cover managerial costs exclusively.

IRDOE, Center for Advanced Study in Education, is part of the Graduate School and University Center of the City University of New York. During November 1973 through June 1975, IRDOE employed a full-time project director, project associate, graduate student assistants, and other

staff members and consultants from the University to oversee the project activities. The amounts and type of staff changed during the course of the project--more research assistants were employed during periods in which extensive classroom observations were made, or when tests or other instruments were administered, and when data was analyzed. Computer specialists were used during the early part of 1975 when IRDOE, the Board of Education, and Citibank were considering plans to revise the computerized information. To manage the computer-assisted guidance project in 1975-76, a graduate assistant was able to attend to the administrative details and to train school personnel. The director and associate concentrated on policy issues, continuing to spend a great deal of time in public relations and information dissemination.

The authors hope that this report will convey the highly enthusiastic flavor of the reaction of the many people, at all levels and from various backgrounds, who have seen the project in operation. IRDOE staff, Citibank, and the Division of High Schools were inundated with requests for information, pleas for involvement, and proposals for expansion long before sufficient evidence was available on which to base recommendations for future activities. These reactions alone, apart from any data, suggest a widespread feeling of a need for computerized services in guidance-related areas.

Overview of the Project

The aim of this report is to summarize all our experiences with the Computer-Assisted Guidance (CAG) project during the period from November 1973 through June 1975, and to suggest conclusions and recommendations based on our findings and observations. The five reports submitted at regular intervals during the course of the project were very detailed; many of those details, which were necessarily presented in discrete segments, will not be repeated here.[1] We will, however, include some data not previously reported. The intention now is to look at the entire experience, seeking an integration of findings and a broader perspective than was possible while the project was in progress.

This report covers three time periods during which students in five high schools had use of the computer system: Period 1, February-June 1974 (5 months); Period 2, September-December 1974 (4 months); and Period 3, January-June 1975 (6 months). Although the CAG project continued to operate in the same schools for another year, there was no

[1] The five previous reports on A Demonstration of Computer-Assisted Guidance in New York City High Schools, with their publication dates, were: "First Quarter Report," 3-31-74; "Second Quarter Report," 6-30-74; "Third Quarter Report," 9-30-74; "Fourth Quarter Report," 12-31-74; and "Assessment of Selected Effects of CAG on Student Users," April 1975. Copies cannot be supplied, but can be inspected at IRDOE. The appendices to these reports contained copies of all evaluation instruments.

further data analysis after June 1975. We will comment in a final postscript on activities and developments during the 1975-76 school year.

The basic objectives of the CAG project were to demonstrate the feasibility of using an automated system to provide high school students with factual and current information on colleges and careers, to assess the effects of such a system on student choice, and its effects on the allocation of staff time. We expected that effective use of a computerized system would increase the number of students seeking college and career information, the range of college and career alternatives available to them, and their awareness of the factors and processes involved in making decisions or choices concerning colleges and careers. We expected also that there would be a reallocation of counselor time--with, for example, less time spent in routine information-conveying activities and more time spent in meaningful interaction with students, helping them match their interests and capabilities with the external requirements of colleges and occupations. The project concentrated on students in grades 11 and 12.

The program used to test the viability of the concept of computerizing such guidance functions and its applicability to New York City students was the "Guidance Information System" (GIS), a product of Time Share Corporation (TSC), a subsidiary of the Houghton Mifflin Company. It is a computerized data retrieval system which provides students or staff with instantaneous access to information about occupations, two- and four-year colleges, and financial aid. A teletypewriter terminal is used to type in requests for information. Through a telephone linkage, the request is transmitted to the computer which responds by typing the appropriate information from the permanently stored data files. A student alone, but usually assisted by a staff member, may type in his own request or the information may be requested in the student's absence; in the latter case, the printed copy of the computer output must be delivered to him. Largely because of fiscal constraints, each one of the five high schools had access to the computer about one day a week; these access, or on-line, days were scheduled in advance.

At each school a staff member, whom we have designated a liaison, supervised the CAG operation; usually the liaison had some paraprofessional or other assistance. The number of teachers assigned supervisory duties differed from school to school and from time period to time period. In all instances, however, there was continuity in the assignment of liaison responsibility. The liaisons arranged for publicity, recruitment, orientation, and scheduling of students for computer use, and for followup after the use. On the day the school had access to the computer the liaison usually operated, or helped operate, the teletypewriter terminal.

The five public high schools, one from each borough, were selected collaboratively by the Division of High Schools and the Borough Superintendents. The schools were: Louis D. Brandeis in Manhattan, Herbert H. Lehman in the Bronx, Midwood in Brooklyn, Francis Lewis in Queens, and Port Richmond in Staten Island.[1]

[1]Throughout this report the schools will be letter-coded to provide anonymity.

Although these are all academic-comprehensive high schools, they were more different than alike, in both student and school characteristics. The student populations differed considerably in ability levels, in the proportions who were college-bound, in socioeconomic levels, and in ethnic composition. The schools varied in age of the school building, size of student enrollment, number of sessions held, and rate of utilization (the percent utilization of each building in relation to its rated capacity).

Of great importance is the fact that within the common framework we established, each school developed unique procedures and routines for project implementation. The many diversities among the schools were welcome in this investigation of the feasibility of using computer-assisted guidance. While these differences greatly complicate the making of inter-school comparison, at the same time the results furnish a better base for generalization about a wider range of organizational structures and implementation procedures.

One caution to keep in mind while reviewing this report is that the particular system used to study computer-assisted guidance (in this case, GIS) may impose limitations on the generalizability of the findings. For brevity, this report generally uses the term "CAG project," or simply "CAG," but it is actually the "TSC-Guidance-Information-System-Computer-Assisted-Guidance project."

CHAPTER II

PROJECT ENVIRONMENT

This chapter provides a picture of the pilot high schools, as well as of the students' perceived needs for college and career information before there was much use of CAG. This will serve as a general baseline against which we can later examine details of CAG usage. Following this, we will introduce the main features of GIS.

Participating High Schools

It has been mentioned that the five high schools involved in the project differed on many dimensions. This section will describe these differences in some detail.

Although not a randomly selected sample, these schools represented the diversity of the New York City public high school system. The age of the building ranged from School E, the oldest built in 1927,[1] to School B, which was the newest and which did not have a full official graduating class until June 1975 (the end of Period 3). The size of the student body and the utilization rate tended to co-vary; School A was by far the largest, had the highest utilization rate, and operated from about 7:30 a.m. to 4:30 p.m.; School C, the next largest, also had a high utilization rate, and held classes from about 7:30 a.m. to 5:30 p.m. School E was the smallest school, with an enrollment of approximately one-third of that of School A; it operated the shortest school day, with no overlapping sessions.

In terms of the percentage of students reading two or more years below grade level, School A was the highest (70%), with the four other schools much lower and much closer together--C, D, and E with 20%, 16%, and 26% reading two or more years below grade level, respectively. The percentage of graduates (excluding School B) applying to college was related to the reading scores, except for School A. The rank order was: A (with the most applying), D, C, and then E with a much lower percentage. These figures do not agree with students' statements about their college plans, as we will describe in Chapter II. In socioeconomic level, Schools C and D were in the most affluent communities; the families of

[1] Board of Education of the City of New York. High School Profiles, 1971/1972, prepared by the Division of Systems Planning and Program Analysis, Office of Planning-Programming-Budgeting. This resource presents a statistical overview of the high schools for the 1971-1972 year. School B was not yet included, and documented comparative information is not available; its student population characteristics are similar to those of School E.

students in Schools E and B were largely blue collar; and in School A they were the poorest, with many families unemployed and on welfare. In ethnic mix, the proportion of non-white students was about a sixth at School E, and just over a fourth at Schools C and D. Over 90% of the School A students were non-white.

Another school variable was the extent of involvement in other special educational programs; some schools--A, for example--seemed to be involved in innumerable projects, while School C had only a cooperative work-study program. In School E the special attention CAG afforded to students and staff was quite a novelty. Two schools (A and D) offered courses in data processing; one of these (School D) had its own mini-computer and offered instruction in programming. Certain administrative functions, such as students' programs, had been computerized by the Board of Education before the 1973-74 year, and several schools had had exposure to these kinds of computer functions.

In February 1974, when CAG started up, one of the more salient school characteristics was the extent of available college and career advisory services. School A maintained a modest college office and had no career advisor; it was a participant in a small career guidance project which ended in June. Of all the schools, B was the most career-oriented; it had a career academy, offered students career decision-making courses, and was involved in a large state-funded project to improve career education. Since it was a new school with no full graduating class, college advising services were minimal. School C, on the other hand, had an elaborate college advisory service and established systems; there were three college advisors assigned to the college office. School C had a licensed guidance counselor assigned to work with students on occupational choices. School D also had a large and well-established college office staffed by at least two advisors; there was little emphasis on career counseling. School E's college and career office was staffed by two advisors. In addition, this school was involved in a small special career education program which ended in June 1974 with the first in a series of New York City fiscal retrenchments.

Many of these student and school characteristics have direct bearing on the results of the CAG project. The proportion of the students going on to college and the ability level of the student population affected interest in and use of the specific kinds of information stored in the computer, as well as how much help students would need to understand the system. The size of the student body determined the number of students eligible for service. The number of sessions held affected the availability of students; a school operating on more than one session tends to discourage students from being in the building after the end of their school day. Space constraints affected the location of the CAG equipment and thus its accessibility. During the time periods studied, economic concerns became increasingly important in making college and career decisions; they also affected the availability of staff, particularly in the 1974-75 year (Periods 2 and 3).

Initial Student Views on College and Career Planning

In March 1974, approximately one month after the project became operational, we administered the Survey of Student Activities and Plans to 1889 juniors and seniors in the five pilot schools.[1] The Survey investigated the students' initial status--their current plans for education and/or occupations after high school, sources of influence on their decisions, and their perceptions of the college and career information they had received in high school prior to administration of the Survey.

We asked students to indicate what they thought they would do immediately after graduating.[2] For a large majority of the respondents, high school graduation did not mean the end of their education, even though many expected to work while going to college. At Schools C and D over 90% of the respondents planned to continue their education. Schools A and E were intermediate in this respect, while about three-quarters of the students tested at School B said they planned to continue their education.[3] These percentages were slightly higher for juniors than for seniors, except at School E.

Most students planning further education expected to start immediately after high school; about 30% to 40% expected to work at the same time, with Schools A and E being at the higher end of this range. Of those expecting to continue schooling immediately after graduation, most chose a four-year rather than a two-year college. Very few students planned to get a job and then go to a school or college later on; and few expected to go to a specialized training school (technical, art, etc.). These results suggest that potentially large numbers of students might be interested in information about colleges or further schooling opportunities.

To investigate occupational plans, students were asked to list three choices of occupations or jobs they would be interested in after finishing all schooling. In each school and grade, two-thirds to three-fourths of the students listed three choices, and almost all others listed one or two. A larger percentage of juniors than seniors listed three choices (except in School A, where they were equal). This difference between grades 11 and 12 was statistically significant at the .05 level of confidence. One possible explanation is that 12th graders,

[1] For details, see Appendix, Table A1, the chapter on Evaluation Methods, III, page 22. Of the 1889 students tested, 85% had had no CAG experience. The 15% who had already used CAG in February or March 1974 were almost all juniors, the largest proportion of whom were in Schools D and E.

[2] For details, see Appendix, Table A4.

[3] These high proportions of students expecting to go to college occurred under the CUNY policy of admitting every New York City high school graduate without charge for tuition or other entrance requirements. With the imposition of tuition, there may be reductions in the proportions, or changes in the colleges to which they eventually apply.

who are closer to the necessity for decisions about the future, are less likely to entertain unlimited, perhaps unrealistic, options. An alternative but related possibility is that in the added year of maturing, the seniors have already narrowed their choices and now begin to focus on realizable interests. Since slightly more juniors than seniors also said they planned on post-high school education, the "closer-to-decision-time" explanation assumes more serious contemplation.

Next we examined the first-choice occupations listed in response to the question above, in terms of groupings[1] and of specificity. There was a total of 341 different first-choice occupations; the most frequently listed groups of occupations, in descending rank order, were: teacher, secretary, medical doctor, nurse, lawyer, accountant, engineer, psychologist, journalist, business management, computer programmer, musician, electrician, social worker, policeman, physical therapist, and dentist. Note that most of these occupations require post-high school training. The associated frequencies ranged from 181 for teacher down to 18 for dentist; there were 167 different occupations, about half the total, listed by single individuals.

The number of responses and their frequency do not convey the variety of occupations listed--from medical illustrator to horse trainer; nor the range in the degree to which students can be specific--from cytotechnologist or RCA repairman to "hospital work" to "painter." To quantify specificity of choice, we rated the occupations as very specific (i.e., listed in the Dictionary of Occupational Titles [D.O.T.]), medium (e.g., teacher), or general (e.g., work with children). The largest proportion, 64%, were very specific; 13% were medium, and 23% were general. These findings have implications for the kinds of occupational information the students need; over one-third of them might use help with narrowing and clarifying their choices, apart from others who might benefit from an opportunity to consider alternatives to their first choice.

To determine what factors were most important in shaping students' decisions about their future college and occupational plans, respondents indicated, for each item on a list of 13 possible sources of influence (people, books, etc.), whether its influence was "very much," "some," or "little or none." In all schools and grades, the students' "own interests" were consistently rated the highest as influencing decisions about the future, and their "own abilities" scored just slightly lower. Also ranking highly were the influence of "parents or guardians," and "someone who works or studies in (the student's) field of interest." Receiving intermediate ratings, in decreasing rank order, were: books, magazine articles, or stories; friends; teachers; and guidance counselors or advisors. The least influential factors (continuing in decreasing order) were: relatives, college catalogs, and TV or movies. Although students rated guidance counselors or advisors below the middle in rank order as sources of influence on their decisions, results to be presented in Chapter VIII on Impact of CAG on Student Users show that in January-

[1] Similar titles were grouped; e.g., "teacher" included special education teacher, music teacher, math teacher, etc.

February 1975 they ranked counselors highest as a source of information about both colleges and careers.

Given this picture of the students' college and occupational goals, the next general area of investigation concerned students' perceptions of the college and career information they had received--or remembered receiving--since the beginning of the 1973-74 school year.

Almost all students said they had met individually with a school guidance counselor or grade advisor at least once since September 1973; these percentages were slightly higher for seniors than for juniors. Most of the help they received was with planning their high school program, but it also included some help with plans for post-high school education. The help from the guidance counselor or grade advisor seldom involved occupational or job plans; those reporting such help in each school and grade ranged from 3% to 19%.

Many fewer students reported having seen a college advisor; about two-thirds of the seniors and a third of the juniors said they had done so. As to the kind of help they said a college advisor gave them, about half the seniors and a fourth of the juniors said they received help with plans for further education. In both these respects, the School E juniors were an exception, equalling the seniors.

The responses concerning college advisors as a separate group are somewhat suspect; from general observation, students do not differentiate clearly among guidance counselors, grade or program advisors, and college advisors, even though in the high schools these people differ in their functions and their qualifications. The remaining questions, discussed below, pertained to advisors generally, and did not require students to differentiate among them. Students rated their opinion of the help they had received from the school advisory personnel, and whether they would like to talk further with an advisor if time permitted.

On a 3-point scale, students indicated how helpful the school advisors had been to them in planning what they would do after high school. Both juniors and seniors rated their advisors as just below the middle of the scale in helpfulness. These findings may reflect the very great student load carried by most guidance and advisory personnel in the high schools, and do not suggest that students thought poorly of the advisors.

Indeed, when asked whether they would like more time to talk with an advisor, over half the seniors and three-fourths of the juniors did want more time to talk, if possible. Students who responded affirmatively could check more than one area in which they wanted help. More students wanted this extra time to talk about college, rather than occupational, plans; for both topics, more juniors than seniors said they would like to talk with an advisor. In general, the desire for more help was greatest at School A--the largest of the five schools, and one with the relatively fewest number of advisors.

These results suggest that students perceive more need for help with educational than with occupational planning, and that juniors express a greater need for help than seniors who were graduating in three months. By

the time this data was collected, the seniors had probably already obtained whatever help the school's advisors could give them, especially with respect to college; and their college applications were probably processed by the high schools. Up to March of the school year, the advisors evidently give a greater priority to seniors, which seems reasonable, since there won't be another year available in which to help them.

In summary, most of the students in the pilot high schools expect to continue their education after graduation, and can state possible occupational goals, although with varying degrees of specificity. They do think about their future education and occupation, guided primarily by their own interests and abilities. Most of them had seen an advisor at least once for an individual consultation and had received some help, especially concerning plans for college. The results suggest a redundancy in the availability of educational information, and at the same time a considerable need for occupational or career information. Of course, educational planning necessarily involves aspects of career planning, although these students apparently perceive their most immediate need as one for college information. The apparent redundancy in providing educational, particularly college, information may be a legitimate response to the students' requests. The results nevertheless point clearly to a need, whether identified by the students or not, for more planning information, especially concerning occupations. Sizable proportions of students would like more help to plan for their futures. They themselves emphasize help with college plans, but examination of their occupational choices suggests that they could also use help with career planning. Regardless of what they need most, in the eyes of many students a need for additional aid or information exists. Whether CAG could help fill this gap was the major concern of this project.

Main Features of the Guidance Information System

This section briefly describes TSC's stated purposes, the four files, the operation of the system, and some important terminology. Later sections will contain fuller details.

The Guidance Information System was designed for use by high school students nationwide. TSC states that the Guidance Information System:

> ...makes it possible for students to explore large data files stored in a computer, and to examine the ways in which their personal criteria for selecting colleges and occupations [affect] the range of opportunities available to them.... [The user] can...interact directly with the information.... [He] can change his mind, and his instructions, at any point. This places the decision-making where it belongs, with the student....

GIS consists of four separate data files of information retrievable from the computer:

1. The four-year college file (Col 4) contains information on approximately 1,600 colleges nationally.

2. The two-year college file (Col 2), which is similar in structure to the four-year college file, contains information on approximately 1,000 junior and community colleges nationally.

3. The occupational file (Occu) contains information on about 1,300 occupations which were selected from the more than 20,000 in the Dictionary of Occupational Titles (D.O.T.).[1]

4. A scholarship and financial aid file, listing about 250 scholarships. Since it is a prototype and limited in size, it was used less than 1% of the time, so there will be few references to it in this report.

The user sits at a terminal, which is connected by telephone line to a central computer.[2] Using the instructions and code numbers provided, (s)he chooses one of the four files and types commands on the terminal keyboard, requesting information from the computer storage. The computer searches for and selects the requested information, and relays it almost instantaneously by typing its responses. The instructions and the responses simulate a rudimentary conversation.

The Guidance Information System has been characterized as a direct interactive system, without a monitoring capability. "Directly interactive" means that the user requests and receives information on the spot; thus he can see the results of his choices, compare or change them, and see the consequences of each additional instruction. "Without a monitoring capability" means that the computer keeps no permanent record of the interaction, and the user's name (or other identification) is not stored in the computer.

For this project, each school had a "heavy duty" teletypewriter

[1] When an occupational description is printed out, it lists titles of some "related jobs." GIS contains about 3,000 of these related occupational titles with D.O.T. numbers. Since these "related jobs" are generally not in the data file, the student can consult the D.O.T. for a description of many more occupations. IRDOE provided the schools with D.O.T.'s.

[2] TSC's computers are in Hanover, New Hampshire; a foreign exchange line was brought to New York City so that, for our schools, the link-up was the equivalent of making a local telephone call. The CAG project had one such telephone link-up, the use of which was rotated among the schools on different days. From September 1974 on, IRDOE conducted a similar project in CUNY community colleges using GIS and more telephone link-ups, thereby increasing the total amount of potential access to the computer.

terminal--the work-horse model--which provided a hard copy of the interaction in printed form. This printout is the only permanent record of the use. Carbon paper was used throughout the project; the schools usually gave the original copy to the student and kept the carbon copy on file. All students who were at the terminal wanted to keep a copy.

The "Student Study Guide" constitutes the main tool for using the system. This booklet contains explanations of the instruction letters which tell the computer to perform its functions, directions for using the various files, and a list of all college and occupational characteristics users need to obtain information of interest. Although the Guide is reusable, several hundred were purchased for each of the high schools. There is also a "User Instruction Manual," containing information for counselors and alphabetical lists of colleges and occupations, with their GIS code numbers (and, for occupations, the D.O.T. number). Students would use this Manual if they wanted the code number to obtain a description of a specific preselected job or college in GIS, or if they wanted to know whether an occupation or college is included in the data files.

GIS uses a narrowing logic; as more specifications are considered either by inclusion or exclusion, the original pool (of, say, 1,300 occupations) becomes smaller and smaller. The college and occupational files are similar in structure. (There are also important differences, which will be discussed more fully in later sections.) The stored information is organized by characteristics--qualities or features which describe an occupation or a college. Characteristics define what types of information can be retrieved. All characteristics are coded by number. The characteristics are grouped into broad categories. "All women" is an example of a characteristic in the "Coeducation" category. The college files contain more characteristics (and categories) than the occupational file, and thus provide more choice.

To use GIS, the computer must be instructed in what to do with the characteristics; these instructions (or commands) are signified by a letter. Thus, the computer can be instructed either to consider only "all women" colleges, or not to consider colleges with an all-female student body. To operate the system, the user must know at least 5 of the 12 commands or instructions. These five basic commands instruct the computer to:

1. Consider or include (colleges or occupations having) this characteristic.
2. Remove colleges or occupations having this characteristic. (Do not consider those with this characteristic.)
3. Delete or erase from consideration a characteristic previously specified (i.e., "I've changed my mind").
4. Print the names (if there are 25 or less) of the colleges or occupations that meet the prior specifications.
5. Print detailed information about a specific college or occupation (identified by its GIS code number).

Using these commands,[1] alone and in combination, the files can be used in two ways--to make searches or to provide descriptions. In a search, the user selects characteristics that are important to him and derives a list of jobs or colleges that meet the requirements he has specified. For a description, the user requests details about a particular college or occupation by using the fifth command, Print. Either or both of these types of uses may occur in one computer interaction. Searches could occur first, to narrow the range of choices, and could be followed by a description of one or more of the choices. A search requires a clearer understanding of the operating instructions (terminal commands) and of how the system is constructed. Figures 1 and 2 show, respectively, annotated sample printouts obtained from an occupational search, and from a description of an occupation.

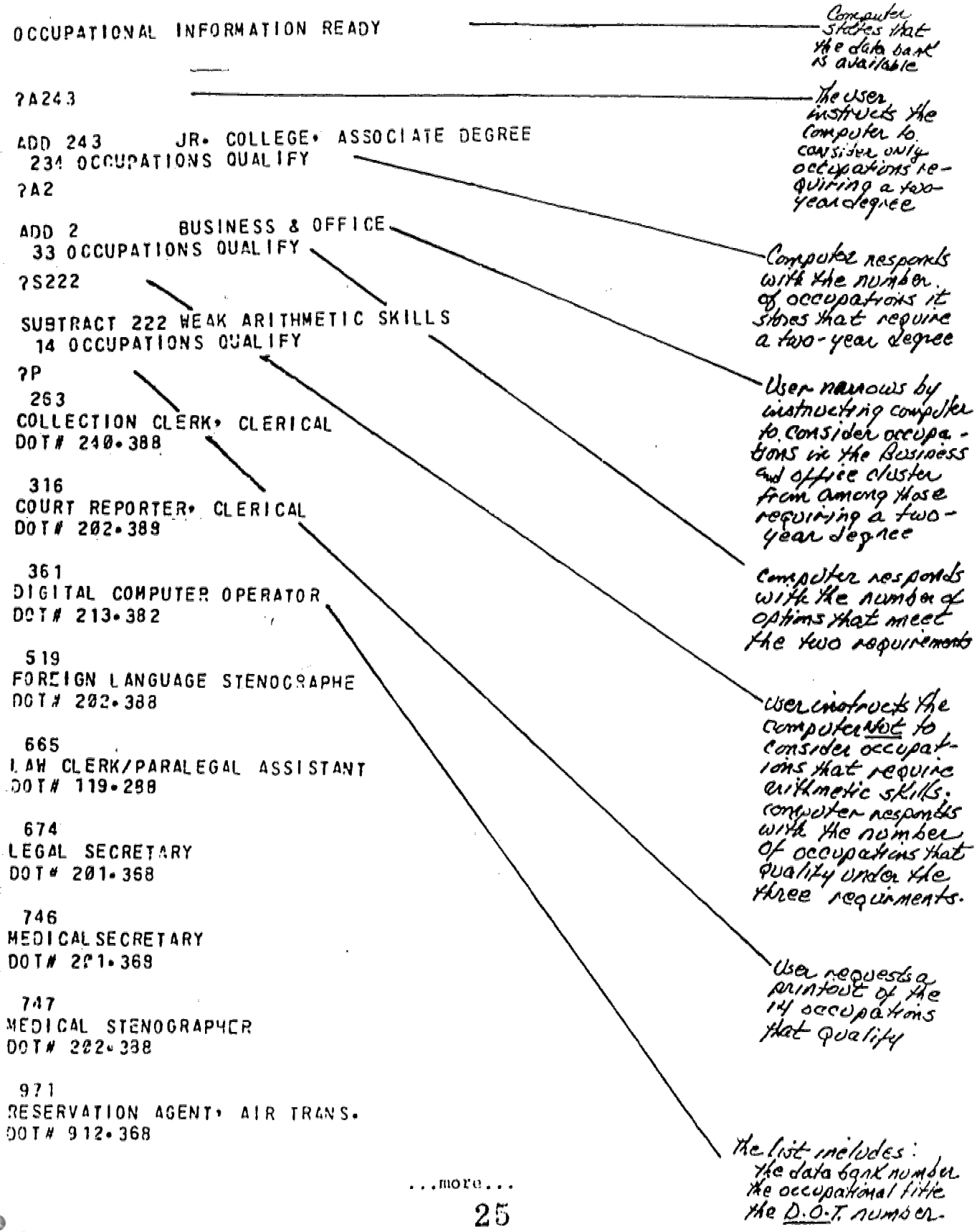
One of the more significant differences between the college and the occupational files is the distinction between selectors and descriptors. In the college file, selectors and descriptors are the same; that is, any characteristic can be used as a specification criterion for selection as well as appearing in the description. This is not true of the occupational file, where some characteristics are only for description and cannot be used as input. For example, consider the description of "jobs that are mostly performed outside"; the user cannot ask for (select) a listing of occupations that are "mostly outside." Such information is, however, available in a description of a specific occupation. This difference between selectors and descriptors in the occupational file makes it more difficult to grasp the way the occupational file works, as compared with the college files, which are simpler.

Another factor affecting the CAG experience is whether the student is or is not present during the computer interaction. This is not a feature of the system as much as a function of how it was used in the schools. This report refers to direct use, meaning that the student was present during the computer interaction, even though a staff member may have operated the terminal. Indirect or batched use means that the student had previously submitted in written form, which a school staff member processed in his absence. Generally, batching was done (on an on-line day) before or after regular school hours, or at any time no students were scheduled. Batching was sometimes done in instances where students failed to keep their scheduled appointments. The advantages and disadvantages of both types of use will be discussed in detail in Chapter VI, pp. 58 ff.

[1] One other command also produces a description, but one that is much more detailed. For any college (or occupation), this command produces a list of all characteristics (in code numbers or in English) true of the given college--i.e., those characteristics which the college has. In the college files in particular, such a list is lengthy; if done in English, it is very time-consuming, and if done in numbers, the user must decode them. It is also possible to obtain a partial list.

FIGURE 1

SEARCH MODE: SAMPLE INTERACTION EMPLOYING THREE BASIC GIS COMMANDS



...more...

FIGURE 2

DESCRIPTIVE MODE: SAMPLE OF AN ACTUAL GIS DESCRIPTION OF AN OCCUPATION

```
?P279


 279
COMMUNITY SERVICE HEALTH WORKER
195.268

JOB DESCRIPTION AND WORKER REQUIREMENTS:
HELPS CARRY OUT PROGRAMS PLANNED BY THE COMMUNITY-SERVICES-AND-HEALTH
EDUCATION OFFICER. MAY PREPARE & DISTRIBUTE HEALTH INFO. MATERIALS.
ANSWER INFO. REQUESTS. & HELP PROMOTE ESTABLISHMENT OF LOCAL HEALTH
SERVICES. REQ. ABILITY TO RELATE TO OTHERS & INSPIRE CONFIDENCE OF
OTHERS. ABILITY TO FOLLOW DIRECTIONS.

RELATED JOBS:
045.108  COUNSELOR
195.268  CASE AID
195.168  GROUP WORKER
195.188  PROBATION OFFICER

FOR FURTHER INFORMATION:
NAT'L COMMISSION FOR SOCIAL WORK CAREERS
2 PARK AVENUE. NEW YORK. N.Y. 10016
NATIONAL ASSOCIATION OF SOCIAL WORKERS
2 PARK AVE.. NEW YORK. N.Y. 10016
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CHAPTER III

EVALUATION METHODS

The evaluation activities were designed to accomplish two general purposes:

1. To systematically monitor the project operation, so as to identify areas of potential successes and problems that facilitate or interfere with the implementation of a computer-related guidance activity in the public high schools; and

2. To assess the effects of such a system on student decision-making and on staff and student reactions.

To these ends, much effort went into planning an evaluation that would provide evidence on which to base future decisions and the redirection of maladaptive practices. We wished also to use techniques and instruments that required little staff time and that might prove helpful to the school staff. Informal feedback suggested that certain of the evaluative procedures did meet the schools' own administrative recordkeeping needs. Considering the amount of information we requested of the liaisons, they spent very little of their CAG time (reported mean, 6%) in gathering and maintaining evaluation data.

Figure 3 shows the instruments used for assessing system operation, use of the system, and the quality of the data files; also included are the dates of administration or use, and explanatory comments. Figure 4 shows, similarly, instruments used to obtain participants' reactions (upper half) and to assess students (lower half). Much of the information in these two figures will not be repeated in this text. Tables A1 and A2 in the Appendix give fuller details about the students who were assessed.

IRDOE staff made 10 introductory and staff orientation visits (2 per school) prior to February 1974. During the three project periods there was a total of 97 man-days of site visits; the majority of these, especially in Periods 1 and 2, were on on-line days to see what was occurring and how the CAG operation might be improved. Off-line day visits were usually for data collection and informal discussions. We often helped students and staff at the terminal, and learned a great deal during these visits. The liaisons reported that these sessions were valuable to them; they frequently requested our presence when they expected visitors, anticipated problems, or wanted to try something new.

FIGURE 3

INSTRUMENTS FOR ASSESSING SYSTEM OPERATION, USE OF THE SYSTEM, AND QUALITY OF THE DATA FILES

Instrument or Technique	Date(s)	Comment
Observations (in man-days; by IRDOE staff)	Pds.* 1, 2, 3	Visits on both on-line and off-line days. Pd. 1, N=45; Pd. 2, N=27; Pd. 3, N=25 (including visits for student testing).
Copy of Printout (borrowed from liaisons) AND User Sign-In (kept by terminal operator)	Feb. 1974	For each use. Printouts plus User Sign-In gave name, grade, file, date, search/description, and direct/indirect data. Required matching printouts with User Sign-In to obtain total users and uses.
User Sign-In AND TSC Automated Summaries (without student names)	3/74-6/74 (Pd. 1)	Obtained times, plus information as above, except search/description, without having to reconcile the information with copies of printouts (although IRDOE continued this process for two months as a check).
TSC Automated Summaries (with student names)	Pds. 2, 3	TSC modified its summary program so as to permit typing user name into terminal. Gave all time and user information, and all in one record. Usefulness depends on the fidelity with which identification is typed in at the time of use.
Hardware Monitoring Checklist (kept by liaisons and IRDOE staff)	Pds. 1, 2, 3	For each on-line day. Described type and extent of malfunctions and estimated resultant time lost.
Data Files Output (Analysis by IRDOE staff; also, liaisons' reactions)	Feb. 1974; (May 1974 and April 1975)	Examination of printouts and comparison with information from other sources gave recency and accuracy of information in the files, and characteristics used in searches. (Also based on ratings from Liaison Questionnaires, and Information Rating Cards. See Figure 4.)

*Period 1 = February - June 1974.
Period 2 = September-December 1974.
Period 3 = January - June 1975.

FIGURE 4

INSTRUMENTS FOR OBTAINING PARTICIPANTS' REACTIONS
AND FOR ASSESSMENT OF STUDENTS

Instrument or Technique	Date(s)	Comment
Participants' Reactions		
Information Rating Card (kept by liaisons, IRDOE staff, and any other user)	Pds. 1, 2, 3	For noting any unusual (good or bad) outcomes or experiences, by file and characteristic; e.g., output omissions or logical problems with system construction.
Log Day (kept by IRDOE staff, and at School D by liaison)	May 1974 (1 entire on-line day per school)	For each student user that day. Gave a description of a typical day. Served as a basic source of data on student reactions.
Liaison Questionnaire	5/74 4/75*	Mailed; all 8 liaisons responded. Mailed; all 5 liaisons responded.
Principal's Questionnaire	5/74 2/75*	Mailed; all 5 principals responded. Mailed; all 5 principals responded.
School Librarian Questionnaire*	4/75	Mailed 6 (2 to School E); all responded.
School Personnel Questionnaire*	4/75	Mailed to 18 guidance counselors and teachers involved with CAG; 13 responded (with at least 1 from each school).
Student Assessment		
Initial Survey of Student Activities and Plans (given by classroom teachers, liaisons, and IRDOE staff)	March 1974	Time required, 40 min. 1889 Ss were tested in English classes, or in economic classes in School D. Gave initial picture of student views, although a few (mainly in grade 11) had already used CAG. Analysis is based on grades 11 and 12. For details, see Appendix, Table A1.
College Office Applications Records* (analysis by IRDOE staff)	6/74 and 9/74; 6/75	For all identifiable college applicants or applications in the 5 schools. Processed 5366 applications in 1974, and 4899 in 1975.
Tests of Impact of CAG: Vocabulary; Decision-Making (plus Preferred Sources of College and Career Information); Self College, Ideal College, Self Occupation and Ideal Occupation Questionnaires	Jan./Feb. 1975. Given by IRDOE staff; some liaisons assisted.	Time required, less than 1 class period. Liaisons were asked to select English classes equally divided between users and non-users; School A tested Ss in homerooms. In Schools B, D, and E, Ss tested took either Vocabulary or Decision-Making, plus 1 other test. School C classes took Vocabulary and Decision-Making, but no other test. For details, see Appendix, Table A2.

*Data not previously reported.

The basic information on student use of the computer system was obtained in different ways at different times. In the first month, to get basic data on which files were used and the mode of use, we had to borrow the carbon copies of the printouts from the liaisons. The carbons were important to the evaluators as well as to the schools, which used them in various ways--primarily as a basis for followup discussions with students. All schools hoarded the copies, and were reluctant to lend them to the evaluators. In several instances where the printouts were not available for data analysis, this was usually because they had been given to counselors. When we obtained the most complete set of carbon copies available, we matched them with the User Sign-In records, which (if completed) gave the date, users' names, grade level, and the type of CAG experience (direct or indirect mode). Even when the schools very carefully maintained both sets of records, the matching process invariably showed that several students were not accounted for on one or the other record. It became clear that a better method was needed for identifying users and for summarizing data on use.

In March 1974, through a contract modification, TSC began providing daily automated summaries, giving an account of all requests made of the computer, with times, for each school; but the summaries contained no student names. These accounts provided useful information about time, and furnished some check on data obtained from hand analysis of User Sign-In records; however, identification of individual students, and whether the use was batched or direct still had to come from matching the automated summaries with the User Sign-In records. While an improvement, this still did not resolve the problem of unidentifiable uses. In addition, there were omissions in the automated summaries that usually occurred as a result of the breakdown of the central computer, or the shift to another computer that was not programmed for automated summaries.

Beginning in September 1974 (Period 2), we requested a change in TSC's summary program to permit student names and other descriptive information to be typed at the terminal at the time of use. The information appeared on TSC's summary, although it did not go into the computer; this change facilitated the task of data collection and analysis. In those instances when not all of the identification information requested was entered at the terminal, it would not appear on the TSC line-by-line summary. Generally, however, both time and user information became available on the same record, and matching of two separate data sources was no longer necessary.

Because all the basic information about system use was not complete, especially in Period 1, our analyses are perforce only for those students and variables for which we could determine the necessary identification. It seems ironic that in a computer project so much of the data collection and analysis had to be done by hand. Manual record-keeping and data handling are time-consuming and less than fully accurate. We know, for example, that our counts of multiple users of CAG are not precise because of duplications and misspellings in student names. With no citywide student identification numbering system,

completely accurate counts are not possible, despite whether the analysis is automated or done manually.

The Hardware Monitoring Checklist provided a record of equipment malfunctions, the frequency and duration of breakdowns, and responses to calls for service. Most liaisons completed these records fairly carefully in Periods 1 and 2 when every malfunction was perceived as major, but much less so in Period 3, by which time the liaisons had become quite competent about dealing with equipment-related problems. As these lessened over time, the liaisons raised more questions about implementation and the underlying theory and construction of the data files (e.g., how they were compiled, how colleges and occupations were classified, etc.).

Such questions were discussed during observation visits, as well as at two group meetings of the liaisons held in April and September 1974. At the first meeting the liaisons described how they oriented and scheduled students for CAG use and how they followed them up after use. This discussion led us to develop the one-page Log Day form, as a way of describing a typical on-line day. IRDOE randomly selected one day per school in May 1974, on which all CAG activities, including students' reactions on the spot, were systematically noted. For each user that day, CAG staff, assisted by an evaluator-recorder, summarized what occurred during the use, as well as preliminary and followup activities. Log Day information was a basic source for description of student reactions.

The quality of the data files was assessed from our own independent checking, from ratings of the categories and characteristics by liaisons, and from notes on the Information Rating Card. On this card, any user (but mainly staff) reported unusual outcomes, noting the file and characteristic used.

To document changes in career and college counseling practices that are attributable to CAG is a very complex task, because of the variety of people in different capacities who perform such functions in the high schools. Instead of attempting to assess the effects of CAG on time allocated to these guidance functions, we collected opinions, ratings, and judgments by means of questionnaires mailed to school staff members. In May 1974, on a lengthy questionnaire, the liaisons rated, described, and evaluated the project, including staffing, administrative support, training, materials, quality of the data files, and effects of CAG on students. They also indicated how much time they allocated to CAG, and how the CAG time was spent. In April 1975 they completed a similar questionnaire. The principals, in a brief questionnaire each spring, expressed their opinions and described their reactions to the project. Since staff members other than those assigned to the CAG unit took part in project activities, we asked liaisons for names of such people, and sent out a general School Personnel Questionnaire. Also near the end of Period 3, the librarians received a questionnaire specific to them. The response rate to all questionnaires was 100%, except for the School Personnel Questionnaire, where about three-fourths of the 18 surveyed responded.

The Initial Survey was given in mid-March 1974 to all students in classes selected by liaisons as being representative of the entire population in grades 11 and 12 (see Appendix, Table A1). Regular classroom teachers, plus liaisons, administered most of the Surveys. The 1063 juniors and 826 seniors tested constitute approximately a 25% sample of all students in the respective grades. Very few of the seniors tested had had CAG experience (overall, 3%); about a fourth of the juniors had used CAG (range, from 13% in School B to 40% in School D). Where Ns permitted, we compared users and nonusers, but found few differences at this very early stage. The Survey results describe the initial status of the students to be served by CAG, in terms of their attitudes and future plans. (See Chapter II, pp. 8 ff.)

To obtain objective evidence of the effects of CAG on student behavior, we first considered that college applications might reveal changes attributable to CAG. But because of the difficulties with respect to individual schools' recordkeeping practices, we could not compare CAG users and nonusers directly, and instead resorted to a comparison of the 1974 and 1975 graduating classes. The supporting reasons will be explained in the section on Analysis of College Applications. (See Chapter VII.) It is clear, however, that there are many ambiguities in the college applications data.

In reviewing the very positive project results obtained in Period 1, the Board of Education and First National City Bank requested additional data on the effects of CAG on students, so as to be able to reach a more informed decision concerning its future use. To guide the direction of this undertaking, IRDOE and a representative from the Division of High Schools jointly proposed impact criteria. In relation to the criteria adopted, we devised direct cognitive and attitudinal measures of the impact of CAG on students. The purpose of these tests was to assess effects of CAG use on decision-making, vocabulary, student attitudes, and students' knowledge of, and description and organization of information about colleges and careers.

Early in 1975 (Period 3), IRDOE, assisted by liaisons, gave these tests to users and non-users in the same classes. No class took more than two of the tests. (Table A2 in the Appendix gives details.) For the testing, we had requested that the liaisons select classes about equally divided between users and non-users overall, 53% (389) of the 740 different students tested had used CAG (range, from 36% at School C to 62% at School E). These students were all in grade 12, except for School E, where 84% of these tested were in grade 11. Of the 389 different users, 52% had had only indirect (i.e., batched) CAG experience, and 57% had not used CAG since Period 1--6 to 12 months prior to the testing. It is possible that the non-users had some exposure to CAG in group orientation sessions, but none had used the terminal, either directly or indirectly.

The same statistical design was used for analyzing results of both the Vocabulary and Decision-Making tests. On both tests the score was the number of correct responses. To deal with the question of possible initial differences in ability level between users and

non-users, we had hoped to use student honors status as a control variable. (It was not possible to ask liaisons to use honors status as a selection variable, in addition to asking for equal division between users and non-users within classes.) As it turned out, no honors students were tested at Schools B and C, and at the other schools, the cell Ns were very disproportionate and some were very small. To statistically compensate, we used a multiple regression program ("Glypoth") to analyze significance of differences.[1]

For the final analyses, we combined honors users and non-honors users and compared them with honors plus nonhonors non-users, without distinguishing between honors and nonhonors students. As explained in Appendix B, we are willing to assume that no important initial ability differences existed between users and non-users that would account for the obtained results.

We realize, of course, that many other questions can be raised about the initial comparability of users and non-users we will discuss some of the possible variables in connection with the test results.

The remaining impact tests dealt with student attitudes toward the computer[2] and other sources of college and career information, and, by means of four questionnaires, with the way students described and organized information about colleges and careers. There were four open ended-questionnaires--Self College, Ideal College, Self Occupation, and Ideal Occupation. On the "Ideal" questionnaires, students were asked what questions an ideal counselor should ask of students looking for a college or occupation; the "Self" instruments asked students where they might consider going to college or what occupation they may pursue, and asked them what were the important features of their choice. These instruments had no "correct" answers; their reliability and validity had not been established; and they were given only in Schools B, D, and E.[3] For these reasons we did not analyze the results statistically; nevertheless, the findings are clear enough to stand by themselves.

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[1]The Glypoth program handles the unequal cell Ns by using cell means as the population estimates, and yields F ratios which are interpreted in the same way as those obtained from analysis of variance. For a description of the Glypoth analysis, see: Gross, A.L., Costa, N.D., & Steckler, J.F. A Fortran Program for Hypothesis Testing in the General Linear Model. Journal of Education and Psychological Measurement, 1974, 34, 133-135.

[2]The attitude questions, which were placed at the end of the Decision-Making test, asked the student to select, from each of the two lists of sources presented, the three sources (s)he considered most valuable for obtaining college and career information. Respondents were included in the analysis only if they gave three responses to the question. For each question, proportions were obtained, by school, of the number of users and non-users selecting each listed source as one of the three most valuable.

[3]The Self College Questionnaire was given only in School D; thereafter, we gave the Ideal College Questionnaire, since it proved to be easier to score and interpret.

Each of the four open-ended questionnaires provided space for writing 10 responses. The questionnaires were scored for the total number of unduplicated statements and the total number of different categories employed. The number of statements, or amount of information, represents the student's ability to describe what he knows about colleges or careers. The number of categories or the variety present in the statements, reflects how the student organizes the information.

Responses to each questionnaire were analyzed independently by at least two scorers, without knowledge of whether the respondent was a user or non-user. A statement was defined as containing one piece of information. Two statements by the same student containing the same information counted as one statement (e.g., "The school is coed," and "It has male and female students.") Categories were not imposed on the data, but were generated by the actual content of the responses. Specific categories were narrowly rather than broadly defined. We used GIS classifications and labels whenever possible, which permitted analysis into GIS-related and non-GIS-related categories. For example, the two statements, "The college requires high marks for admission," and "The college requires high SAT scores" were placed in the one GIS category of "competitiveness."[1] (TSC groups these two characteristics under this classification.) Any one student might make two or more statements within the same category; thus the number of statements per student was usually larger than the number of categories (s)he employed.

For the two occupation instruments, another breakdown was into job-oriented as compared with personal-oriented categories. (The two college instruments did not generate responses divisible into this type of impersonal vs. personal grouping.) Job-oriented responses were worded in terms of job or work situation characteristics (e.g., "This occupation requires arithmetic ability"). Personal-oriented responses were phrased in terms of the student's background or abilities (e.g., "You must be able to work with numbers"); or in terms of the characteristics of the hypothetical student counselee named in the question (e.g., "Are you good in math?"). Some responses were not scorable as job- or personal-oriented, either because they were "neutral" (e.g., "Interview people in the field" or "Go to the library") or irrelevant (e.g., "Work is hard") or ambiguous (e.g., "Where do you want to work?").

Although decisions are difficult concerning what constitutes an unduplicated statement and what kinds of statements constitute a category, we made every attempt to remain consistent and fair. Analysis of any open-ended questionnaire presents similar difficulties, but this is the price to be paid in obtaining responses which are not stimulus-bound.

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[1] Note however, that these two responses (if made by a single student) would be counted as two different statements since they do not cover identical information--the former example refers to high school grades, while the latter refers to scores on a specific test.

CHAPTER IV

PROJECT IMPLEMENTATION

The aim of this chapter is to provide some flavor of CAG in action in the five demonstration high schools through a description of how the project was staffed, how the time was allocated and used, and how each school operationally responded to the demands and challenges provoked by the computerized project.

Project Staffing and Administrative Support

From its inception, the CAG project received a warm welcome. Principals of the high schools eagerly awaited its installation, were cooperative in finalizing arrangements, and implemented the project in their schools in a manner that facilitated effective demonstration. What helped inestimably, in our judgment, was that throughout the three time periods (February 1974 - June 1975), the Division of High Schools allotted one teaching unit to each of the pilot schools.[1] (A teaching unit represents the equivalent of the average salary for one regular classroom teacher. A licensed counselor, for example, represents 1.3 teaching units, while a paraprofessional is the equivalent of .7 of a teaching unit.) The schools used their teaching allotment in different ways, but each principal appointed at least one liaison, who was responsible for coordinating the CAG activities, and who served as IRDOE's primary contact. Most principals selected regular teachers for this purpose, releasing them from their other duties. Since all teachers must do some classroom instruction, these liaisons could not be assigned to CAG full time; some portion of the allotment thus became available for other assistance.

With the exception of School B (at which a guidance intern was hired as a full-time CAG liaison), all other schools assigned CAG responsibility to relatively young, regular teachers. In addition to having an average of about seven years' teaching experience in the school system, they also had special experience as college advisors, career counselors, and/or program advisors. All had demonstrated competence and concern about quality education. According to their own estimate, the liaisons were selected because they had a job history of personal involvement with students, a high degree of organizational skills, and a close relationship with the schools' college and career advisement services.

In our judgment, it is rare to meet a group of people so interested and involved in a project, and so willing to spend time in self- and

[1] As previously noted, for the period from September 1975 - June 1976, this allotment was halved and each school received the equivalent of half a teaching unit.

program-appraisal. Informal discussions with the principals suggested that, as they said, the liaisons were indeed "some of our best people." With the prevailing scarcity of dollars for education, the principals' choice of such competent personnel provides one index of their commitment to the CAG project.

The individual at each school who was primarily responsible for liaison duties did not change.[1] Some of the other changes in assignments from Period 1 to Periods 2 and 3 reflected reallocations of project duties to better suit individual school needs; many reflected citywide budgetary curtailments. In Periods 2 and 3 there was a reduced number of professional staff involved with CAG at Schools C, D, and A (as well as a clear reduction in the amount of time all 5 schools spent at the terminal--see pp. 30 ff.), although this was not reflected in the liaisons' reported estimates of the proportion of time they devoted to all aspects of CAG. Their estimates for Period 1 ranged from 16% for the School C primary liaison to almost 100% for School B; in Period 2 their estimates ranged from 17% for School C to 87% at School B.

The staffing patterns at the individual schools follow:

School A. In Period 1, liaison responsibility was shared by an English teacher with grade advising duties (the primary liaison) and a health education teacher. Several hours of paraprofessional time, and a few student monitors (who received "service credit") completed the staffing. For Periods 2 and 3, the grade advisor and a full-time paraprofessional conducted the CAG operation; student monitors continued, but to a much lesser degree. The terminal was placed in a small private room in the college office.

School B. In all 3 project periods, a guidance intern was hired for the CAG project. Since this school had the most elaborate and varied career education programs, he was responsible for coordinating CAG with all other career and decision-making activities. In Periods 2 and 3, in which the terminal was moved from the Career Education office which the intern shared with two other members of the staff to an office of his own, he had the clerical assistance of student monitors.

School C. CAG responsibility in Period 1 was shared by a college advisor-English teacher (the primary liaison) and a licensed counselor for career guidance. In Periods 2 and 3 only the college advisor was actively responsible; since the college office itself was more minimally staffed during this time, the liaison had to assume additional responsibility for its functioning, reducing the actual time devoted to CAG. The location of the terminal in the college office facilitated her duties, but contributed to the career counselor's problems in coordinating her career office advising duties and CAG during Period 1.

[1] For 1975-76, all schools retained this same person with the exception of School B which transferred responsibility to a teacher of business education.

School D. In Period 1, CAG activities were shared by a college advisor-English teacher (the primarily active liaison), an occupational counselor, and two half-time paraprofessionals who manned the project in the early evening hours. The paraprofessionals were recent graduates of School D, enrolled in a CUNY college, and interested in computer technology. For Periods 2 and 3, the professional level responsibility was entirely that of the college advisor, who similarly to School C devoted increasing amounts of time to the college office; the time of the paraprofessionals was also reduced to about one-third of the Period 1 amount. Since the terminal remained in a location most accessible to the college office, increasing use was made by the other college advisors.

School E. In Period 1, a math teacher who was responsible for School E's College and Career Office was selected as primary liaison, assisted by a counselor responsible for a special career project which ended in June 1974. They had the assistance of a part-time secretary as well as a paraprofessional two days a week. Later, all professional responsibility fell to the primary liaison, but the secretarial and paraprofessional assistance remained at the same level. The terminal was located in the librarian's office--also shared by the paraprofessional--several floors away from the College and Career Office, but adjacent to the career section of the library.

In most schools CAG was established as an adjunct to the college office, primarily because career advisement services were, in general, not well developed and the college office was one of the locations (and services) that was accessible to and familiar with large amounts of student traffic. In all schools CAG functioned independently although cooperatively with the other related departments and staff. The liaisons were responsible to the principal and/or to an assistant principal for guidance. By the end of Period 1, principals were among CAG's warmest supporters. They wanted to "keep the program going," and they wanted access to the computer more than the scheduled two days a week. The principal of School E, in an unsolicited letter to the project director, expressed it as follows: "The CAG project has been of great, almost inestimable value to us. It has added a dimension of knowledge and...of motivation. It has stimulated our entire...operation. There has been an almost galvanizing effect. The program should be expanded to other high schools if funding can be found. Certainly, it must be kept here." At the end of the project, the principals still remained strong supporters, except for the principal at School C. Although this principal indicated that [his] interest in CAG seemed to diminish over time, he also stated that, in his observation, student users did benefit.

The liaisons were unanimous in their high, positive rating of the attitudes of their school administrators in Period 1; all said the administrators were very much interested in the project and had observed its operation on both on-line and off-line days. Only two principals (Schools B and D) requested occasional formal reports from the CAG liaison (number of students served, percentage using each of the four files, etc.), but discussion and personal observation showed that all principals were aware of the problems and progress of the project. Their "very much

interested" attitudes, according to the liaisons' reports, were apparent in the amount of time and effort the administration expended--introducing CAG to the parents and community, encouraging demonstrations for (and use by) people in other schools and agencies, writing articles for the school newspaper, and motivating involvement of other school staff. Of great importance to the liaisons was the fact that the principals established few constraints, facilitated liaisons' requests for supplies, and granted permission to employ class time for student orientations, terminal use, and testing. By the end of the project, liaisons at Schools A, C, and D viewed the administrators as staying more in the background. The liaisons' most frequent comment was that administrators relied on CAG to fulfill a valuable function.

Orientation, Training, and Allocation of Staff Time

Training sessions were conducted in each school near the end of January 1974, during Regents week. One or two representatives from TSC and IRDOE staff conducted the training. The sessions ran from three to as many as six hours, with one to twenty people present. Attenders usually included the principal, the assistant principal in charge of guidance, the liaison(s), counselor(s), advisor(s), staff of other special projects, outside interested group representatives, and faculty from other departments (e.g., math, data processing, etc.).

The intent of the sessions was to familiarize the school staff with the capabilities of the system, to orient them to the conceptual basis of the program, and to teach them basic use of the equipment (how to make contact with the computer), the functions of the terminal commands, and so on. The Student Study Guide was the basic training tool. After group discussion and an on-line demonstration, each participant who wished to do so could try out the system individually.

With some on-line practice it takes less than an hour to learn the essentials of operating the system; acquiring full expertise and finesse, however, takes a little more time. At the end of the initial training session, most participants at the schools felt they had a general understanding of the system and expressed confidence about the hardware. They recognized that it would be difficult to learn to operate the system from the printed materials alone, since much of the necessary information was not clearly outlined in either the Student Study Guide or User Instruction Manual. As in the case of School E, however, reading the materials in advance clearly facilitated the initial sessions.

At these meetings, or at ones scheduled immediately following, we also worked with the liaisons, explaining necessary details, including explaining the scheduling of terminal time, priorities for student use, what to do in case of difficulties, and the recordkeeping procedures to be maintained. We also continued with on-line practice, covering certain refinements, such as how to correct a typing error, shortcuts in searching, and other ways to maximize obtaining information quickly and efficiently.

Further informal training (and mutual learning) continued with each visit IRDOE staff made to the schools. Initial analyses of use of the various commands suggested that maximal efficiency and complete understanding of the narrowing aspects of the GIS program were still not universal in February 1974; however, by the middle of Period 1, all such problems were overcome. The high school liaisons demonstrated competence and mastery, frequently raising questions about the system that we were able to answer only with the help TSC provided.

The liaisons' responsibilities were many and complex. They included attending to the CAG priorities, motivating and recruiting students, orienting or explaining the system's capabilities to them, helping operate the terminal or arranging schedules for terminal operators, following up students, maintaining records and forms, and (especially in School A) conducting demonstrations for outside groups. In Period 1 the liaisons spent the largest proportion of their CAG time (i.e., the time they devoted to all aspects of the project) in orientation activities--recruiting and explaining in classrooms, with groups, and with individual students. Next most time was spent in followup activities after students had received the printout. Estimates of the amount of time liaisons spent personally operating the terminal ranged from 10% (Schools A and D) to 30% (School B). The most significant change in Period 2 was in School D, where the liaison estimated that she devoted 50% of her time to operating the terminal--reflecting the reduced availability of the paraprofessionals. In general in Period 2, proportionally less time was spent in orientations (which include recruiting), with more time spent in followup activities with students.

At each school, other staff became involved in the CAG operation. We observed school staff members learning to use the system on their own, and helping to retrieve information for students (Schools A, C, D, and E). They also helped with orientations, interviewed students, and referred them to the liaison. They aided in followup activities, explaining the output and helping students locate additional services for more information. Many staff members used the terminal to request information about colleges and careers pertaining to their own subject matter area--as a learning experience for themselves and to meet needs of students who might say, for example, "I like math; what can I do with it?" These others also used the terminal to obtain information as parents, and for friends who were parents of school-aged children. According to the principals, staff members of the schools were impressed and enthusiastic when they noted increased student motivation. Again, School C's liaison and principal were the only ones to note lack of general interest among the school staff during the 1974-75 school year. Even the few staff who felt "the information wasn't terribly accurate" continued their involvement and showed their interest in the CAG concept by continuing to use it.

Scheduling and Use of Terminal Time

Although the terminals were installed by January 4, 1974[1] and the schools had received their first supply of Student Study Guides, the phones were not put in until the last two weeks of the month.[2] During this time students were taking Regents examinations, and the new term was scheduled to begin in February. Thus, the first few project days at the end of January were used for practice. Staff of the schools and any students available were encouraged to explore and experiment with the Guidance Information System. These days were hectic because the schools were using the system on contention; that is, a school dialing into the computer would get a busy signal if another school was already on-line, and this happened frequently. The contention experience was very brief, but it was obvious that advance scheduling of on-line days was necessary.

For Period 1 we prepared a calendar assigning each school exclusive use of the system one day a week; the specific weekday was rotated monthly so as to equalize any disadvantages associated with particular weekdays. While this procedure worked adequately, the schools did much trading of days or half-days. The liaisons indicated a preference for having one regular weekday assigned to them, so that they could plan their time longer in advance and students could become more aware of "their day" on the computer (and thus would be less likely to forget appointments that had been scheduled in advance). There was no problem in designing a set-day calendar for Periods 2 and 3; according to the liaisons' reports, this arrangement was very successful, and they did much less trading of days than in Period 1. Modifications in scheduled days were maintained centrally, every request being cleared through IRDOE.

Days and Mean Hours Used. The data to be presented next pertains to the scheduling and use of on-line days and the time used to process student requests for information. (It includes only student use of the terminal.) The total number of days scheduled and used, as well as total terminal time, are not directly comparable across the three periods, because of the differences in duration of the periods. The two measures that can be compared over time periods are the days used expressed as a percentage of days scheduled and mean hours on-line per day.

In Period 1, all weekdays were prescheduled, and the only "extra" time was Saturdays and Sundays. In Periods 2 and 3 extra weekday time

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[1] TSC rented terminals from Data Access Systems, Inc. (DASI). This led to one school's nickname of "Daisy" for its terminal; other schools also adopted nicknames and we had "Herbie" at Herbert H. Lehman High School, as well as "Alphonse". The particular model (KSR-33) we used types at a speed of 100 words per minute, but is very sturdy, and records the interaction as printed copy. In operation, however, it is noisy.

[2] A general freeze on phones for all New York City agencies necessitated special permission for the installation of the five private phones. When not in use for CAG, the phones were locked. At the end of June 1974 and 1975, phone service was temporarily suspended and terminals were stored. All equipment had to be reactivated each September (1974 and 1975).

on-line was often available to the high schools on request. These days came from a companion CAG project operated by IRDOE in four CUNY community colleges.[1] Some schools (A and D) requested extra time, while others (Schools E and C) rarely did. In summary, the five high schools requested and used 13 extra days or parts of days in Period 2 and 24 extra days or parts in Period 3, the Spring semester. The schools sometimes used the extra time instead of, and not in addition to, their scheduled days. They requested extra time not necessarily because they did not have enough, but rather because they did not have the "right" time (i.e., days when staff and students were available). Most often they requested and used half-days or less--for example, when the staff did not have a full day to devote to CAG. This fact suggests that, at least in some schools, a schedule of two half-days per week might maximize terminal use to a greater extent than the scheduling of one full day.

A small portion of the on-line time scheduled in advance was not used--10½ days in Period 1, 5 days in Period 2, and 21 days in Period 3.[2] The reasons for not using scheduled time were similar to those for requesting extra days--nonavailability of CAG staff or of students (during graduation rehearsals, Regents or final examinations, etc.). In Periods 2 and 3, some unused days also resulted from shifts in schedule that meant departing from the regularly assigned weekday;[3] the school would sometimes simply forget to get on-line on the rescheduled day.

Table 1 (p. 32) shows the on-line days used as a percentage of the days scheduled in advance. In Period 1, School E stands out because it used every scheduled day; the other schools used 84% to 89% of their scheduled time. In Periods 2 and 3, with the extra days available, most schools used more days than had been scheduled. School C again differs from the others; it used 86% of its scheduled time in Period 2 and 73% in Period 3--much less than the other schools.

In terms of mean hours per day spent on the terminal (Table 1) this time was by far the greatest in Period 1, and dropped to half that amount or less in Periods 2 and 3. The only exception to this general trend was School E, which maintained almost the same average in all three periods (5½, 5, and 5¼ hours). School C had the lowest average per day throughout, with a very sharp drop in the 1974-75 school year.

The reasons for the decreases in mean hours per day in successive periods seem attributable to particular situations in the schools. In School C, and to some extent D, the increased responsibility of the CAG liaison for other school activities was a factor. The School A liaison offered as

[1] Stimulated by the early positive feedback from the high schools, the New York State Education Department's Bureau of Two-Year College Programs and the Division of Occupational Education Supervision funded a demonstration of CAG at the community college level (VEA Grants Nos. 75-2-587, 76-2-421). The project was continued in 1975-76, expanded in 1976-77 (VEA NO. 77-2-381).

[2] Schools C and D accounted for 14 of the 21 unused scheduled days in Period 3.

[3] Shifts in schedule came about as a result of equalizing days for those schools whose regularly scheduled day fell on a holiday.

TABLE 1

TERMINAL TIME SCHEDULED AND USED FOR STUDENTS, BY SCHOOL AND BY TIME PERIOD (TIME IN HOURS, TO NEAREST QUARTER-HOUR)*

Period	School					All Schools
	A	B	C	D	E	
Period 1 (5 months)						
Days Scheduled	19	19	18	19	18	93
Days Used	17	16	15½	16	18	82½
Days Used as % of Days Scheduled	89%	84%	86%	84%	100%	89%
Total Time in Hours	99½	98	78¼	103¾	98	477½
Mean Hours per Day	5¾	6¼	5	6½	5½	5¾
Period 2 (4 months)						
Days Scheduled	13	14	14½	13½	12	67
Days Used**	14½	14	12½	13	14	68
Days Used as % of Days Scheduled	112%	100%	86%	96%	117%	101%
Total Time in Hours	35½	44¼	15	39½	71¼	205½
Mean Hours per Day	2½	3¼	1¼	3	5	3
Period 3 (6 months)						
Days Scheduled	23	23	22	22	23	113
Days Used**	31	22	16	25	23	117
Days Used as % of Days Scheduled	135%	96%	73%	114%	100%	104%
Total Time in Hours	79¾	45¼	14½	70¾	119¾	330
Mean Hours per Day	2½	2	1	2¾	5½	2½
Total, All Periods						
Days Scheduled	55	56	54½	54½	53	273
Days Used**	62½	52	44	54	55	267½
Days Used as % of Days Scheduled	114%	93%	81%	99%	104%	98%
Total Time in Hours	214¾	187½	107¾	214	289	1013
Mean Hours per Day	3½	3½	2½	4	5¼	3¾

*All times in this report should be considered as underestimates, especially in Period 1.

**Includes extra days; see explanation in text.

an explanation that by Period 2 the student's CAG on-line experience was usually only a part of a longer individual consultation, which CAG helped to initiate. Thus, less time was spent at the terminal and more with students. In Schools B and E the fact that the staffing remained relatively constant throughout the project may help to account for School E's maintenance of a high level of terminal use, but it does not explain School B's decline in hours used per day. The School B decrease in Period 2 was, however, not as great, relative to Period 1, as the decreases in Schools A, C, and D. And in Period 3, School B nearly doubled the amount of indirect use (processing requests in the absence of the students), a procedure which requires less time.

Although the schools used fewer hours per day in Periods 2 and 3 as compared to Period 1, they tended to use a greater proportion of their scheduled days--101% and 104%, respectively for Periods 2 and 3 as compared to 89% in Period 1. Thus, to some extent, the fewer number of hours used per day may be explained by the fact that the schools took advantage of the availability of extra days by using less time on more days. (This also explains the proportions in excess of 100% noted above.) This lends support to the suggestion that for some schools, scheduling more half-days may be better than whole days. Other conditions, to be discussed in subsequent sections, also contributed to the changed patterns of use.

Not reported in Table 1 was the time used for purposes other than handling student requests. At least a total of 12 hours in Periods 1 and 2, and more than 14 hours in Period 3, was used for staff exploration and demonstrations for classroom teachers, student groups from other schools, parents, and a large number of agencies and individuals from the educational and business-industrial community.

Equipment Malfunctions. All computer-related projects suffer from hardware malfunctions and related peripheral problems. Our original instructions to the liaisons were that they should call TSC at the first sign of a problem, and could expect a response from them within 10 minutes. The possible malfunctions included problems with telephone lines, teletypewriters, and the central computer. The occurrence of a problem did not mean that the schools experienced (or reported) lost time. As an example, when they checked "garbage" as a problem, this might not have interfered with the operation, as long as the essential parts of the printout were readable. The Hardware Monitoring Checklist, to be completed for each scheduled on-line day or half-day that was used, gave information about the nature of the problem, the degree of disruption it caused, and an estimate of the time it took to be corrected.

Different malfunctions caused the schools different problems. Some telephone-related problems, for example, had to be referred to the phone company, while others could be dealt with by TSC. Similarly, some terminal-related problems were corrected by a call to TSC while for others (such as those resulting from blown fuses), TSC had to call in DASI. In this latter type of problem, the remainder of the on-line day might be lost to the schools since DASI repairmen could not service the terminal until the following day. If a school lost the use of an on-line day, it usually could not process any requests until its next scheduled day the following week (unless the school could use extra days in Periods 2 and 3).

Since we estimated the amount of time they probably would have used CAG that day, it is somewhat unfair to examine "Mean Reported Hours Lost per School per Month" in Table 2, but these means do at least give a relative picture of the amount of disruption caused by equipment problems. On the average, each school lost about two to three hours in each of the start-up months, but only a half-hour by the final month (June 1974) of the period.[1]

The main point illustrated by the data in Table 2 (p. 35) is that reports of malfunctions and time lost because of them were greatest in the start-up months--namely, February-March, and September 1974--and diminished considerably thereafter. Liaisons submitted 82% of the requested Checklists in Period 1, and 71% in Period 2. The number of days with malfunctions reported dropped from 55 in Period 1 to 21 in Period 2, or from two-thirds to about one-third of the days on which reports were requested. By December 1974 we were receiving almost no Checklists. For this reason, malfunction analysis was not possible (nor necessary) in Period 3; by then, these problems were minor. Our observations and discussions with liaisons indicated that on days for which they submitted no Checklists, very little time was lost and few or no malfunctions occurred.

During the first few project months, an equipment breakdown of any kind caused a flurry of activity, including calls to IRDOE and calls to TSC (as instructed). In February and the first part of March 1974, any and all problems were usually first addressed to IRDOE; nearly always, we either called TSC or DASI or asked the school to call TSC directly. By mid-March 1974 the schools were making their own direct calls; only in rare instances when a new type of problem occurred, or one requiring a change in scheduling, did they notify us in advance. After the first few months, the schools no longer reported short intervals (5 to 10 minutes) of time lost, taking such brief interruptions much more in stride. By May 1974 staff at some schools became so blase about malfunctioning equipment that they did not even call TSC, because they had learned certain techniques for handling many problems themselves.

That the perception of problems changed more drastically than did the occurrence of problems is supported by a comparison of the liaisons' regular daily Checklist recording of problems with their ratings of problems and service in their questionnaire at the end of Period 1. The frequency of occurrence of problems noted in the Checklists ranked, from most to least, as follows: telephone-related, garbage, cutoffs, and password rejections. The end-of-period questionnaire ratings cited garbage as the most troublesome overall. This result suggests that the principle of recency was operative, since garbage was the most recent, as well as the most frequent, problem just prior to the ratings.

According to the Checklists, the schools made 21 calls to TSC for assistance between March and June 1974.[2] For a third of these calls, the schools reported that TSC either did not respond at all (N=5) or did not

[1] The reported total of 63½ hours lost for Periods 1 plus 2 is a minimum estimate, since it does not include short intervals of unknown frequency and duration.

[2] The Checklist was not available for the entire month of February and, therefore, no accurate count is available.

TABLE 2

REPORTED TIME LOST DUE TO EQUIPMENT MALFUNCTIONS IN PERIODS 1 AND 2, BY MONTH, ALL FIVE SCHOOLS COMBINED*

Period	N Scheduled Days Used	Reported: N Days	Reported: Days with Malfunctions	Reported: Total Hours Lost	Mean Hours Lost per School per Month
Period 1 (5 months)					
February	16½	18	18	13¼	2¾
March	20	18	15	16	3¼
April	15	13	9	1¼	¼
May	22	14	8	3½	¾
June	9	5	5	2¼	½
Total	82½	68	55	36¼	
Period 2 (4 months)					
September	11	9	6	12¼	2½
October	21	12	6	6¼	1¼
November	14½	12	7	5¾	1¼
December	13	9	2	3	½
Total	59½	42	21	27¼	
Total, Periods 1 & 2	142	110	76	63½	

*All time calculations are to the nearest quarter-hour. Malfunctions did not necessarily involve lost time; e.g., in April 1974 malfunctions were reported on 9 days, but the total time reported lost was only 1¼ hours for all 5 schools.

Reports on the Hardware Monitoring Checklist were requested only for scheduled on-line days, so this table does not include any extra days used in Period 2 (see text). Some schools, by trading, used the terminal for half-days, for each of which a Checklist was requested. Thus, "Reported: N Days" can exceed "Number of Scheduled Days Used." Of the total of 142 scheduled days, 140 were whole days and 4 were half-days, for a total of 144 days on which malfunctions could have been reported. For Period 3, there were too few reported problems to warrant analysis of malfunction data.

respond within one hour (N=2). Service improved in Period 2, as indicated by TSC's returning all 113 reported calls. At the end of Period 1, the liaisons rated TSC's service--promptness of response, courtesy, and "obligingness." These ratings tended to be good or excellent. In the end-of-Period 3 ratings, however, two liaisons rated TSC as poor in respect to forewarning about difficulties or interruptions of service.[1]

Liaisons' attitudes toward TSC, Data Access, and IRDOE suggest that some of the success of CAG is directly attributable to the interest and attention the liaisons felt they received. Comments like the following provide confirmation for this view: "Sometimes the problem seemed insurmountable until TSC gave me sound, easy-to-follow advice that solved everything"; "Any questions or problems that arose were handled expeditiously by those people who coordinated the project"; and "I found the IRDOE staff extraordinarily helpful and supportive."

CAG Operation in the Pilot Schools

This section will describe the varied ways in which the schools implemented the CAG project. While all faced similar overall restraints such as staffing, one day per week access to the computer, and priorities for student use, each school responded in different and somewhat unique ways. As already explained, each principal exercised his freedom to divide the allocated teaching unit into actual personnel as he chose and in response to schoolwide concerns. The scheduling of on-line days, likewise, was adapted by the liaisons who wanted increased flexibility to meet their school needs. Originally, IRDOE set different student use priorities for Periods 1 and 2. In Period 1 we asked that CAG be used primarily by juniors seeking occupational information, while in Period 2 the priority was to be for seniors selecting colleges.[2] However, we instructed the liaisons to disregard these priorities if they interfered with optimal use of the system. As will be seen in Table 9 (page 67), overall, the schools tended to focus on juniors in the Spring semesters (Periods 1 and 3) and on seniors in the Fall.

Certain other factors, some alluded to earlier, also affected the strategies developed by the individual schools. Although each had to develop procedures to deal with such common concerns as the nature of the Student Study Guide, for example, as well as recruiting, orienting, and following up students, there were other more unique considerations. These included school organizational factors (such as size of student enrollment and length of the school day), location of the teletypewriter terminal, and the schools' educational climate.

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[1] For example, TSC periodically took the computer out of service for overhaul or maintenance checks, but did not (or in some cases, could not) notify IRDOE or the schools in advance as to when this would happen.

[2] In Period 3 there were no priorities; the schools could make their own choices.

Since the Guidance Information System is designed for national use by high school students, the presumption was that the students, with the help of an adult, could read the Study Guide, make choices among characteristics, learn the necessary machine commands, process their own requests, or prepare a summary sheet which they could use at the terminal or leave for batching (i.e., processing in their absence).

At the early meetings with the liaisons, there was a good deal of speculation about the suitability of the Study Guide for the New York City high school student population represented by the five schools. Concern was expressed that the language level was too difficult, the format was too complex, many of the characteristics were not relevant to the students' needs, and the instructions and commands were confusing. Some of these problems, however, involve the way GIS is constructed; others appeared more amenable to solution. Possible solutions for these difficulties were discussed--including the provision of an index, rewriting especially confusing passages, or complete revision. The original contract, however, ran only through December 1974, and since its purpose was one of assessing feasibility, we did not undertake any major revisions. Instead, we encouraged and helped each school to make those adaptations it found necessary. We also discussed some of these concerns with TSC, who revised the Study Guide three times between late 1973 and June 1976.[1]

As it turned out, the liaisons' initial feelings about the difficulties of the materials for students proved to be correct. The schools coped with these difficulties in various ways, all by attempting either some modification in the Study Guide and/or with student worksheets and/or by working with groups or individual students.

From the project's inception IRDOE encouraged direct use of the computerized information retrieval system on the assumption that the advantages of having the student present outweighed any disadvantages. (We will return to a discussion of these points in Chapter VI , Student Use of the Computerized System, and in Chapter VIII , Impact of CAG). While agreeing that direct interaction might prove most beneficial, the liaisons developed styles of operation more in keeping with such factors as the size of the student body and the number of free class periods for students.

The primary advantage of indirect use is that it permits serving many more students per unit of time; its disadvantages are that the student cannot influence the process, and special orientation and/or followup sessions are needed. These sessions could, and indeed most often did, take place on off-line days. In Period 1 all schools, except School B, processed from 71% (School A) to 79% (School D) of the uses in the absence

[1] At the beginning of each project period, IRDOE supplied new sets of Study Guides to the schools. Although revised, on inspection the revisions appeared minor and the inadequacies in format and content that characterized the earliest editions persisted. It was not until the 1976-77 year that substantial modifications were made; this edition represents a great many improvements, including a Glossary of Terms, a simplified and more logical format with larger type and fewer columns per page, and clearer, more complete definitions of characteristics.

of the student. Not only is this a reflection of the schools' desire to provide service to as many students as possible, but it also reflects other organizational considerations. If a school wanted to encourage direct use by students, this usually entailed scheduling appointments in advance for the on-line day. Not all students have free periods, but those that did could use the terminal then, if the room was open and supervision was available. In general, most schools found little demand for direct student use after school hours; the fact is that many students work after school. Getting students in and out of class to go to the terminal involved much paperwork (e.g., writing passes) for the CAG staff; moreover, at first the liaisons were reluctant to ask that a senior be excused from an English class to use the terminal. As time went on, however, and the value of the system became apparent, the liaison would schedule on-line appointments during class time. In those instances where students forgot appointments, their requests might be batched and the indirect users asked to return to pick up their printout and discuss it.

Reflecting differences in structure, organization, and emphasis, the individual schools evolved their own strategies for recruiting and orienting students, handling student use of GIS, and followup after obtaining printouts. Next we will describe some of the unique aspects of implementation in each school, and the ways in which they adapted the general procedures to meet their particular goals.

School A. As already noted, this school had a very meager career education program, and because of the length of the school day it did not offer much in the way of after-school activities. At the beginning this school was the one most concerned about having the student process his own request but also most concerned with loss of class time. The CAG staff worked late on every on-line day, but in this, the largest of the schools, students had no or few free periods and a high percentage worked after school. Thus, a large amount of batching was done.

In Period 1 School A experimented with several procedures. To recruit students in February and March 1974, the liaisons went into the College Bound classes and distributed Study Guides, simplified summary worksheets, and specially prepared sets of revised machine commands to interest students in "Project Decision." In the classrooms, the liaison(s) reviewed the Study Guide and helped individuals prepare the summary sheets which were to be brought to the terminal at the appointed time. By mid-March, the liaisons felt confident enough to attempt to enlist the interest of the cooperative work-study students (generally, those of lesser academic ability)--at first individually, but later in small groups. The liaisons indicated that small group orientation was preferable because of the peer support. For all three periods, the liaison(s) did all orientation; in Periods 2 and 3 the liaison was assisted by other professional staff members.

In Period 2, to implement the priority for seniors to use the college files, the remaining liaison (a grade advisor) worked closely with the college advisor; the location of the terminal in the college office facilitated the flow of such referrals. In concert, the liaison and the college

advisor decided to discourage use of CAG by the large proportion of students interested only in CUNY, since more reliable information about CUNY is easily available in the college office. Instead, they encouraged exploration by students interested in non-CUNY schools, with the result that there were fewer users than in Period 1 (and considerably less batching). The liaison called in each student whose class standing made competitive colleges (i.e.,non-CUNY) a possibility. Once their requests were processed, the system was opened to all other students.

By Period 3 few, if any, classroom orientations were conducted. Word had spread through the school and sufficient numbers of students came on their own to use the terminal. This freed the liaison, who established a "mini-career resource library" near the terminal, starting with the D.O.T. IRDOE provided to each high school; the library was stocked with all the materials she could locate free of charge. The fact that word-of-mouth advertising caused School A students to initiate asking for an appointment was "very unusual in this school." "Most students," according to the liaison, "do not actively seek advice"[1]--although by 1975 they "were stopping 'the computer lady' in the hall and asking me questions."

School B. Of the five, School B had the major career emphasis--including a good career library and participation in several other career orientation programs supported by outside agencies; in addition, over half the school population was in the Career Academy. Because this was a newly-built school it did not have a full graduating class in June 1974. Thus, CAG was used more by students in lower grades than the other schools.

In February 1974, the guidance intern initiated CAG by providing two full days of orientation to large groups of 10th and 11th graders. For these, and all other orientations, he xeroxed the Study Guide, cutting and pasting pages to reduce format problems. The initial recruitment effort, similarly to that of every other school, was to recruit students who had taken PSATs or who expressed interest in going to college. This liaison, like the others, focused on higher ability students initially because the liaisons were not completely comfortable with GIS, and the college data files were easier to manipulate.

Group sessions dealt with general issues (e.g., what are liberal arts colleges), as well as with students' individual problems. The liaison spent a good deal of time with each student at the terminal, and had many direct users operate the terminal themselves. In Period 1, School B's liaison had the largest proportion of direct users. According to the liaison, he was much less successful in interesting non-college bound 11th graders. With each student, he spent a great deal of terminal time in exploring and discussing college and career alternatives. Students who could not have direct interaction were invited to submit a summary work-sheet; after batching, the liaison almost always arranged a followup interview with students. In the initial project months, most batching resulted from students' failure to keep their appointments.

[1]According to the results of the Initial Survey (March 1974), however, School A's students had the greatest desire for more help.

The liaison also established the CAG experience as part of a new Decision-Making course offered by the guidance department. There were efforts to coordinate CAG activities closely with the school's career programs. By the end of March 1974, he had begun a community program drive inviting School B parents and students to come in together in the evenings or on Saturdays, to use CAG.

In Period 2 the terminal was moved to a private location that served as the liaison's office which became a "center" for college and career advising. During every visit we observed many students in the office, preparing summary worksheets and looking through brochures and catalogs.

The one notable change in procedures in Period 3, which affected outcomes, was a radical shift to batching. According to the liaison, "in order to serve more students we have almost exclusively indirect use of CAG."

School C. Perhaps relying on its reputation as one of the more "academic" public high schools, School C attempted no revision in the Study Guide or auxilliary student materials. Initially (in February and March 1974), recruitment was directed to the higher ability students; the college advisor-liaison conducted orientations in only two classes, after which "word of CAG spread, and self-referred students came to the college office asking to use the computer." They were encouraged to borrow Study Guides, or read them there, and to complete a summary worksheet if they wished. Many students did not [have to] fill out a worksheet, either working the terminal themselves or asking one of the three advisors in the college office for assistance. School C students had free periods and often came to the college office at the end of the school day.

Toward the end of the first period, CAG staff began to reach out to students of lesser academic ability, those in remedial classes as well as those in the "modified" (easier) curriculum. Most of these were recruited by the career counselor-liaison, and most of their requests were batched. The occupational file was used mainly to obtain descriptions of specific occupations for use with a career education group or for publication in the school's newspaper.

In Period 2, as has been mentioned, only the college advisor worked with CAG. She did, of course, help students who were interested in career information, but with the serious staff cutbacks in the college office there was an overall decrease in use. Most of the students who used CAG sought access on their own. To facilitate the CAG operation, as well as the large volume of applications to non-CUNY colleges, the liaison asked each student who wanted to see a college advisor to use GIS first.

According to the liaison, use of CAG "fell off during Period 2 because most of the potential college-bound 12th graders had already applied to college and had had CAG experience as juniors" in Period 1. School C personnel felt that, for college information, "the system is most valuable to students in the spring semester of the junior year." While this may be one important reason for the great decline in use in Period 2, usage in Period 3 was also low. Despite the on-paper allocation

of the teaching unit allotment to CAG, it was quite clear from visiting the school that the liaison's first loyalty was to the college office; she had much less time to complete IRDOE's data collection forms and to recruit students and help process their requests; moreover, she indicated that CAG might increase the office's already heavy work load by leading to more college applications to be processed and more tests (e.g., SATs) to be arranged.

School D. At this school the liaison(s) modified the Student Study Guide extensively, more extensively than at any other school. The primary liaison produced a much-shortened guide to the college and occupational files, by including only those categories she considered most important (e.g., tuition, location) to students. She told the students, however, that the complete Study Guide was available, and invited them to review it.

In Period 1, orientation took place in English classes. Both liaisons (the college advisor and the career counselor), and at least one paraprofessional, visited each class and discussed GIS, giving a full period of orientation. Largely because of the time allotted and the fact that there were three (or four) staff people present to give students individual help, all interested students prepared summary sheets. The students wrote out their requests and interests (in words). The paraprofessional later coded these requests into the appropriate commands and characteristics. School D had requested, paid for, and received a somewhat more complex terminal model--one with a papertape feed--that enabled pretaped requests to be processed automatically. As a result of this school's interest in and familiarity with computers, only about a fifth of the interactions in Period 1 were direct. Most direct uses, and all batched ones, were processed by the paraprofessionals in the late afternoon and early evening hours.

The primary liaison also operated the terminal. She, moreover, spent a great amount of time early in Period 1 exploring the construction of the system. Together with the paraprofessionals, they first brought to our attention some of GIS's inconsistencies and inadequacies. The liaison(s) screened all printouts before returning them to the students; if it appeared necessary, she requested the student to come in and discuss it. Students also initiated appointments with the advisors and counselors after receiving their printout.

In Periods 2 and 3 activity at School D was low; however, the amount of direct use increased greatly. Both occurred as a result of the same citywide cutbacks in staffing. As in School C, CAG personnel on-paper assignments remained about the same as in Period 1, but they actually had much less time for CAG activities. The counselor-liaison was inactive and, according to the college advisor-liaison, potential college-bound seniors had previously explored the college data files. Many 8th term students enrolled in the mini-school began to use the occupational file, and almost all students were self-referred.

School E. School E was the only one of the five that maintained a "College and Career Office." This office was staffed by a mathematics teacher who assumed CAG responsibility as well. With the help of part-time paraprofessionals and a secretary she tried many approaches for

devising a smooth flow from orienting to following up students. Because the school was so small (about 1/3 the size of School A), by the end of Period 1, almost all seniors had had CAG experience.

During Period 1, the liaison invited all students seeking or referred to the office for advising to review the Study Guide and complete a summary sheet--color-coded by file. Both she and the paraprofessional went into classes to provide orientation, and there were referrals from other staff and counselors. The liaison estimated that approximately one-third of the students heard about the system by word-of-mouth, another third signed up as a result of classroom orientation, and the remainder represented referrals from faculty and from community-wide publicity.

In Period 1, in the liaison's eagerness "to give a good thing to everyone," School E batched 3 out of every 4 requests; but if students came to the terminal during a free period on an on-line day, the liaison encouraged them to use GIS immediately. Either she, but more likely the paraprofessional, operated the terminal. By Period 2, the liaison placed somewhat more emphasis on having the student present (i.e., on direct use). We observed that it was not uncommon on on-line days to see an entire class lined up, each student waiting his or her turn.

As can be seen in the chapter on Student Use (Chapter VI), School E saw the most students, was most consistent in the amount of on-line time they spent each scheduled day, used all scheduled days and rarely requested more, and were rigorous in completing data collection forms and maintaining their own CAG records. The only changes from Period 1 to Period 2 and 3 concerned improved (i.e., better systematized) procedures.

If the student did not come in to pick up his batched printout, it was sent to his homeroom. (All 5 schools sent the printout to the homeroom class in similar situations.) School E, however, sent the carbon copy to the student's guidance counselor in an attempt to involve the guidance department in the followup process. Another example of a follow-up procedure that was tried was having the liaison return to the classroom, distribute the class's batched printouts, discuss the output, and encourage another round of use.

In summary, in this chapter we have attempted to provide a description of the various ways in which five pilot high schools implemented a computer-assisted information retrieval system. Some of the need for adaptation was a direct result of such things as the way GIS is constructed and the way the Study Guide was written. Other variations resulted from the limitations imposed by the amount and duration of funding--including one day per week access. Still others reflected unique and salient aspects of the pilot schools--their size, the range of administrative support, the ability level of the student population. Even the age of the physical plant had an impact, affecting (at the simplest level) the location of the terminal and its accessibility to staff and students. The variation enabled important differences to become apparent and thus provided us a broader base on which to make suggestions, recommendations, and predictions.

CHAPTER V

ANALYSIS OF THE GIS DATA FILES

Before presenting the data describing the number and nature of the students who used GIS--and its impact on them--it may be well to examine the nature of the information a student obtains when using the system. Although the purpose of the CAG project was to assess the concept of computerizing college and career information for high school students and staff, the test of such a concept necessarily involves demonstration with a specific system; the usefulness of any such system depends largely on the kind and quality of information contained in the files, its accessibility, and its meaningfulness to the student in relation to his needs and interests. One concern in this chapter is the adequacy of the information and of the system to the New York City high school student population.

The analysis of GIS is based on examination of printouts[1] and the Student Study Guide and User Instruction Manual; independent checks on the accuracy, recency, and completeness of the information in the data files; observations; student reactions; and liaisons' perceptions and ratings. The discussion will necessarily include comments or implications about the Student Study Guide which contains all categories, characteristics, explanations, and commands for using GIS. The consensus among the liaisons was that a large proportion of the students could not use GIS without help. Part of the difficulty was in the verbal presentation in the Study Guide, compounded by the lack of explanation about how information in the data files is classified and interrelated.

The GIS files use a narrowing or "inverse pyramid" format. The Study Guide, in its general overall explanation of each of the files, does not stress this narrowing or decision-making logic. With one major exception, the college files and the occupational file are similar. In the construct and use of the college files, however, no distinction is made between characteristics that can be used as input and characteristics outputted. This is not true of the occupational file; in this file a distinction is made between characteristics that can be used as input in a search for occupations (selectors) and characteristics that describe an occupation as output (descriptors). Thus, in the occupational file, the user can obtain more descriptive information about an occupation than (s)he can use in a search for one.

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[1] We borrowed and examined copies of all available printouts generated for February 1974. There were a total of 278 printouts from the four-year college file (COL 4); 42 printouts of requests from the two-year college file (COL 2); and 131 occupational file printouts available for examination. The analysis of categories used was based on a total of 377 searches (all files combined). The analysis of recency is based on a total of 357 printouts (all files combined).

For the college files the explanations of the separate categories (i.e., groupings of characteristics) are generally fairly full and clear. The layout of the Study Guide booklet, however, makes some categories less visible or noticeable than others.[1] The COL 4 file contains about 25 categories and 600 characteristics; the COL 2 file contains about 21 categories and 350 characteristics. Each of the 1600 four-year colleges and 1000 two-year colleges in the respective data files are (theoretically) coded as having or not having each of the characteristics.

The occupational file contains only 7 selector categories (consisting of about 80 characteristics); the descriptor categories consist of the same 7, plus 9 more. There are about 270 descriptor characteristics. In this file many of the categories have little or no explanation in the Study Guide. For example, the category, "Levels of Formal Education Usually Preferred or Required by the Employer," contains 14 characteristics or gradations in amounts of education (from "less than high school graduation" to "doctor's degree required or preferred"). The only explanatory statement in the Study Guide is "Several levels may be true of one occupational title."[2]

The liaisons were asked to rate each category of characteristics in terms of several defined variables, using three-point scales. For the college files,[3] the variables included the completeness of the categories and the output, the accuracy of the output (including its timeliness), the clarity of the descriptive explanations of the category, the appropriateness of the characteristics within the category, the relevance or meaningfulness to students of the information in the category (regardless of TSC's treatment), and the frequency of student use of the category. For the occupational file, liaisons rated the categories[4] in terms of completeness (or exhaustiveness), relevance, clarity of explanations, and logicalness of the classification (i.e., do the occupations listed as output seem to belong to the characteristics asked about?) The Appendix contains the liaisons' mean ratings of the college and occupational categories (Tables A5 and A6, respectively). These tables give the TSC titles of the categories and also show the number of characteristics in each category.

College Files

Some of the problems with any data file relate to how the decisions are made about what information is to be stored, and how that information

[1] This has been improved in the 1976-77 edition.

[2] A fuller explanation of this important category seems warranted. The 1976-77 revision of the Study Guide does not provide a more adequate explanation.

[3] Since the two college files (COL 4 and COL 2) are highly similar, for these ratings we did not ask liaisons to differentiate between the two.

[4] Liaisons were asked to rate separately categories included as selectors and categories used as descriptors.

is compiled. To collect and assemble its college data, TSC sends questionnaires to colleges, and makes "a strong effort to get as complete a return [as] possible. Data on [nonrespondents] are obtained from the most recent college catalogues and other reference sources...." Several possible sources of error are obvious--two, especially at large institutions, are: Who fills out the questionnaire, and how reliable is the information furnished by that respondent? Definitions of category meanings may differ among respondents (e.g., what one college calls a prelaw or premed program another may not). If institutions do not respond, then TSC must make inferences from the available reference sources. TSC acknowledges these as problem areas. Less obvious, perhaps, is the possibility of unintentional or purposeful distortion by the questionnaire respondent of the college's activities or requirements (e.g., describing the college in ways that encourage applications from particular kinds of students).

Overall, in terms of which colleges are included, the liaisons indicated that both college files constitute a fairly complete inventory of institutions. The liaisons reported that a few undergraduate colleges were missing--e.g., SUNY at Old Westbury and C. W. Post.[1] Neither of SUNY's two Health Service Centers (Upstate and Downstate) are included, both of which have third- and fourth-year undergraduate programs.

When asked if the COL 4 and COL 2 files comprised the total range of postsecondary educational institutions necessary for New York City high school students, the liaisons agreed that it would be most desirable to include selected graduate schools (e.g., Columbia University School of Journalism), specialized schools (e.g., New England Aeronautical Institute), technical, trade, and business schools (e.g., Katharine Gibbs, beauty culture schools), and other vocational schools where high school graduates could obtain skills training.

Completeness can refer to the categories and characteristics chosen for classifying colleges in the file, as well as to the number and kinds of schools included. Overall, the liaisons rated the completeness of the individual categories highly; all mean ratings were above the midpoints of the scales, with "Costs" being lowest. They did suggest the inclusion of other categories, such as size of college departments and the number of students in each, percentages of minority groups on campus, and high school course prerequisites for college majors. They also suggested that, in the two-year college file, there should be a more refined breakdown of the Conventional Academic Programs of Study category.

The liaisons' ratings of accuracy closely paralleled those for completeness, despite the fact that inaccuracies in the output were the subject of most of their day-to-day comments. All means were above the midpoints, with the lowest ratings given to "Costs,"[2] a category that quickly becomes obsolete. Nevertheless, liaisons noted that the costs

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[1] C. W. Post is in the file, but under its new name--Long Island University, C. W. Post Center--which is not in common local use and which is not cross-referenced under the former name.

[2] "Costs" appears as a major category in the Study Guide, and is made up of: (1) Annual Tuition and Fees; and(2) Annual Tuition, Fees, Room and Board.

are "in the right ball park." On a daily basis what proved most disturbing to liaisons was incomplete or misclassified information. Several examples (from the COL 4 file) follow. Contrary to the information in the file, Queens College offers a communications major, has a drama society (as of 1973), and does not offer a major in dance. John Jay College was not (but now is,1976) listed as having a major in law enforcement and corrections.

While these two latter examples are illustrative of the problems of collecting and classifying information about large multi-unit university systems, similar examples were noted for smaller colleges and univerities. On the other hand, liaisons frequently indicated that the college files contained information that they as college advisors were not aware of; after checking it independently, more often than not GIS was correct.

In certain categories more than others, classification is a problem area. The School C liaison, for example, disagreed with how colleges were classified within the category of "Competitiveness";[1] she felt the classification was quite at variance with her own experience. But what might be regarded as very competitive for one high school and its student body may not be as competitive for another high school with a different student body.

GIS is designed for a national audience. Obviously, data bank classifications cannot differ for each high school; however, our analyses and the liaisons' ratings suggest that the stored information would be much more meaningful to our student population if it better reflected New York City experiences rather than, as now, national ones.

According to TSC, the data files are "updated on an annual basis in a major updating effort completed in the spring and early summer. Limited amounts of data are also changed in the periodic updating between the major updating efforts...." This statement leads to the expectation that in Period 1 (which began in February 1974), the college files should have been updated for the 1973-74 school year.

Our examination of the February 1974 printouts showed a total of 639 different four-year colleges retrieved from the file, distributed all over the United States. Of the 639, 9 colleges (1.4%) were updated in 1974,[2] 22% in 1973, 76% in 1972, and 1 college (0.2%) in 1970. The two-year college printouts we examined contained names of 110 different colleges, located in 19 states. Here the most recent information for one college was dated 1973, and all others 1972. These findings do not support the TSC claim of annual updating. (The reader is cautioned to keep in mind that all these data are based on the very first month of the project. Similar analyses have not been done since.)

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[1] The category of Competitiveness contains 5 degrees of competitiveness. (There is some overlap between this category and that of Academic Characteristics of the Undergraduate Student Body.)

[2] When the computer prints the name of a college, is also prints a single digit which represents the update ("vintage") year (although it is not labeled as such). For example, a "2" signifies that the information about this college was last updated for the 1972-73 year.

The update patterns by state are not the same as the total update pattern. In actual practice, TSC updates its information one state at a time. We found that 83% of the four-year colleges in New York State had been updated in 1973--far higher than the 22% we found nationally. Quite early in the negotiations, IRDOE had suggested the desirability of TSC's giving priority to updating information on colleges in New York State; apparently they adopted this suggestion.

Next we turn to an examination of the frequency of use of the various categories in the college files. Measurement of use can be considered as one index of importance and relevance.[1] The categories of Majors and Location were employed in 98% and 81%, respectively, of the 270 searches of the COL 4 file in February 1974. Coeducation and Competitiveness were used in two-thirds of the searches. The next two categories in rank order, Size of Total Enrollment and Costs, were used far less frequently (24% and 23%, respectively). All other categories were used infrequently, if at all; 11 of the 24 categories analyzed (one was inadvertently left out) were employed in 5% or fewer of the searches.

The use of categories in the COL 2 file differed slightly from that of the COL 4 file. Generally, somewhat fewer categories were used in the 41 searches for COL 2 information that we examined; of the available categories, half were used in 5% or fewer of the searches. The most frequently used categories were Technological and Occupational Curriculums leading to Associate Degree, and as in COL 4, Location.[2] (The category of Majors was probably little used because it is not specific enough to be meaningful.)

These results strongly suggest that major course offerings and geographic location are important to all students, but that students' interests in or requirements for--use of--other information varies with their educational aims. Based on these data, COL 4 searchers exhibited a wider range of interests (used proportionally more categories) than COL 2 searchers.

The findings with respect to usage agree with the results on the Initial Survey as to the factors students considered most important in choosing a college. Their first three choices on the Survey were the fields of study the college offers, location, and tuition and other costs. The lowest Initial Survey rankings were for the size of the college and its accreditation status. Thus our results with respect to frequency of use of college categories parallel to some extent the interests students showed on the Initial Survey, early in March 1974. It is worthwhile to note that, one year later (on a somewhat different measure, see Chapter VIII), students who had had CAG experience differed from non-users both in

[1] Another measure of relevance or meaningfulness was obtained from liaison ratings; overall the categories of information were rated lower on relevance than they were on completeness, accuracy, and clarity of explanations. Ratings of appropriateness were similar to, but slightly higher than, those for relevance.

[2] More than half (53%) of the two-year college searches asked about New York State, as contrasted with only 18% of the four-year searches. This finding might be interpreted to mean that for either costs or other reasons, two-year college applicants want to be closer to home.

respect to their knowledge of the meaning of accreditation, and in their estimates of the value of this type of information.

The role of the liaisons in helping students select characteristics for use in a search cannot be ignored; many categories rated low in relevance by liaisons were the same ones least used by students (as shown in the Appendix, Table A7). We cannot be certain whether the liaisons' low ratings reflected student behavior or, whether liaisons' own feelings of relevance influenced student behavior. In Period 1 especially, as the liaisons were learning how to operate GIS and establishing procedures for student use, a great amount of effort went into helping students focus on characteristics to use in a search. All schools, as noted, coped with this in various ways--all of which had the effect of limiting choice to one extent or another. School D, for example, included only certain characteristics in their modified guide; the School C liaison was observed to steer students away from characteristics that she felt were misleading. As the School A liaison expressed it, "we, consciously or unconsciously, made choices [for the student], introducing our biases [i.e., when we got no response from the student or had other knowledge that (s)he wasn't making appropriate choices] and limiting the decision-making aspect of the project, one of its strongest points."

Occupational File

The structure and organization of the occupational file differs in many significant ways from the college files. First, as already mentioned, there is a much smaller number of characteristics usable as input (7 selecter categories vs. 25 COL 4, and about 80 characteristics vs. 600 COL 4). Secondly, this file is generally less easily understandable, because the concepts underlying the GIS classification of occupations are less well known and sometimes seem to be at variance with common sense.[1] A third major difference is that occupations are only sampled, selected and based almost completely on the information contained in the Dictionary of Occupational Titles (D.O.T.), which was last revised in 1965.

TSC provides no explanation of the basis for choosing their sample of 1,300 from the 20,000 occupations listed in the D.O.T., and inspection of these occupations, as listed in the User Manual, raises questions about the adequacy of the sampling. To examine the situation, we checked to see whether the occupations of interest to students, as stated on the Initial Survey, were in the occupational file.

Of the 341 occupations listed on the Initial Survey as first choice, 41% were in the GIS file, and 35% had one or several closely related occupations in the file; but 24% were not there (in Period 1). Examples of

[1] Common sense suggests that a petroleum engineer, for example, should be classified either under Manufacturing (with other engineers) or under Marine Sciences (off-shore drilling). This occupation can, according to TSC, be properly classified under Transportation since a petroleum engineer is involved with transporting oil over pipelines.

occupations not in the TSC system include: translator, athlete (except for jockey), ecologist, owner of own store or business, member of armed services, marine biologist (which was, however, in the COL 4 Emerging Fields category), sanitation worker, zoologist, computer programmer, travel agent, news broadcaster, and model.[1] The liaisons felt that while the file was, in general, complete, there were many omissions of very much interest to students. Liaisons also indicated areas of general omission--not enough emphasis on sports-related and artistic occupations, and on occupations requiring two and four years of college. That is, liaisons felt there were too many jobs requiring a Ph.D. and too many "immediate opportunities at the lowest level of employment."

For the occupational categories, the liaisons rated three of the same variables as for the college files--completeness, relevance, and clarity of explanations (see Appendix, Table A6). The average ratings of both the occupational selectors and descriptors, in terms of completeness and clarity of explanations, were clearly lower than those for the college files, and particularly so for clarity of explanations. The relevance of the occupational information was rated, overall, just slightly higher than that of the college information.

This reinforces the impression that the high schools do need access to good occupational information. The liaisons generally gave lower ratings to the occupational selector categories than to the descriptor categories--especially for clarity of explanations and for the fourth variable, the logicalness of the classifications. Their judgments agree with our own comments on the inadequacies of the occupational selectors, which are, of course, crucial in determining the job choices obtained in the printout. (The ratings of some of the separate selector categories will be discussed subsequently.)

Unlike the college files, the occupational file does not provide an update year. As part of each occupational description, however, the user obtains 3 to 4 names and addresses of organizations to which to write for further information (see sample description in Figure 2). To estimate the recency of the occupational file data, we used the names and addresses listed on all occupational printouts for February 1974, which yielded a total of 188 different job titles and 150 different sources (addresses) for additional information.

We mailed letters requesting information to the 150 sources. After two months, only half had responded. Of the 75 nonrespondents, 18 letters (requesting information on 27 occupations) were not deliverable.[2] A more

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[1] On the other hand, the 1974 and 1975 versions of GIS contained redundancies--e.g., steward and stewardess, 11 kinds of draftsmen(aeronautical to structural), 5 geologists, a blues and concert singer, and so on.

The 1976-77 edition of the User Instruction Manual includes sanitation engineer, translator, athlete, and news broadcaster; the new description of marine biologist is exactly the same as biologist. The other examples are still omitted.

[2] When these letters were returned to us, we were easily able to check in the telephone directory 5 sources with New York City addresses. Two were listed in the 1972-73 directory, and the other three were in neither the 1973-74 nor the 1972-73 directories. None of the addressees from whom we requested computer-related occupational information replied.

important fact is that the 57 other nonrespondents, who evidently received our letters (requesting information on 61 jobs), did not reply within two months. These are sources to which many students send requests for information.

The 75 organizations that did reply (covering 100 occupations) sent literature which we reviewed for appropriateness. Only 27 responses were judged as appropriate to the request--that is, we received what we sent for.[1] Overall, the sources of additional information suggested in the descriptions are not adequate in terms of response rate nor appropriateness of descriptive materials sent, and many addresses are not up to date.

In the occupational file, it is relatively easy to determine the existence of a problem, but very hard to identify the reason for it. For example, if the list of occupations retrieved from the computer seems to have little relation to the input, it is difficult to say whether TSC's classification was faulty (illogical), whether the D.O.T.'s schema is too complex, or whether the user misinterpreted the definitions of characteristics (inadequate or unclear explanations). The liaisons' ratings of clarity of explanations of the selector categories were uniformly low, except for the category of 15 Occupational Clusters. Actually, the latter selector category is the only one that receives much explanation (in the Study Guide), and it is fairly self-evident; the other six categories have very little or no explanation. Examples of unclear terms are plentiful; one illustration from the Study Guide follows.[2] Following the "Characteristics About Industries--Or Fifteen Occupational Clusters" is the category "Characteristics About Occupations Within Industries." The only explanation of the latter category is these "characteristics...are the nine Occupational Categories of the D.O.T., Volume II...." There is no explanation of how to use characteristics in that category either alone or together with the 15 Clusters.

Consideration of the logicalness of the job classifications seems to involve several related problems. Besides seeming at variance with common sense, another source of confusion is that the same occupation may be found using several characteristics in one category (Amount of Formal Education Required or Preferred is a good example), or may be classified in more than one Cluster. In the fall of 1974, TSC sent an addendum to the User Manual containing a list of all occupations in each of the 15 clusters. While this aided substantially, there are not such "keys" for certain other troublesome categories, such as Interests. For the Interests selector characteristics, the Study Guide tells the user to pick one interest (but not both) from a pair; yet no pair accounts for all occupations. The unfortunate conclusion is that many occupations in the data file are not coded on certain Interests pairs. Liaisons gave the lowest ratings to the Interests category on all variables except relevance. As we shall see, Interests ranked second highest in frequency of student use, so this is more than a minor problem.

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[1] Others said they would send materials if we prepaid shipping charges; in one or two other instances, there was a nontrivial charge for the materials.

[2] Again, the 1976-77 Study Guide attempts clearer explanations, including a glossary of terms. Some categories still remain fairly inexplicable--e.g., Characteristics About Occupations Within Industries.

Another related complication is that many classification "rules" cause confusion. For example, when a user specifies a desire for jobs at a particular educational level, the list outputted yields those occupations where an employer would either prefer or require that level of training. In many instances, the result is that the jobs outputted usually require more education, but the student may be unaware of this fact, unless (s)he clearly understands the implications of the "preferred or required" classification scheme.

The general problem is that there is no set of explanations, no "key," that helps the user understand the system underlying the classifications. It is often unclear why an occupation was included and on what basis (other than the D.O.T.) it is classified. This is obviously a tremendous disadvantage in that it requires much time to become an "occupational file expert," and even the most expert cannot acquire a full understanding of the classification. The most expert tend, rather, to figure ways around the problem.

The analysis of student use of the 7 occupational selector categories was similar to that done for the college files. The aim was to obtain objective evidence on their importance or relevance.

Since there are only 7 categories to select from, the results are, as expected, that frequency of use of each occupational category was higher than for the college categories. Of the 66 searches examined, 97% used at least one characteristic from the category of 15 Occupational Clusters, 83% used Interests, 82% used Characteristics About Occupations Within Undustries, 73% used Levels of Formal Education, and 55% used Aptitudes. In spite of the relatively small number of occupational categories and characteristics, almost no one used Training Other Than Formal Education (9%), or Special Vocational Training Time (6%). Thus, the effective range of occupational selectors was essentially limited to five categories; and even categories like Aptitudes and Interests, which are not very satisfactory, had to be used in half to four-fifths of the searches to narrow sufficiantly. There were suggestions for additional categories; for example, three liaisons suggested adding a category describing which high school and/or college majors are related to the occupation.

The liaisons' ratings can aid in determining the reasons for the relatively low usage of some categories. They rated the Aptitudes category very low on all four variables, suggesting that they considered this category, which does not reflect the kinds of self-information that students possess, as unsuccessful in providing meaningful job choices. Part of the reason for the very low use of Special Vocational Training Time and of Training Other Than Formal Education may be that students are more concerned with, or at least more aware of, the existence of formal educational requirements for jobs. But consideration of the liaisons' relatively low ratings of these two least-used categories (especially for clarity of explanations), as well as our own analysis, indicates that they are not used primarily because of the lack of any explanations. For example, (until 1976-77) the Study Guide does not define differences between "apprenticeship," "on-the-job training," and "in-plant training other than on-the-job training."

Based on our experience and the evidence collected, it is our opinion that the Guidance Information System is a good starting point for a computerized college and career information retrieval system. One of its major defects is that it is not responsive specifically to the needs and concerns of the New York City high school student population. GIS is a national venture. The major significant implication of this latter fact is that TSC, the group primarily responsible for maintaining and updating the system, is necessarily more concerned with marketing and service problems than with educational ones. TSC has provided responsible service, over and above what they contracted for. We feel it is of great importance that educational principles should form the basis for choices of what files the system should contain, what information to include in a file, and how to categorize it. It is unrealistic to expect TSC to devote their time to developing a set of educational objectives and designing content and methodology that will facilitate carefully defined outcomes. Their proper concern was to design a system that has widespread usefulness with diverse student populations across the country--which they have done.

In the 15 months of using GIS, 4137 New York City students in five high schools obtained a great deal of benefits; an improved system could provide additional ones. New York City students need a system with some modifications, some expansions, some unique additions, and maybe some deletions. These necessary changes would take a substantial degree of time, commitment, and for TSC a shift of purpose which is unrealistic to expect from a proprietary organization with an already useful and marketable product.

CHAPTER VI

STUDENT USE OF THE COMPUTERIZED SYSTEM

This chapter presents and discusses data on the amount of student usage of CAG during Periods 1, 2, and 3, in terms of the numbers of student users, the total number of times students used CAG (uses), and the student users' grade levels. To fill out the picture, we will also include data on amount of use of the different files, the proportion of time the student was present (direct) or not present (indirect or batched), and whether (s)he searched the file or requested a description of a college or an occupation from a file.

Users and Uses

Table 3 (page 54) shows, under "Total Users," how many different students had CAG experience in each time period. The "New Users" columns indicate, for each time period, for how many of these different students CAG was a new experience--that is, how many had not used CAG in any other period. In Period 1 the "Total Users" always equals the "New Users"; in Period 2, however, of the 954 total students served in all schools combined, 708 had had no prior CAG experience--i.e., were new users. And, 246 (954 - 708 = 246) students had used CAG in both Periods 1 and 2. The figures for Period 3 are to be treated similarly. During the 15 months under consideration, 4137 different (new) students in the five high school used CAG to obtain college and/or career information; in addition, 504 of these students used CAG in two periods (1 and 2, 2 and 3, or 1 and 3).[1] Added together, there were 4641 students who used the system 6789 times.

The largest number of users and uses--about half the grand total--occurred during Period 1. In Periods 2 and 3 usage was lower, with the largest decrease in Period 2, the Fall semester. Looking at the individual schools in Table 3, in every instance use was greatest in Period 1 and least in Period 2. Moreover, the schools maintained their relative positions: In every period School E had the most new users and total uses; Schools A and B ranked second or third, School D fourth, and School C continuously served the fewest students.

Although there were actually fewer students served in Periods 2 and 3 than in Period 1, how much of a real decrease occurred is not apparent from the data in Table 3. There were differences in the lengths of the time periods (5, 4, and 6 months, respectively), as well as differences in the number of on-line days. As we have already seen, the availability of extra days in Periods 2 and 3 made possible by the community college

[1] There were among this group a small number who used CAG in three time periods; these few students were counted twice, thereby inflating the 504 number somewhat.

TABLE 3

NUMBER OF STUDENT USERS AND TOTAL NUMBER OF USES, BY SCHOOL AND BY TIME PERIOD*

Period	School												All Schools		
	A			B			C			D			E				
	Users		Uses	Users		Uses	Users		Uses	Users		Uses	Users		Uses	Users	Uses
	Total	New		Total	New		Total	New		Total	New		Total	New		Total New	
1 (5 mos.)	497	497	779	445	445	551	383	383	540	392	392	551	557	557	911	2274 2274	3332
2 (4 mos.)	205	165	271	218	173	269	68	42	84	84	53	117	379	275	537	954 708	1278
3 (6 mos.)	282	243	560	409	330	529	80	73	101	193	174	230	421	335	759	1413 1155	2179
All Periods	-	905	1610	-	978	1349	-	498	725	-	619	898	-	1167	2207	- 4137	6789
(N using CAG in more than one period)	(79)			(124)			(33)			(40)			(228)			(504)	

*The first time a student used CAG (s)he was counted as a "New User"; any repeated use by that same student in the time period (s)he first used CAG was added to the "Uses." If the same student used CAG in another time period, (s)he was counted as a "Total User" in that time period.

In School D, large numbers of students were not listed on the User Sign-In Sheets. In the other schools and in Periods 2 and 3, there were only small numbers of unidentified users. From the TSC automated summaries, we could estimate additional uses in each school, and counted these as "New Users," which may therefore involve some duplication.

project[1] resulted in a large increase of on-line days for the high schools and a decrease in mean hours of daily use. To determine what usage in Periods 2 and 3 might have been, had usage continued at the Period 1 rate, we could have predicted a total of 2747 uses in Period 2 instead of the obtained 1278, and 4726 uses in Period 3 instead of the obtained 2179. Although this is the least conservative prediction,[2] in both Periods 2 and 3 use was approximately half of what could have been expected.

Even among the highest users there was a decline in Period(s) 2 (and 3), reflecting that both the initial impetus to serve as many students as possible wore off, and that use in the Fall semester might be lower than that of the Spring term. We also have some evidence that the schools began to use the computer differently, and perhaps with more benefit to students. We will return to this point in the data on direct and indirect usage.

In connection with the results for the individual schools, two facts need to be considered. First, Schools C and D experienced the most severe cutbacks in staffing in Periods 2 and 3 which suggests that staffing has a critical influence on amount of usage. Second, Schools C and D are, generally speaking, the most affluent--both with a strong college orientation and a reputation for academic excellence; this suggests, perhaps, that a system like GIS may be least used in similar schools.

Table 4 (p.56) is helpful in examining the schools' patterns of use during the three time periods. The upper third of the table presents the mean number of uses per on-line day. For all schools combined, the results are as follows: Period 1, 40.4 uses per day; Period 2, 18.8; and Period 3, 18.6. It can be seen that the average daily use decreased by slightly more than half in the latter two periods. For the most part, this is in accord with the general decrease noted above, but also reflects the fact that some schools--notably A and D--increased in the proportion of scheduled days used: Thus the availability of extra days accompanied CAG use on more days, but for fewer students per day.

The mean number of uses per hour (and the average minutes per use) presented in the lower portion of Table 4, tells us more clearly how many students' requests were being handled per unit of time on-line. This measure, just like the mean uses per day, was highest in Period 1, except at School B (which shifted to much more batched use in Period 3). The differences among schools and among time periods, however, were not nearly

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[1] See page 31, footnote 1.

[2] In Period 1, 3332 uses divided by 82.5 on-line days used (from Table 1) = 40.4 uses per day. At this same rate, for Period 2 there could have been (40.4 x 68 days used =) 2747 uses; and for Period 3 (40.4 x 117 days used =) 4726 uses. This procedure does not consider the possibility that had there been no extra days available in Periods 2 and 3, the schools could have been expected to use an equivalent proportion of scheduled days as in Period 1 (89%); with this correction, the predicted usage would be 2409 and 4063 in Periods 2 and 3, respectively.

TABLE 4

MEAN NUMBER OF USES PER ON-LINE DAY AND MEAN USES PER TERMINAL HOUR, BY SCHOOL AND BY TIME PERIOD*

Uses	Schools					All Schools
	A	B	C	D	E	
Uses per Day						
Period 1	45.8	34.4	34.8	34.4	50.6	40.4
Period 2	18.7	19.2	6.7	9.0	38.4	18.8
Period 3	18.1	24.0	6.3	9.2	33.0	18.6
All Periods	25.8	25.9	16.5	16.6	40.1	25.4
Uses per Hour						
Period 1	8.0	5.5	7.0	5.3	9.2	7.0
Period 2	7.5	5.9	5.4	3.0	7.7	6.3
Period 3	7.2	12.0	6.3	3.3	6.3	7.4
All Periods	7.4	7.4	6.6	4.2	7.6	6.8
Minutes per Use**						
Period 1	7	11	9	11	9	9
Period 2	8	10	11	20	8	10
Period 3	8	5	10	18	10	8
All Periods	8	8	9	14	8	9

*Mean uses per day = Total uses ÷ days used. These quotients were obtained from the respective figures in Table 3 and Table 1. Similarly, mean uses per hour = Mean uses per day ÷ mean hours per day (from Table 1).

**To nearest minute.

so sharp as uses per on-line day: The schools tended to process roughly similar numbers of student requests per hour of use.[1]

Thus, the decline in the amount of use in Periods 2 and 3--reflected in the number of uses per day--did not affect the average length of time taken to process a student's request for information. The individual schools did differ, however, in respect to the number of requests processed per hour. They tended to maintain the same rank order, with School E processing the most and Schools C and D the fewest requests per hour. As we will see below, the primary variable to which these findings are related is the proportion of requests that were direct or batched.

[1]The overall slight increase in Period 3 is entirely attributable to School B.

Before considering the data on direct-indirect use, we will consider multiple use of CAG by students.

Multiple Use

Some students used CAG more than once, and the proportions of "multiple users" differed by school. Table 5 shows the data, summed for the three time periods. Although a majority of the students used CAG only once, over a third (38%) used it more than once. Using CAG twice

TABLE 5

NUMBER OF STUDENTS USING CAG ONCE AND MORE THAN ONCE, BY SCHOOL, ACROSS ALL TIME PERIODS (Based on N = 4137 New Users)

N Times CAG Was Used:*	School A	B	C	D	E	All Schools
Once	500	666	346	422	645	2579
More Than Once	405	282	152	197	522	1558
% Using CAG More Than Once	45%	30%	31%	32%	45%	38%
Breakdown of Multiple Use:						
2 times	233	202	104	138	275	952
3	93	50	31	42	119	335
4	42	23	9	13	56	143
5	28	6	7	2	34	77
6	7	0	0	2	21	30
7	1	1	1	0	11	14
8	1	0	0	0	3	4
10-13 times	0	0	0	0	3	3

*Total uses, irrespective of different users, equal 2579 + 2(952) + 3(335) ... + 10(1) + 11(1) + 13(1) = 6789.

was quite common, and 128 students returned 5 or more times. In the individual schools, the proportion of multiple users was about 30% in Schools B, C, and D, and went up to 45% in Schools A and E.

Multiple use seems to be related to how CAG is presented. School A, for example, encouraged students to return with new questions or suggested areas to explore at the next CAG use. School E stressed as much coverage as possible, so its students needed to return for additional

information. School B, on the other hand, initially spent a considerable time with each student at the terminal, exploring all options and alternatives; at School B there was the smallest proportion of students using CAG more than once. The school-to-school difference probably reflects liaison practices and attitudes, including methods of recruitment, conditions of use (e.g., direct vs. indirect; search vs. description); it may also be a characteristic of certain types of students.

The liaisons were asked how they characterized students who requested repeated use of CAG. Most "repeaters," according to the liaisons, tended to be highly motivated students, or ones exceptionally fascinated with the computer system. One liaison felt that the repeaters were students with a wide range of interests who could not decide on a single set of characteristics for college or occupational information, and who would continually return to explore different criteria. Another liaison indicated that in her experience, repeaters exhibited a growing sophistication with the program, using more refined criteria for searches, and asking more specific questions about the output. Liaisons commented that repeaters learned to use the system with much finesse, and began to ask much more specific questions about themselves as well as about GIS.

Direct Vs. Indirect Use

The CAG experience can involve either having the student process his own request for information, being present at the terminal while an operator processes the request, or having his request processed while he is not present. We have called the last condition of use indirect or batched. The first two conditions--both involving the presence of the student--is referred to as direct use; for all intents and purposes, there appears to be no difference between them.[1]

Table 6 (p.59) shows the percentage of direct and indirect use for each school for each time period. During Periods 1 and 3, for all schools combined, only a little over a fourth of the students (29% and 28%) were present at the processing of their request; thus, indirect use predominated in the two Spring semesters. During Period 2, however, nearly half the students (48%) had direct experience, and every school had as much or more direct use than in Period 1. The surge in proportions of direct use in Period 2 was in response to IRDOE's feedback to the liaisons, implying a change in this direction.

In the individual schools, the proportions of direct use differed from the overall averages. In Period 1, School B stands out as having

[1]There were actually very few instances where students processed their own requests. Basically, there were two reasons: the machine commands as presented in the Study Guide were too difficult for the average student to comprehend on his own, and telephone security concerns as well as the need to establish an efficient operation discouraged most liaisons from attempting this more frequently. In every school, however, there were individual students and student aides or monitors who operated the terminal.

TABLE 6

PERCENTAGE OF DIRECT AND INDIRECT USE, BY SCHOOL AND BY TIME PERIOD*
(Figures in Percentages)

School	Time Periods						All Periods	
	1		2		3			
	Direct	Indirect	Direct	Indirect	Direct	Indirect	Direct	Indirect
A	29	71	56	44	25	75	32	68
B	45	55	45	55	3	97	29	71
C	29	71	46	54	88	12	39	61
D	21	79	76	24	52	48	33	67
E	25	75	39	61	37	63	30	70
All Schools	29	71	48	52	28	72	31	69

*Uses that could not be identified as direct or indirect were not used in calculating the percentages. For all schools all periods combined there was a total of 188 unidentified uses, of which 135 were for School D in Period 3.

considerably more direct use (45%) than the other schools; it maintained this same proportion in Period 2, but shifted radically in Period 3, when 97% of its use was indirect. School D in Period 2 had far more direct use (76%) than the other schools; and while this proportion dropped to 52% in Period 3, D still remained above the average. School E had the largest proportions of indirect use in every period (75%, 61%, and 63%); viewed along with the Table 7 data, these uses were mostly to obtain descriptions. School A had somewhat more than average direct use in Period 2, but dropped off in Period 3. The School A data for Period 3 are misleading, since most requests for descriptions of a career or college that followed a search were subsequently batched by the liaison.[1] In other words, many of the indirect uses in Period 3 were uses for students who had used CAG directly earlier in the period.

We have already noted (in Table 4), that Period 2 had the fewest uses per unit of terminal time. We can now examine the findings with respect to direct vs. indirect use in relation to mean minutes per use, shown in the lower third of Table 4. The correspondence between proportion of direct use (Table 6) and minutes per use is not perfect, but comparing the respective entries in the two tables indicate that there is a relationship. That is, the data generally confirm the impression that direct processing takes longer than indirect processing. Thus, when the overall proportions of direct use went from 29% to 48% to 28%, minutes per use went from 9 to 10 to 8 minutes; or when direct use in

[1]Most counts in this report (on number of uses, multiple uses, file use, and so on) follow the same procedure: In general, any two requests by the same student on different days were considered as two uses; two different requests by the same student on any one day were also counted as two uses.

School B dropped from 45% to 3%, minutes per use dropped from 10 to 5.[1] (As anticipated, there does not appear to be any relationship between minutes per use and proportion of searches. See Table 7.) There is a slight suggestion from these data, borne out by observation, that the schools tended to become more efficient over time in processing requests, whether direct or indirect.

The consensus among the liaisons was that direct interaction (as well as searching) was a preferable experience for the student. Why, then, did the schools often make more use of batching? The answer, in part, is that any perceived advantages to the student of direct use had to be balanced against time and demand considerations. We saw that School C's use of batching decreased in each period, as did its volume of use. When there are relatively few students' requests to process, there is little problem in having enough on-line time available so that the students can be present (provided, of course, that there is sufficient staff time for supervision). The primary appeal of indirect CAG use is that it permits serving a greater number of students. Indirect interaction was also sometimes used because of scheduling problems; it was often difficult to schedule students to come in on the school's on-line day.

The advantages of indirect interaction do not make it the preferable technique. The Period 1 Log Day results support concerns that had arisen during less formal observation. In numerous instances the terminal operator had to change batched requests for searches because the specifications submitted by the student were improperly written, or yielded "too many" qualifying options, or no options. In these cases, the operator generally made a guess at what to add or delete from the request in order to give the student what he probably wanted. The resulting printout may or may not have been useful to the student. Sometimes the operator did not guess or could not make any changes; in that case, the request was not processed and the student was asked either to submit modifications or to return in person.

The value of having students at the terminal is threefold. First are personal-motivational benefits: Students enjoy being at the terminal watching the typing of the input, and seeing the results type out automatically. Many studerts appeared so fascinated that they strained to read the information as it was being printed--even though this speed was not terribly fast. Liaisons liked the opportunity for extended personal interaction afforded when the student was present; according to the liaisons at Schools A and B, such discussions may be as useful as the computer information.

The second type of advantage accruing from having the student at the terminal is that (s)he can make immediate decisions on modifications in his/her original request, can pursue new ideas, and can discuss the output as it appears. Students can change their mind about what they want as a

[1] Log Day results showed that in May 1974 (Period 1) the average time required to process indirect requests ranged from 3 to 6 minutes, and for direct interactions, from 7 to 16 minutes.

result of the information that that characteristic provided, and can respond to something they see during the run to ask for different types of information.

Finally, direct interaction reduces the routine and often cumbersome paperwork involved in explaining the output to (or revising the input for) the student.[1] When the student is present and professional staff is available, explanations and discussions could and did take place during or immediately after the process. A major problem with the indirect mode is that of orientation and followup--that is, what takes place before and after a request has been batched.

Theoretically, the advantages of having a student present could be sacrificed to some extent if it were possible to insure that every student could be counseled with respect to defining his input requirements and would receive discussion of his output. All the schools tried to conduct scheduled orientations and individual or group followup, with varying success.

The liaisons reported that from 1% (School C, Period 2) to 50% (School E, Periods 2 and 3) of students who had had their requests batched, returned at a later date on their own with questions on additional requests. If, however, the student did not come to collect his batched request, no followup discussion was possible; in these instances, the liaisons sent the printout to the student's homeroom class. The proportion of students with no followup was estimated for Period 1 as 25% at School C, 10% at School D, 50% at School E, less than 10% at School A, and zero at School B. The schools were more successful providing followup in Period 2; an estimated 3% of batched requests at School C, and 10% at School E received no group or individual followup.

It is difficult to determine whether students who had indirect CAG experience gained useful information. The data to be presented in Chapter VIIIprovides indication of benefits to students who had this type of exposure, despite impressions that indirect interaction is not nearly as satisfactory as direct interaction. What is clear is that batching should probably not be done for students with little or low motivation--those least likely to return to pick up their printout: It seems unlikely that students who had indirect CAG experience and no followup gained much useful information.

Searches Vs. Descriptions

Within either the occupational or the college files, GIS can be used in two types of ways, namely, for searches and descriptions. In the first type, a search, the user selects characteristics or qualifications that

[1]There were, as noted, problems in some schools in releasing students from classes during the regular school day. "Passes" had to be written to excuse a student from one class, and if the use occurred during a period change, another "late pass" was needed.

are important to him, and derives a list of jobs or colleges that meet the requirements he has set. (See Figure 1, page 15.) The second type of use is purely descriptive;the user has a particular college or occupation in mind and asks the computer to supply descriptive details from its file. (See Figure 2, page 16.)

Of course, both these capabilities can be employed in a request, and in most cases that is what happened. First the user conducted a search, after which (s)he obtained a description of those items on the resulting printout that were of most interest.[1] The type of use that predominated varied with the school and the individual student.

Table 7 shows, for each school, the proportion of CAG uses which involved searches for occupational or college information, in February 1974 and in Periods 2 and 3; 100% minus the tabled entry is the proportion of descriptions-only. (We did not attempt to extract figures for March-June 1974 because they had to be obtained from an examination of carbon copies of all printouts--a tedious and costly process.) Based on liaisons' estimates and our observations, February 1974 was fairly representative of Period 1.

TABLE 7

PERCENTAGE OF USES INVOLVING SEARCHES, FEBRUARY 1974 AND PERIODS 2 AND 3, BY SCHOOL*

	School					All
	A	B	C	D	E	Schools
February 1974	79%	79%	100%	99%	51%	84%
Period 2	80%	100%	99%	69%	37%	67%
Period 3	59%	99%	100%	95%	37%	67%
Total Identified Uses	902	856	292	462	1366	3878
Total N Unidentified	8	5	35	14	48	110

*Percentages are based on uses which were identifiable as either searches or descriptions-only. Of the 3988 total uses involved, 531 were in February 1974 and 3457 in Periods 2 and 3. Of the February total uses, 15% were unidentifiable; for Periods 2 and 3, less than 1% were unidentifiable. Any search which was followed by a description within the same use was counted as a search. We did not analyze March through June 1974 because of the relatively great effort involved prior to the TSC automated data program.

[1] In Table 7, this type of use--i.e., a description following a search in the same file (and during the same session)--has been counted as "search." To qualify as a "description-only," a session had to be devoted to this activity alone.

Most schools used the search mode much more frequently than descriptions-only, except for School E, which consistently made the least use of searches. School A used searches almost exclusively throughout, as did School D--except in Period 2. At School B, after Period 1, almost all uses were searches. At School A in the earliest periods, about four-fifths of the uses were searches; in Period 3, this decreased somewhat, to 59%.

Another way to view the data in Table 7 is to consider the reverse of the tabled entries--the percentage of descriptions-only. At School A the proportions of descriptions-only (21%, 20%, and 41%) were generally higher than at Schools B, C, and D. These School A figures, however, reflect the liaison's practice of encouraging students to think about the list they obtained from a search, and then to return to obtain descriptions of the most interesting items.[1] The increase in proportion of descriptions-only for School D in Period 2 reflects that school's increased use of the occupational file (see Table 8, p. 65), and the liaison's feeling that that file was too unwieldy to search. At School E, the high proportions of descriptions-only may be partly responsible for their results (to be presented later) on the independent measure of decision-making skills and the favorable attitude of students toward the computer as a source of college and career information.

School-to-school differences reflected not only liaison attitudes, but students' interests as well. At every visit to the five high schools, IRDOE staff observed students using GIS to test or confirm what apparently were decisions already made. One student at School C, after completing a search in a college file, examined the list of colleges and said--with skepticism--"I never heard of 'X' College, not that I would have applied there if I had." Another student (School E) came to the terminal asking for a description of "a lawyer and a plumber"; when he was asked, he told us that his father wanted him to go into his business (plumbing), but that he was interested in the law. There are numerous other examples of students using the computer to confirm choices made previously. It was not uncommon for students to request a college file search and look over the output to see whether indeed the college they wanted to attend was on the list: When it was, the students' excitement was obvious; when it was not, and the reason uncovered,[2] the students were appreciative.

Most liaisons agreed that the primary value of CAG was in helping students explore schools and occupations in relation to their own personal interests, abilities, and qualifications. All felt that using the system

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[1] Because the description was obtained at another session, to be consistent we counted it as a description-only, having previously counted the search.

[2] A student (School A) included in her requirements in a search that the college offer a major in secretarial science. After examining the list of colleges that met her requirements she asked the liaison why "X" College was not on the list. By checking the data file first (and then the catalog) the liaison was able to tell her that "College X" did not offer her major. It turned out that the student had already been accepted by and decided to attend that college. As a result of this interaction the student changed her plans, electing to enroll in a college that offered the field of study in which she was interested.

to obtain descriptive information from a source as novel as the computer, and with more immediacy and personalization (in the printout) than from library references, produced enough student interest and motivation to make such use worthwhile. While this argument has merit--and is supported by the findings with respect to the impact on students--it seems to us that the unique feature of GIS is its search capabilities, i.e., its narrowing program format that shows the user the results of his/her own criteria in decision-making.

Data Files Used

Table 8 shows, for each time period, the proportion of total uses of each file. In all schools, the proportion of use of the COL 2 file was small--a result in accord with student preferences indicated in the Initial Survey.[1] We therefore combined COL 4 and COL 2 into a "College Total," which can be contrasted with the respective percentages of uses of the occupational file. (In all periods together, there were only 33 uses of the Scholarship file--less than 1%.)

Regardless of the different priorities IRDOE suggested for Periods 1 and 2, total uses for all schools combined were fairly evenly divided between occupational information and college information. In line with the priorities, there was slightly more use of the occupational information in Period 1 (51%, vs. 48% college), and of college information in Period 2 (55%, vs. 44% occupational). In Period 3, when no priorities were specified, there was somewhat more use of the college than of the occupational files.

The overall results conceal marked differences among the separate schools. Examination of the results for individual schools in Periods 1 and 2 suggests that most of them made some effort to comply with the priorities. In Period 3, however, use in Schools C and D was almost exclusively of the college files, by juniors (from Table 9, p.67). Of the Period 3 uses, about two-thirds of those at Schools A and E were in the occupational file, but less than a third of those at School B. Extrapolating from Table 9, these School A and E uses (of the occupational file) may have been largely by juniors; most of School B's use of the college files in Period 3 (70% of the total uses) must have been by juniors, since there were few senior users in that period. It is interesting that the big career emphasis in School B did not lead to high use of the occupational file. Rather, the interpretation may be that career information needs at School B were being better met than college information needs.

To comment further on differences among the schools with respect to the balance between use of occupational and college information, School E usage remained the most constant throughout the three periods--

[1] Use of COL 2 did increase slightly over the time periods--overall, from 9% to 12% to 13%. Even in Period 3, use of the COL 2 file accounted for only 24% of the college file explorations.

TABLE 8

TOTAL USES OF EACH GIS FILE AS A PERCENTAGE OF USES WITHIN EACH TIME PERIOD, BY SCHOOL#
(TOTAL USES = 6789)
(Figures in Percentages)

Files Used	Period	School					All Schools	Total N Uses
		A	B	C	D	E		
College 4	1	18%	36%	71%	65%	25%	39%	1297
	2	54	55	91	48	24	43	555
	3	24	50	87	72	29	40	875
	All Periods	26%	45%	76%	65%	26%	40%	2727
College 2	1	2	12	8	11	12	9	296
	2	10	15	4	14	12	12	153
	3	7	20	12	19	10	13	271
	All Periods	5%	16%	8%	13%	11%	11%	720
College Total	1	20	48	79	76	37	48	1593
	2	64	70	95	62	36	55	708
	3	31	70	99	91	39	53	1146
	All Periods	31%	61%	84%	78%	37%	51%	3447
Occupational	1	80	52	21	23	62	51	1705
	2	36	30	5	38	63	44	560
	3	69	30	0	9	61	47	1028
	All Periods	69%	39%	16%	21%	62%	49%	3293
								Schl. Unds.
Scholarship or Undesignated**	1	*	*	*	1	1	1	20 14
	2	*	*	0	*	1	1	8 2
	3	0	0	1	*	*	*	5 0
	All Periods	*	*	*	1%	1%	*	33 16

#The percentages are based on the Ns for total uses in Table 3; e.g., of School A's 779 total uses in Period 1, 20% involved one of the college files and 80% involved the occupational file.

*Less than 1%.

**Students who signed in without indicating which file(s) they used were counted as having one undesignated file use. Undesignated uses occurred mainly in Period 1 prior to automation of user identification.

two-thirds occupational and one-third college. School C almost abandoned use of the occupational file after Period 1 when the career counselor-liaison became inactive, and School D did the same somewhat later but for largely different reasons. In both Periods 1 and 3, School A made the highest use of the occupational file.

There seems to be some inverse relationship between amount of use of the occupational file and the nature of the student population at the five schools. Schools C and D, the more affluent, tended to use the occupational file least; Schools A and E, with a lower socioeconomic population, made greater use of occupational information, perhaps because fewer of their students will go on to complete college.

Grade Level of Users

To what extent did the schools abide by the suggested priorities to stress use by juniors in Period 1 and by seniors in Period 2? And what happened in Period 3 when no priorities were specified? Table 9 (p.67) shows the results with respect to grade level; the table combines grades 9 and 10 because there were very few or no 9th grade users involved.[1]

In Period 1, 58% of the users in all schools combined were juniors--nearly three times the proportion of seniors (21%). In the individual schools, only School A had fewer junior than senior users (42% vs. 48%). School B, as was mentioned, did not have a full graduating class in Period 1, and 42% of its users were 10th graders. (6% were 9th graders.)

In Period 2 there was a shift, in line with the priorities; the overall proportions are 56% seniors and 55% juniors. In Schools C and D the CAG users were almost entirely seniors. School B was the only school where senior users did not exceed juniors. This was probably because so many Period 2 juniors knew about CAG as a result of the large number of them who were recruited in the sophomore year (Period 1, Grade 10). School B had many more senior users in Period 2 than in Period 1 (51% as compared with the previous 2%), and use by 9th and 10th graders fell off sharply, from 48% to 8%.

In Period 3, the Spring term of the 1974-75 school year, the schools made their own choice about grade level priorities. As Table 9 shows, nearly three-fourths of all users were in grade 11; this is a much higher proportion of juniors than in the two previous periods. Use by seniors was correspondingly lower, at 13%, than in Periods 1 and 2. The only school with any appreciable proportion of senior users was School A, with 30%.

These results are not conclusive with respect to the pre-established priorities, but they strongly suggest that the priority for use by juniors

[1] There is some duplication in grade level; for an explanation, see the footnote to Table 9. The highest proportions of grade 9 users were at School E--12%, 2%, and 9% in Periods 1 to 3, respectively.

TABLE 9

PERCENTAGE OF CAG USERS IN GRADES 12, 11, AND 10 AND 9, BY SCHOOL AND BY TIME PERIOD*
(Figures in Percentages)

Period	Grade	Schools					All Schools
		A	B	C	D	E	
1	12	48%	2%	12%	25%	14%	21%
	11	42	50	83	69	56	58
	10-9	10	48	5	6	30	21
2	12	61%	41%	94%	96%	46%	56%
	11	35	51	6	0	39	35
	10-9	4	8	0	4	15	9
3	12	30%	7%	10%	9%	9%	13%
	11	69	68	89	90	70	73
	10-9	1	25	1	1	21	14
Total N with Identified Grade Level		980	1002	494	596	1333	4405
Total Unidentified		4	70	37	63	62	236
Total N in Grade 9		18	29	0	0	110	157

*The percentages are based on the students with known grade level. This table involves some duplication because some students used CAG in more than one period. If, for example, a student used CAG in Period 1 as a tenth grader, and again in Period 2 as an 11th grader, (s)he is counted twice in this table. The Period 2 data involve 246 such duplications, and Period 3, 258.

in the Spring term accorded generally with needs in the individual schools. As we saw in Table 8, however, the priority for juniors' use of the occupational file in the Spring semester did not accord with actual usage, since over half of the Period 3 uses (by juniors and seniors) were of the college files. There is more question about IRDOE's priority for college file exploration by seniors in the Fall term. Cross-comparisons would have been helpful in examining how practical were the pre-established priorities. Did seniors in the Fall term use mainly the college files, and in the Spring term did more juniors than seniors use the occupational file? Any such cross-tabulations would be very time-consuming, since they would have had to be done by hand.

The liaisons were asked which students, in terms of grade (maturational) level, benefited most and least from CAG. They tended to agree that the older students, in grades 11 and 12, got more out of the experience than did the younger ones, although the liaisons at Schools B

and E stressed that CAG benefited high school students in all grades. When the liaisons were asked which students benefit most and least in terms of ability and aspiration level, five of the six respondents agreed that students at or above grade level in ability, the college bound, and the highly motivated benefit the most. The remaining respondent (School E) said CAG was of most benefit to those below average ability, and of least benefit to the "extremely bright." One liaison (School C), while agreeing that CAG benefits the highly motivated student, felt that those with lower ability may be more receptive to the CAG method--i.e., to GIS's decision-making programming format.

Considering the diversity of the analyses we performed with more than 4,000 CAG users--who used GIS with apparent benefits--there remain several questions that need to be addressed, but which are not answerable from the analyses we conducted. For example, the evidence presented in Chapter V, Analysis of GIS Data Files, indicated inadequacies in the system; in particular, the occupational file was less understandable, less relevant, and less well-organized than the college files. To what extent, if any, did the specific system employed in this demonstration influence usage patterns? At Schools A, C, and D, the terminal was located in (or near) the college office; at Schools C, D, and E, the primary liaisons were college advisors. To what extent did this predominance of college emphasis bias the results? With the citywide cutbacks in school staff in Periods 2 and 3 there was a reduction in the amount of staff time actually spent on CAG. Is the decreased use in Schools C and D, for example, related to the resultant college office workload, and the fear of increasing that workload through CAG use? Another consideration is the worsening economic conditions in New York City which reached a nadir in Period 3. Did this situation, in fact, influence use in School A? In Period 3, School A's use of the occupational file by 11th graders may reflect student awareness that their plans for going to college might not be realizable.

Despite the fact that--considering all evidence together--CAG is seen as providing some benefit to large numbers of students in all grades, some priorities need to be considered and explored further. In terms of the kinds of decisions GIS requires, we feel that most ninth graders might not be ready to use the system without a more structured framework in which to consider their options. The data with respect to tenth graders are inconclusive, although the liaisons report that CAG causes students to begin thinking seriously about career and college decisions earlier in their high school years. Further study focused on these younger grades could reveal under what circumstances these students could profit from CAG. From the evidence we have gathered, CAG can be successfully used with juniors and seniors. GIS, despite its limitations, is highly flexible and provides many different experiences for many types of students. In the next two chapters, we will examine the question of whether these experiences have direct impact on student users.

CHAPTER VII

OUTCOMES: ANALYSIS OF COLLEGE APPLICATIONS

One area in which we anticipated differences between students with CAG experience (users) and those with no CAG experience (non-users) was in their applications to college. Initially, we reasoned that as a result of the computer's capability to retrieve all appropriate colleges in its data files, there might be more applications by users than non-users; and that users who made college applications might apply to a greater number of different colleges. It also seemed possible that the acceptance rate for users might increase as a result of their exposure to a list of colleges that fulfilled their requirements (i.e., colleges that met the needs they had specified).

We could not compare college applications of users and non-users. The closest we could approach comparative data was through an examination of the college applications filed by the 1974 and 1975 graduating classes in the five high schools. The rationale for this comparison is that most of the 1974 graduating seniors (June 1974) had already completed the college application process prior to the introduction of CAG in February 1974. In contrast, any uses of the GIS college files by the 1975 graduating seniors either in Period 1 as juniors or in Period 2 as seniors, could have influenced their choices and actions.

The reason that we could not compare users and non-users was that the records and recordkeeping procedures in four schools would have made collecting this data extremely impractical. Although Schools A and D both maintained the college application records in terms of individual students, there were differences. At School D, a card was kept for each student listing the colleges (s)he had applied to; at School A, however, a notebook was kept, listing chronologically the date an application was processed and for which student. Thus, for School D it would have been possible to separate users and non-users, and compare the number and kind of college applications; for School A it was not possible since there was no easy way to first compile a list of the colleges a particular student had applied to.

At Schools B, C, and E, records were maintained by college. Usually this took the form of a file card system of colleges applied to, each college on a separate card, listing the name of the student(s) who applied. Similarly to School A, it would therefore have been extremely difficult to separate users and non-users among the college applicants.

Although we used the most suitable records available in the individual schools, the figures in this chapter are less accurate than would be desirable for many reasons. One important consideration is that the raw numbers of applications must be viewed in relation to the respective numbers of graduates, which we accomplished by calculating applications per graduate (APG). The discussion in this section--with the exception of

CUNY--pertains to college applications rather than applicants. Other complicating factors are discussed below.

To collect the college data, IRDOE staff visited each high school several times in June of each year; in September 1974 we visited again to re-check the June 1974 data, but did not do so for t' 1975 data, since the project contract ended in June 1975. The schoo college offices process all applications and keep all records. They are supposed to be notified of CUNY admissions; they are not promptly and systematically notified about acceptances or rejections by other colleges.

We analyzed the data within three categories, namely City University of New York (CUNY), State University of New York (SUNY), and "other" colleges; the latter two make up the non-CUNY total. Applications to CUNY represent just one per graduate; those to SUNY and those to other colleges may represent more than one application per graduate. There is undoubtedly overlap among these three categories of students-who-applied. Our impression when collecting the data and from discussions with the college advisors was that most students who applied to SUNY and/or "other" colleges also applied to CUNY. Moreover, in at least 3 of the 5 schools every graduate was directed to file a CUNY application--whether or not (s)he was going to go on to college. The advisors and students thinking about college regard this as a safeguard, since the graduate could be sure of acceptance by CUNY.

With the advent of the Open Admissions policy at CUNY, in which every New York City high school graduate is admitted to one of the twenty units of CUNY, the student files only one application to the system, on which (s)he expresses his/her first six preferences for particular coll s within CUNY. Although acceptance to the system is guaranteed, ther is no guarantee that a student will be accepted to the schools of his/her choice.

CUNY applications go through a central processing, and lists of acceptances are received by the sending high schools; these lists of CUNY acceptances state to which CUNY college the student is admitted. We used these lists to determine the numbers of students applying (and accepted) to CUNY. If a student had applied but had not yet been listed as accepted, our data would not show that CUNY application. Neither do we know whether the accepting CUNY college was among the student's preferences. Although CUNY notifies the sending high schools about acceptances, its applications processing differed in the two years. CUNY acknowledged late applications by June 1974, but had not yet done so by June 1975, when all our data collection ended. For this reason we probably identified fewer CUNY applications in 1975.

The colleges comprising the SUNY system, and all other public and private colleges each require a separate application. It is easier to fill out an application to CUNY than to most other colleges, because the kind of information CUNY requests is simpler and less detailed. It is, moreover, less expensive to apply to CUNY; other colleges require a fee to be paid when the application is submitted. Finally, high schools differ with respect to the number of non-CUNY applications they encourage

a student to file, since each separate application requires a copy of the high school transcript, letters of recommendation, and other information that the sending school processes. Thus, in order not to swamp the high schools' college office, there is an unwritten limit placed on the number of applications the average student files.

Our data with respect to non-CUNY applications comes from the records, described above, which are maintained by the college office. Information about acceptances by non-CUNY schools is also maintained by the college office, but differs from CUNY acceptances. In general, many SUNY colleges notify the sending high school and the individual applying about acceptance; the high school does not receive SUNY acceptances (and rejections) until after the end of June, so again we may have identified fewer of the SUNY acceptances in 1975. Acceptance/rejection letters from the other colleges go to the student directly, and often not until May or even June; the student, in turn, may or may not notify the college office of the outcome. There is no apparent reason why the procedure with respect to these 'other' colleges would affect counts of applications or their outcomes in the two years differentially, although the strong probability is that we did not uncover all data with respect to other colleges in either 1974 or 1975.

To summarize: Because of college and high school recordkeeping procedures, the applications and acceptances for CUNY are fairly accurate--although better for 1974 than 1975--while for SUNY and other colleges, our records reflect applications made (at least those listed by the high schools), especially for the 1974 graduating class, but information about acceptances/rejections was not always available. We regard all the applications data to be discussed here as underestimates.

Certain other factors affect either all schools, or particular ones. Few college offices noted whether the student sought financial aid, which would have been very useful information. For School C, records included both January and June graduates, so the raw numbers of applicationsand of graduates are quite large (but this is controlled by the calculations of applications per graduate); the other schools included only June graduates. Since School B, the newest school, did not have a full, official graduating class until 1975, its 1974 figures and some of those for 1975 are based on very small Ns, and its percentages are to that extent much less reliable than those for the other schools. This reduces the significance to be attributed to fluctuations from 1974 to 1975 in School B, and the discussion will generally ignore such fluctuations. Also, most non-CUNY information from School B was not documented, but reflects the"recollections"of the college advisor. For School A, the non-CUNY figures were modified to include applications to colleges that appeared on lists of acceptances/rejections but for which we found no prior record of application. In these relatively few instances, we made an arbitrary assignment of one application.

One other background factor may have had very great significance--a factor we could not have anticipated in advance--namely, the serious worsening of general economic conditions between June 1974 and June 1975.[1]

[1]Figures from the Bureau of Labor Statistics indicate that in this period the national unemployment rate increased from about 5.5% in June 1974 to a peak of about 9% in May 1975. Unemployment in New York City was much higher than the national averages.

Because of these conditions, 1975 graduates might have been more likely to choose colleges where they could expect to get scholarships or other financial aid, or to choose public colleges, or if necessary to choose colleges (public or private) in the City or those to which they could commute. Many students may have elected to apply to fewer private schools having expensive application fees. Still others, who may have been faced with a tight job market, may have decided to go to CUNY. Concerning these factors we have no data; their possible effects can only be taken into account judgmentally (if at all). On the other hand, we do know that the economic conditions affected staffing in the public high schools; with the reduction in college office staff (most severe at School C but in evidence at School D as well), fewer applications might have been expected to be processed. Students may have been influenced, directly or indirectly, to apply only to colleges to which they had a reasonable chance of being accepted.

Keeping all these qualifications in mind, we can now turn to the results. Table 10, page 73, presents the basic data. From 1974 to 1975 there was an overall increase of 13% in the number of graduates, in spite of decreases at Schools C and D. At the same time, there was an overall decrease of 9% (from 5366 to 4899) in the total number of college applications. This decrease in total number of applications was almost entirely attributable to School C, whose graduates dropped by 3% but whose applications dropped by 21%. School D, like School C, has a large proportion of college-bound students, but from 1974 to 1975 its percentage drop in total applications was almost the same as its drop in graduates (13%). At Schools A and E, the number of total applications remained quite constant in the two years, but the number of graduates increased, respectively, by 6% and 27%. Thus, at least in School E, the number of applications did not rise in proportion to the increase in the number of graduates. (School B increased on both counts, as expected.) In view of all these differences, it is more meaningful to examine applications per graduate (APGs); these figures in effect cancel out variations in numbers of graduates and numbers of applications.

Applications Per Graduate (APGs)

Looking first at the total applications per graduate in the middle of Table 10, we see that overall there was some decrease in total APGs from 1974 to 1975 (from 1.5 to 1.2 per graduate), and this was the case in every individual school except Schools A and D, which remained about the same. The decrease was largest at School C. In both years, the individual schools maintained the same rank order; School C (despite its decrease) had by far the most APGs, then Schools D and E in an intermediate position, followed by Schools A and B with the least.

Next we can inspect the breakdown of these totals into CUNY and non-CUNY, and of the latter category into SUNY and "other" colleges, to see whether the trends found in the totals also held true within these categories. That is, in 1975 as compared with 1974, was there also a decrease in APGs to CUNY, to SUNY, and to other colleges?

TABLE 10

NUMBER OF GRADUATES AND DATA ON KNOWN COLLEGE APPLICATIONS, INCLUDING CUNY, SUNY, AND OTHER COLLEGES, FOR 1974 ('74) AND 1975 ('75), BY SCHOOL

	School										All Schools	
	A		B		C		D		E			
	'74	'75	'74	'75	'74	'75	'74	'75	'74	'75	'74	'75
N Graduates	1070	1134	200	650	982	953	900	780	386	490	3559	4026
N Applications:												
Total N Identified	980	984	141	338	2415	1917	1322	1157	508	503	5366	4899
CUNY	525	567	111	257	907	657	519	480	180	213	2242	2174
Non-CUNY	455	417	30	81	1508	1260	803	677	328	290	3124	2725
SUNY	76	92	8	26	821	630	450	393	102	111	1457	1252
Other Colleges	379	325	22	55	687	630	353	284	226	179	1667	1473
Applications Per Graduate (APGs)												
Total	.92	.87	.71	.52	2.46	2.01	1.47	1.48	1.32	1.03	1.51	1.22
CUNY	.49	.50	.56	.40	.92	.69	.58	.61	.47	.44	.63	.54
Non-CUNY	.43	.37	.15	.12	1.54	1.32	.89	.87	.85	.59	.88	.68
SUNY	.07	.08	.04	.04	.84	.66	.50	.50	.26	.23	.41	.31
Other Colleges	.36	.29	.11	.08	.70	.66	.39	.37	.59	.36	.47	.37
Applications Within Categories As % of Total N Applications												
CUNY	53%	58%	79%	76%	38%	34%	39%	41%	35%	42%	42%	44%
Non-CUNY	47%	42%	21%	24%	62%	66%	61%	59%	65%	58%	58%	56%
SUNY	8%	9%	6%	8%	34%	33%	34%	34%	20%	22%	27%	26%
Other Colleges	39%	33%	15%	16%	28%	33%	27%	25%	45%	36%	31%	30%

Note: See text for many qualifications pertaining to these figures.

Since students make only one application to CUNY, the CUNY APGs in Table 10 are equal to the proportion of graduates who applied to CUNY. (This interpretation does not apply to the non-CUNY APGs.) Thus, the "All Schools" column indicates that in 1974, 63% of the graduates applied to CUNY, and in 1975 this apparently decreased to 54%.[1] The rank order of the separate schools was similar to that for total APGs. School C was at the top in both years, in spite of a sharp decrease in CUNY applications (92% to 69%); School D ranked second (58% and 61%), and (ignoring School B) School E ranked the lowest (47% and 44%). The overall decrease in CUNY APGs from 1974 to 1975 was attributable to the decreases at Schools C and B (the latter went down from 56% to 40%). There was essentially no change in CUNY APGs at Schools A, D, and E.

In terms of non-CUNY APGs, overall there were slightly fewer APGs to SUNY than to other colleges in both years--a somewhat unexpected result, since SUNY would probably be less expensive than the other colleges. As with CUNY APGs, both SUNY and other colleges' figures decreased from 1974 to 1975--SUNY from .41 to .31 and other colleges from .47 to .37. In rank order of individual schools, School C was again at the top in APGs to both SUNY and other colleges; School D was--roughly--next, followed by School E. Schools A and B were at the bottom. Almost no students at the latter two schools applied to SUNY (in either year), although School A students did apply to other colleges.

The bottom third of Table 10 presents the data in a different but perhaps more easily comprehensible way. Here variations among the schools in total numbers of graduates are ignored. The percentages express the number of applications made in a given year to CUNY, SUNY, and other colleges as a proportion of all applications made in that year. In the individual schools and in "All Schools," these figures look remarkably stable from 1974 to 1975. Viewing the data in this way, the implication is that the specific high school a student attends greatly influences the pattern of colleges (s)he will apply to. CUNY, the least costly, is the most popular at Schools B and A, while applications to non-CUNY colleges predominate at Schools C, D, and E. In terms of this measure, the biggest change was in the proportion of other college applications at Schools A and E.

The overall decline in APGs from 1974 to 1975 does not seem attributable to any school-related or student-related causes. The decrease in APGs to CUNY most likely reflects a difference in central processing of CUNY applications for 1974 and 1975, and the fact that we were unable to identify as many of the CUNY applicants in the latter year. Thus, as far as the data with respect to CUNY is concerned, we cannot be certain that there was really a decrease at all.

Assuming that CUNY applications did not really decrease, general

[1] Keep in mind the limitations with respect to the CUNY APGs for the 1975 graduating class--particularly the fact that we probably identified fewer CUNY applications in 1975.

economic conditions might account for the decline in APGs to SUNY and other colleges. There are two ways economic circumstances might have affected the number of college applications. First, many students may have decided either not to go to college, or might not have been able to fill out as many non-CUNY applications as they would have liked. Another possible factor is that the overtaxed college office staff might have discouraged students from applying to any but the most realistic of their choices. This latter reason probably accounts for the large decrease in APGs at School C (which, in turn, greatly influenced the "All Schools" figure), but cannot explain the very large decline in APGs to other colleges at School E (which had essentially the same college office staffing in both years).

We also examined the number of different colleges applied to, both within each high school and across all high schools. Despite the overall decrease in APGs to SUNY colleges, the number of different SUNY colleges applied to increased from 31 in 1974 to 49 in 1975. (This is a 39% increase, greater than the 13% overall increase in the number of graduates.) Students may have learned more about SUNY through GIS, as well as from college advisors who were increasingly studying and suggesting the SUNY system. To some extent this lends credence to our argument that economic conditions may play a decisive role in the 1974 and 1975 data, since SUNY schools are generally less expensive than others.

In both years, students applied to a tremendous variety of colleges, and no simple summary generalization can encompass the range. In 1974, a total of 385 different non-CUNY institutions were applied to. As with the total number of applications, there was a decrease in 1975 to 331. The only sizable drop was in School E. As implied above, the decrease was in the number of different other colleges.

In one other analysis, the non-CUNY applications were broken down into those to two-year and to four-year colleges. These proportions tended to remain consistent from 1974 to 1975. An overwhelming majority of all applications went to four-year colleges--92% in 1974 and 90% in 1975. This finding agrees with students' preferences as expressed in the Initial Survey, and with their low use of the COL 2 data file.

Because of the many qualifications concerning these data, the possible influence of CAG on the 1975 figures as compared with 1974, becomes a speculative matter; our impression is that economic conditions may have been the most important factor. As we will see below, anecdotal evidence exists suggesting that use of the GIS college files did influence student choices. It is not an unlikely interpretation--although the one most favorable to this project--that the CAG experience served to help at least some students make fewer, more realistic choices.

Outcomes of Applications

Table 11 on the following page presents the outcomes of non-CUNY

TABLE 11

OUTCOMES OF NON-CUNY APPLICATIONS*

	School										All Schools	
	A		B		C		D		E			
	'74	'75	'74	'75	'74	'75	'74	'75	'74	'75	'74	'75
N Non-CUNY Applications	455	417	30	81	1508	1260	803	677	328	290	3124	2725
	Outcomes in Percentages											
Total Non-CUNY												
% Accepted	41%	76%	74%	45%	52%	55%	52%	41%	56%	55%	51%	55%
% Rejected	4	11	13	17	21	19	17	12	22	12	17	15
% Wait-Listed	0	1	3	1	4	4	3	3	2	0	3	3
% Unknown	55	12	10	37	23	22	28	44	20	33	29	27
SUNY (for Ns, see Table 10)												
% Accepted	55	90	88	50	50	58	55	42	43	56	52	55
% Rejected	13	8	0	23	20	14	17	10	31	16	19	13
% Wait-Listed	2	2	12	4	4	5	3	3	3	1	3	4
% Unknown	30	0	0	23	26	23	25	45	23	27	26	28
Other Colleges (for Ns, see Table 10)												
% Accepted	38	72	68	42	55	53	49	41	62	54	51	54
% Rejected	2	11	18	15	23	23	16	14	18	9	16	17
% Wait-Listed	0	1	0	0	3	3	4	3	1	0	2	2
% Unknown	60	16	14	43	19	21	31	42	19	37	31	27
N Accepted As % of Applications With Definite Outcomes (N Accepted Divided by [N Accepted Plus N Rejected])												
Total Non-CUNY	92	88	85	72	71	75	76	78	72	82	75	79
SUNY	81	92	100	68	72	80	76	80	58	78	73	81
Other	96	87	79	74	70	69	75	74	78	86	76	76

*See text for qualifications pertaining to these figures.

applications--applications to SUNY and to all other public and private colleges and universities. Included in the table are the percentages of applications accepted, rejected, and wait-listed, as well as the percentage with outcomes still unknown at the time of data collection. Regardless of the number of applications filed, if use of GIS caused students to apply to colleges that better matched their interests and qualifications, the acceptance rate might be expected to increase.

Before examining this hypothesis, it is important to note that in both years there was a high proportion of unknown outcomes--over a fourth of the total.[1] This fact severely limits any conclusions. For all schools combined, the proportion of unknown outcomes was nearly constant from one year to the next; in the individual schools, however, the proportion of unknown outcomes fluctuated inconsistently.[2] It cannot be assumed that the unknown outcomes would be distributed in the same proportions as the known outcomes, since students who were rejected would be less likely to inform their college office than students who were accepted. The suggestion is that if all outcomes could be known, then we would find fewer non-CUNY acceptances.

To arrive at a clearer interpretation, we looked only at applications with a definite outcome--either accepted or rejected. (The percentage of students wait-listed was negligible in all instances.) The bottom of Table 11 shows the number of applications accepted as a percentage of the number accepted plus the number rejected. For all schools combined, about three-fourths of the non-CUNY applications were accepted, and there was a slight increase in 1975, from 75% to 79%. This increase is entirely attributable to an increase in acceptances of SUNY applications, from 73% to 81%; there was no change in the proportion of acceptances by other colleges. Ignoring School B because of small Ns, the only sizable changes at the individual high schools were an increase at Schools E, A, and C in SUNY acceptances, and at School E in acceptances by other colleges. School A in 1975 experienced a decrease in acceptances by other colleges.

The increase in the proportion of SUNY acceptances (in 1975) at School C coupled with the decrease in the number of SUNY APGs may indicate that fewer, but more realistic, applications had been filed.[3] The increase in SUNY acceptances for Schools E and A were not accompanied by sizable decreases in APGs, but may also reflect more appropriate student choices. No clear school-to-school pattern emerges in examining the proportion of acceptances to other colleges. We cannot account for changes at Schools A and E; from examining School A's increase in percent accepted at SUNY and the decrease in their proportion of known acceptances by SUNY (in 1975), we suspect that the apparent decline reflects improvements in recordkeeping for 1975. The least accurate records kept at School A in 1974 was the entry of notices of rejection.

Thus, in conclusion, the overall increases from 1974 to 1975 in the proportion of acceptances to total applications with known outcomes reflect changes with regard to SUNY. Due to the many qualifications in

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[1] This is in spite of the fact that we re-examined school records in September 1974.

[2] In School A in 1974, for example, 55% of the non-CUNY applications had unknown outcomes as compared with only 12% in 1975. For School A this was largely a result of new procedures adopted by the college office, in response to feedback from IRDOE concerning 1974 findings.

[3] As Table 10 illustrates, School C had, in both years, a greater number of SUNY APGs than any other high school. A decrease from .84 to .66 can be a chance fluctuation.

these data, we can only make the guarded statement that CAG may have contributed to the filing of more realistic (i.e., SUNY) applications.

The analysis of college applications was made in an attempt to ascertain whether the CAG experience affected college choice among students using the system. Specifically, we anticipated that CAG use would increase the total number of college applications filed, the diversity of colleges applied to, and the rate of acceptance. Because of the incompleteness of the data and the numerous attached qualifications, doubt is cast on any firm conclusion.

In 1974 as compared with 1975 there were more applications filed, and more total APGs; we, however, located fewer of the completed applications in 1975 than 1974. On an individual school basis (ignoring School B), total APGs declined at Schools C and E, but remained about the same at Schools A and D. CUNY APGs dropped sharply at School C in 1975, while they remained fairly constant in Schools A, D, and E; in 1974 and 1975, half or more of the graduating classes at each school applied to CUNY. In both years there were fewer total APGs to SUNY than to the other public and private colleges; Schools C and D tended to consider SUNY more frequently than did Schools A, B, and--to some extent--E. CUNY was most popular at Schools A and B, non-CUNY colleges at Schools C, D, and E. This suggests that the high school a student attends greatly influences the colleges to which (s)he will apply.

The data with respect to whether students applied to more different colleges in 1975 than in 1974 indicates that (taking the number of graduates into account) Schools C, D, and A applied to approximately as many different colleges, although School E applied to fewer. There was an overall increase in the total number of different colleges applied to within the SUNY system in 1975.

The acceptance rate would be expected to increase in 1975 if students (many of whom had CAG experience) had applied to colleges that better met their qualifications and interests. Again ignoring School B, and looking at the findings only with respect to known application outcomes, there was essentially no significant change with respect to other colleges, but there was an overall increase in acceptances to SUNY--at School A, an 11% increase; at School C, 8%; at School D, 4%; and at School E there was a 20% increase in SUNY acceptances in 1975.

In summary, use of GIS may have ameliorated decreases in college applications that would otherwise have occurred because of severely worsened economic conditions in 1975; or the observed decreases could mean that CAG brought about more realistic, and fewer, applications. For SUNY in particular, the decrease in APGs, together with the increases in number of different SUNY colleges applied to and the proportion of known acceptances, favor the latter interpretation.

There are better tests of the hypotheses we originally proposed. One such would involve the specific identification, within each school,

of users and non-users of the college files, combined with a list of the colleges users obtained from the GIS files and the colleges each group applied to. An alternative approach would involve matching a CAG school with a non-CAG one, or comparing CAG schools with other high schools that use different ways of providing students with college information.

Reported Effects of CAG on College and Career Plans

The anecdotal evidence suggests that GIS helped some students make more appropriate college decisions and choices, and will give the reader a feeling for the kinds of changes or results CAG was observed to produce. A question of interest to us was whether effects of CAG would be evident and documentable while students were still in high school. Could we determine whether students would make any changes in their current high school program[1] as a result of information they received from the computer, or in their plans for after high school graduation? The reactions in this section include effects on both occupational--career--and college plans.

Three liaisons (from Schools A, D, and E) noted student program changes, which they attributed to use of the CAG system. Their reports commented on students who began to realize that they should have better high school preparation in their subject of interest,or in a subject related to a college major or to a job they were considering. One student decided she should take more typing in preparation for an office job; another student interested in a college secretarial major elected high school courses in clerical procedures and speedwriting after reading the computer's job description. The liaisons reported that students interested in nursing careers realized they needed more high-school chemistry and math for nursing schools; in School D, because of their interest in nursing, some students discovered that their school offered a course in psychobiology.

In terms of helping students make plans for college, one of CAG's values cited by the liaisons was that it often suggested new options that students had not considered; some examples follow. A student interested in ceramics and wanting to attend SUNY discovered that Alfred University, a SUNY college, met his requirements. Students interested in medical technology found programs available at many colleges not previously considered. A student interested in oceanography located a school in Pennsylvania through GIS; he previously thought he would have to travel as far as Florida. A student interested in criminal justice applied to CUNY only for John Jay College, until he discovered that a college in Massachusetts offered such a program. And at least two students returned to School E to tell the liaison how happy they were at (two different) two-year colleges in New England, information about which they had "first

[1]The original intention was to note all "significant" changes in high school programs in one or two of the pilot schools, and to determine if users requested more such changes than non-users. This approach was not feasible, so we asked liaisons and other staff about changes in high school and post-high school plans.

learned from the computer." The School A liaison reported that one student had applied to two two-year colleges that appeared on his printout, was accepted at both, and will go to one to study agronomy. Another foreign student without a residence visa wrote (with help) to every college that offered engineering in every state; he found several that would accept him and give him financial aid. Another student who felt she had to go to CUNY because of costs, found Fordham University and Boston University--both of which accepted her with full (HEOP) scholarships.

Other illustrations indicate that CAG often suggested new ideas about occupations, so that students could better relate their current interests and future educational plans to occupations. A student found that the field of urban planning would let him combine his strengths in social studies and art. Another student, who worked as a CAG monitor and helped to batch requests, indicated a strong desire to learn more about computers and become a programmer.[1] A student who wanted to work with mentally retarded individuals learned that she didn't have to be a teacher but could accomplish her desire in other settings. And another found that the occupation of medical secretary would let him combine his interests in medical technologies and secretarial work. A student interested in advanced math found at least 20 different occupations which could use this strength. A liaison happily reported to us that art majors began to realize that they could find jobs in many areas other than fashion design.

Still other effects were related to students' becoming more realistic in their future planning. One student, of limited academic ability, was interested in being a pediatrician but had no idea of the amount of schooling involved; she discovered that she could still "work with children" as a licensed practical nurse. Another student decided not to go into the family business because it became increasingly clear to her that she could not best use her interests, which were important to her to pursue, in that setting. In several instances, especially in the health field, students discovered alternatives (e.g., to becoming an M.D.) that were much more in line with both their abilities and their wish not to pursue many additional years of education. Others decided to go on to college after having viewed the range of jobs available with only a high school diploma.

The responses of students at the terminal and afterwards in follow-up sessions, were uniformly favorable. A few students were skeptical. The largest number of professed skeptics seemed to be at School C, where several students made comments to IRDOE staff about the "dumb" or "useless" computer--i.e., the colleges and/or careers listed were, apparently, beneath consideration. It is difficult to determine how negative these students were toward CAG, since the majority were recruited by word-of-mouth from seemingly satisfied other student users. In all schools, it was not uncommon to have students drop in and ask if they could "use the computer," and there was evidence that one user's excitement generated interest among other students.

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[1] The CAG project has produced some "computer buffs"; several students exhibited as much sophistication about the intricacies of the GIS program as any adult user.

Their interest, often quite obvious in their facial expressions, ranged from the technological aspects ("You mean this really comes from New Hampshire?" and "This machine is fantastic!") to spontaneous assertions of the value of the information received ("Everything you wanted to know"). One student said, "All schools should have this," and another insisted that her sister (at another school) be allowed to come in and use it. Only one instance of resistance to the process was reported: One student (at School A) found the experience of having to make choices so threatening that she became "angry with the computer," called it "stupid," and left the terminal area "close to tears."

We have already mentioned the behavior of students in "testing" their decisions; they put characteristics into the computer, and came away with a list of colleges or occupations that included the specific one they had already decided on. In our early view, this behavior did not seem productive; later, however, we came to realize that it helped students to make explicit an often internalized, nonverbal decision-making process. All students wanted to take their copy of the printout, and were observed studying their own and examining those of their friends. The format of the GIS printout (of a search) makes it readily understandable that each choice makes a difference, and that decisions have consequences. Indeed, as we shall see in the next chapter, this decision-making experience seemed to make CAG users (statistically) better at the skill than non-users.

CHAPTER VIII

OUTCOMES: IMPACT OF CAG ON STUDENT USERS

By the end of Period 1 (June 1974), the extent of use of GIS as well as the student and staff interest and enthusiasm evoked by this project made clear the feasibility of computer-assisted guidance in the high schools. Apart from feasibility, the remaining question is whether the effects on students are sufficient to justify the continued or expanded use of CAG. The results of the impact tests to be discussed in this chapter present quantitative evidence of these effects. The tests were given in Period 3, early in 1975. (See Figure 4, Chapter III for details of the administration.)

Hypotheses concerning CAG effects were examined with an attitudinal measure and several cognitive measures. The first hypothesis was that student users, as compared with non-users, would prefer the computer as a valuable source of college and career information. Secondly, users would have more knowledge of terminology and concepts that are used to talk about colleges and occupations. Thirdly, users would show more ability to describe and organize information about colleges and careers in ways that reflect important parameters. The final, and perhaps most important, hypothesis was that users would demonstrate better knowledge or understanding of the narrowing concept underlying the decison-making logic which GIS employs.

Limitations Concerning the Test Results

Before presenting the outcomes, several assumptions, limitations, and definitions will be clarified. First, this project is of necessity concerned with the impact of TSC's Guidance Information System on students; therefore, many of the specific test items and the scoring categories developed reflect both the strengths and the weaknesses of that system. We did make every effort to select test items having general, widespread importance in conceptualizing college and career information, as well as having relevance to the specific hypotheses. We can assume that similar findings would apply to an alternative guidance system, provided of course that it is more or less comparable to TSC's (e.g., employs the same decision-making logic); and that a parallel vocabulary test, using terms from the alternative system's particular language, would yield similar results.

The definition of "use" is an important consideration. Of the student users tested, over half had never had direct interaction, i.e., were not present at the processing of their request, and some of them may never have seen the terminal. For any individual student, CAG use may have differed with respect to many variables:

Whether or not the student reviewed the Student Study Guide (or a facsimile), and whether the review involved whole-class, small-group, or individual orientation sessions.

The particular file (college or occupational) the student requested information about.

Whether or not the student requested a file search, a description of a specific college or career, or both a search and a description.

Whether or not the student was present during the processing of his/her request.

Whether or not the student received a copy of the printout.

Whether or not the student engaged in followup activities, including discussion of the output with the liaison or counselor, writing for information, going to a catalog, etc.

For the study of CAG impact, we did not attempt to isolate which CAG-use variable(s) was critical. That is, in delineating user/non-user groups, we did not attempt a more refined breakdown of, for example, college/occupational file users or direct/batched users. About a third of the users tested had had experience only with the occupational file, and some portion of users had exposure only to college files; many users had received only descriptions of specific colleges or careers, while the majority had done searches. The effects of these factors, if any, would tend to reduce user/non-user (U/NU) differences. Although some suppositions are possible from our evidence, future clarification with respect to the effects of these variables (singly and in combination) on U/NU differences would be highly desirable.

The other side of this question is the definition of non-use. It is very likely that many students designated here as non-users may have had some exposure to CAG in whole-class orientation (or followup) sessions, which could have involved the Student Study Guide (or an examination of printouts). If this factor played a part, however, its effect would be to again reduce U/NU differences.

The recency of the CAG use prior to the impact testing may also have had an influence. For nearly three-fifths of the users tested, the CAG experience preceded the testing by a half to a full year. As will be seen, the very encouraging results give evidence for long-range carryover effects of what is a relatively brief experience in a high school student's life.

The most crucial question affecting interpretation of the test results is whether there were initial differences between users and non-users. It is always difficult to conduct carefully controlled studies in classroom situations. We could not assign students randomly and

equally to the user and non-user groups, and school policies at various times encouraged use by higher- or lower-ability students. We have already discussed possible ability differences between the users and non-users in the section on Evaluation Methods, as well as our reasons for assuming that any such differences which may exist cannot account for the obtained results.

The statistical analytic procedures overcame some of the problems, but questions remain as to whether school variations in implementation, use of GIS, and so on, affected the outcomes; and as to whether there were other important ways in which users differed from non-users, especially with respect to motivation. Did users tend to be volunteers? According to the liaisons' reports, the proportion of self-selection differed from school-to-school and from period-to-period, and ranged from little to much. At School A volunteering was almost nonexistent in Period 1, and students had to be "dragged in." At School E, too, there were few volunteers. Schools B and D did considerably less active recruiting of students than A and E, with more reliance on self-selection. At School C, the users were primarily volunteers--students interested or curious enough to "drop in." The school-to-school differences in self-selection, however, do not explain school-to-school variations in results.

The results, to be presented next, demonstrate overwhelming benefits to students with CAG experience. Whatever the possible initial differences between users and non-users, we conclude that they do not negate these benefits. The findings will be discussed in the following order:

1. Preferred Sources of College and Career Information;
2. Vocabulary; 3. Self College Questionnaire; 4. Ideal College Questionnaire; 5. Self Occupation Questionnaire;
6. Ideal Occupation Questionnaire; and 7. Decision-Making.

Vocabulary and Decision-Making were given in all schools; the college and occupation instruments (Nos. 3, 4, 5, and 6) were each given in selected schools (B, D, and E). The students tested were mainly seniors, except for School E where 84% were juniors. No one student took more than two of the tests. (For details, see Appendix, Table A2.)

Preferred Sources of College and Career Information

The two attitudinal questions listed several sources of college and career information, which were similar although not identical. From each list the student was to choose the three (s)he considered most valuable. Choices of the computer as a valuable source were of special interest. Table 12 on the following page shows, by school, the proportions selecting each source as one of the three most valuable; for each question, the sources are listed in overall rank order of preference.

As a general comment on this table, U/NU differences were usually not large, and there was a striking degree of similarity among the separate schools as to the rank order of student preferences. Also, the

TABLE 12

USERS' AND NON-USERS' OPINIONS OF THE THREE MOST VALUABLE SOURCES OF COLLEGE AND CAREER INFORMATION, BY SCHOOL
(Results in Percentages)*

Sources of:	School A		B		C		D		E		All Schools		
	U	NU	U	NU	U	NU	U	NU	U	NU	U	NU	U+NU
College Information													
College Office or Counselor	79%	97%	76%	87%	76%	82%	78%	84%	86%	94%	79%	88%	84%
Visits to College	47	71	68	82	60	76	70	52	60	64	61	71	66
College Catalogs	51	47	51	58	55	51	46	52	52	42	51	50	51
Friends at College	28	38	39	36	58	36	38	25	20	28	35	33	34
Computer	40	23	37	22	12	20	19	35	62	47	36	28	32
Lovejoy's or Barron's	40	15	24	9	24	20	30	32	16	19	27	18	22
Parents or Guardians	7	3	0	2	9	7	14	10	4	0	6	5	5
School Library	4	3	5	4	0	6	5	10	0	3	3	5	4
High School Friends	4	3	0	0	6	2	0	0	0	3	2	2	2
Career Information													
Career Office or Counselor	86%	91%	80%	87%	78%	95%	81%	87%	82%	95%	82%	91%	86%
Talking with People in Different Careers	86	79	88	73	91	93	78	77	72	69	82	80	81
Visits to Places of Work	42	53	56	53	53	56	70	61	60	56	56	56	56
Computer	28	32	34	25	16	13	14	26	52	36	31	25	28
Dictionary of Occupational Titles	40	27	29	33	22	22	16	26	26	33	27	28	28
Parents or Guardians	2	12	7	13	25	14	27	13	4	11	12	13	12
School Library	14	6	3	11	13	2	14	10	2	0	8	5	7
High School Friends	2	0	3	5	2	5	0	0	2	0	2	2	2
(N:)	(43)	(34)	(41)	(45)	(33#)	(55)	(37)	(31)	(50)	(36)	(204#)	(201)	(405#)

*These two questions (given in Period 3, January or February 1975) were placed at the end of the Decision-Making test. Responses were analyzed only for those who gave 3 choices.

#N for career sources is 1 less than the number shown.

(overall) rank order of the college sources was very similar to that for the career sources. Note that the college and career percentages cannot be directly compared; since there were nine college sources but only eight career sources listed as opinions, and since each column sum must be 300%, the career percentages are necessarily each higher than any corresponding college percentage.[1]

College Information. Considering first the preferences for the various college sources, in every school the students (U+NU) gave the top rank to the college office or counselor. Next in rank order were visits to colleges, and then college catalogs. The computer ranked in the middle. Almost no students regarded parents, the school library, or their high school friends as valuable information sources. The only notable exception to the agreement among schools in rank-order pattern was School E, where students ranked the computer higher than did students in any other school. In contrast to School E are the students at School C who valued the computer least.

In fact, the proportion of School E non-users (47%) selecting the computer as a valuable source was larger than the proportion of any other school's users selecting this option. This unique feature of School E students' responses might be attributable to the fact that most of them were juniors, whereas in the other schools only seniors were tested. An alternative consideration is the very small size of School E which could serve to increase the communication between users and non-users; also to be considered is the fact that School E had the largest (except for Period 3) proportion of descriptive uses of any other school.

Comparing users and non-users, for all schools somewhat more of the users preferred the computer (U, 36%; NU, 28%) and Lovejoy's or Barron's (U, 27%; NU, 18%); at Schools C and D fewer users than non-users preferred the computer. For all schools combined, somewhat more of the non-users chose the college office-counselor (U, 79%; NU, 88%) and visits to colleges (U, 61%; NU, 71%). Students may not have differentiated precisely between "counselor" and "computer." To many student users, "computer" may have included "counselor" (i.e., liaison), and we cannot be certain what they meant. For Schools A, B, and E where the greatest proportion of users regarded the computer as a valuable source of information, there was also the greatest difference between users and non-users in their preference for college office-counselors. Schools C and D, which have the more elaborate college advising office, did not follow the same pattern. At Schools C and D, not only was the computer less valuable to users than non-users, but there was greater similarity between U/NU groups in rating the college office.

Career Information. Looking at preferences among the eight listed sources of career information (bottom half of Table 12), there are obvious similarities to the college source preferences. Here the career office or counselor ranked highest, and, as with the college choices, especially so

[1]Taking 8/9 of the career percentage (or multiplying by .9) gives an approximation of the career percentage if there had been 9 career choices.

for non-users (U, 82%; NU, 91%).[1] Nearly as high, and in some instances higher, was talking with people in different careers. Visits to places of work, ranking third (U+NU), was generally not valued nearly as highly as were visits to colleges. The computer again ranked in the middle, just barely above the Dictionary of Occupational Titles. And again, students gave parents, the school library, and their high school friends a low value.

As with the college sources, non-users in each school valued the career office-counselor more highly than users, while more users chose the computer as one of 3 sources than did non-users (estimated overall percentages: U, 28%; NU, 22%). Both groups of students gave the computer a lower value for career information than for college information. The fact that users viewed the computer--and there "computer" is identical to the TSC system--as less valuable for career than for college information accords with our experience and liaisons' reports, which indicates that the GIS occupational file is more poorly organized and difficult to use and interpret.

In the separate schools, again the students in School E (both users and non-users), ranked the computer option more highly than did students in the other schools; while students in School C and the users in School D ranked the computer very low as a career information choice. In Schools A and D, users ranked the computer less highly than did the non-user groups. In comparing the proportions of users who valued the library as an informational source, in almost every school the library was more highly valued for career information than for college information. Since use of the GIS occupational file is presented as a "first step," and students were encouraged to follow up with other library sources, this is not an unexpected result, and one which reflects use in the schools. Furthermore, the fact that, with the exception of School B, the schools did not have a career program and yet the "career office or counselor" was so highly rated by the users, lends additional support to our supposition that students did not differentiate between "counselor" and a computer-assisted counseling experience.

Other studies have consistently reported that "students like to use the computer," but few of them asked the students to make a choice. Thus, our relative rankings of preferred sources are not comparable to the results of previous studies. In the present situation, a third to a fourth of the students chose the computer as a valuable choice. We know from talking to students, from the number of return uses, and from staff reports that students in the pilot high schools also liked using the computer.

In summary, when all schools were combined, there was some support for the hypothesis that users, as compared with non-users, would rank the computer as a valuable source of college and career information. But this hypothesis did not hold true in all individual schools, and neither users

[1] In 1975 when these questions were administered, only School B had a separate, active involvement in career education; little career service was available at Schools A and D, the career counselor at School C was engaged in general counseling duties, and at School E the same person fulfilled both college and career advising responsibilities.

nor non-users ranked the computer as their first choice; instead, they gave it an intermediate value among the listed options. For the college source questions, non-users in Schools C and D gave the computer more favorable rankings than did users. The fact that these two schools are the most academic-oriented and have the most elaborate college advising offices suggests that students in Schools C and D may have, in reality, sources better than the computer available to them; and those who have already used CAG were better able to make such a judgment than non-users.

The relative ranking of the computer apparently has little relation to what a user "gets out" of the CAG experience. We could not detect any relationship between these U/NU attitudes and the U/NU differences on the cognitive impact measures. Thus, for example, although School E users were the most enthusiastic about the computer, the results will show that on the Decision-Making test they differed least from non-users. But the School C users, who were not in general ardent computer supporters, did demonstrate superiority over non-users on both the Decision-Making and Vocabulary measures. Further investigation is needed to determine to what relative preference for the computer as an informational source relates.

Vocabulary

To ascertain whether CAG users had a greater knowledge than non-users of the terms and concepts used to describe colleges and careers, we developed a 12-item multiple-choice Vocabulary test. The six college and six career items were selected from the Student Study Guide as representative not only of the terms used in GIS, but of ideas we felt were important and in common descriptive use.[1]

Table 13 shows the results. Looking first at the "Mean Advantage to Users" column, note that users in School A, which has the lowest academic

TABLE 13

MEAN VOCABULARY SCORES FOR CAG USERS AND NON-USERS, BY SCHOOL*

School	U+NU		Users		Non-Users		Mean Advantage to Users
	N	Mean	N	Mean	N	Mean	
A	75	5.9	48	6.4	27	4.9	+1.5
B	79	6.6	35	6.5	44	6.6	-0.1
C	92	7.5	33	8.2	59	7.0	+1.2
D	86	8.2	43	8.4	43	8.1	+0.3
E	81	7.6	55	7.7	26	7.2	+0.5
All Schools	413	7.2	214	7.4	199	6.9	+0.5

*Maximum possible score = 12.

[1]The Vocabulary items consisted of: employment outlook; university; accreditation; occupational cluster; entry-level salary; structural work; coeducation; level of formal education; manual dexterity/spatial relations; total enrollment; annual tuition, fees, room and board; and private vs. public colleges.

level of the five schools, benefited most; School C users benefited nearly as much, and School B least. However, the magnitude of the difference between users and non-users, statistically speaking, must be regarded as the same in all schools (use X schools interaction, not significant). Thus, variations among schools in students and in method and process relating to CAG gave no significantly greater advantage to users in one school than to those in any other.

Next we can examine the question of primary interest--the difference between users and non-users. The overall mean for users was 7.4 and that for non-users was 6.9; this difference is significant at the .005 level. Thus, we can conclude that users performed significantly better than non-users on the Vocabulary test.

Looking next at the overall differences in level of performance among the five schools (see U+NU column in Table 13), the mean differences were even more clearcut ($p < .001$). This result indicates that, grouping users and non-users together, average performance of students on the Vocabulary measure was significantly better at some schools than at others. The rank order was: School D (highest), then Schools E and C, School B, and School A. The five overall school means correspond approximately with our information about the academic ability levels of the student populations in these schools. This outcome is expected, since any vocabulary measure also taps ability.

In summary, CAG users clearly and unequivocally did better than non-users on the Vocabulary test, demonstrating a greater knowledge of important GIS terms and concepts. Furthermore, largely because any measure of vocabulary is closely correlated with ability, the schools differed in overall performance level with means distributed roughly in accord with performance on citywide achievement tests.[1] Moreover, although the overall performance of some schools was better than others, this in itself did not give a greater advantage to users in those schools.

Description and Organization of College and Career Information

To determine whether CAG had an effect on the way students describe and organize information about colleges and careers, we developed two parallel open-ended questionnaires for each of these areas, with space for writing 10 responses. Scoring methodologies and analysis procedures were similar for the four questionnaires.[2] The objective was to compare

[1] That is, roughly in accord with the proportion reading at or above grade level as measured by citywide reading achievement tests.

[2] Two basic scores were developed--number of statements and number of categories. As indicated in Chapter III, a statement was defined as containing one piece of information; two sentences by the same respondent containing identical information was scored as one statement. Categories were generated by grouping similar statements together. Wherever possible, GIS category classifications were used. See pages 23-34.

users and non-users with respect to the amount, variety, and kind of information generated. No responses were scored for accuracy; our aim was to ascertain the factors students considered important when answering the questions.

The Self College Questionnaire asked students to list "up to 10" important characteristics of the college they would most like to attend, as well as the name of the college. The Ideal College Questionnaire asked the respondent to list questions that an "ideal college advisor" would ask a student seeking college information. The Self Occupation Questionnaire asked the respondent to list the one job or occupation (s)he was most interested in having after completing all schooling, and to describe "up to 10" important things about it. In the Ideal Occupation Questionnaire, the student was asked to pretend that (s)he was an "ideal guidance counselor," and to indicate questions that would help a particular senior (Russ), decide on an occupation. No class or student took more than one of these four instruments; they were not administered in Schools A or C.

The results are presented in Table 14. It is interesting to note, first of all, that the college and occupation "ideal" questionnaires, for both users and non-users, generated more statements and more categories than the respective "self" questionnaires. In fact, we found that the "ideal" instruments were easier to score and interpret, with fewer ambiguous responses. It may be that the "ideal" instruments, by removing the situation from the self, make it less likely that the student's own personal concerns will interfere with responding. Another general comment is that both college questionnaires, in contrast to the two occupation instruments, yielded fewer statements that we could not score or classify.[1] One possibility is that these students have a clearer understanding of the information necessary for decisions about college than they do for deciding about occupations; or perhaps occupational decisions are inherently more complex.

College Information. As the top part of Table 14 (p. 91) shows, the differences between users and non-users were quite similar on the Self College and the Ideal College Questionnaires, except that differences were more pronounced on the latter. On the average, users made more statements than non-users (Self, 6.3 vs. 4.7; Ideal, 8.8 vs. 6.9), and employed more categories (Self, 5.9 vs. 4.5; Ideal, 8.2 vs. 6.3). This difference resided almost entirely in the users' greater employment of GIS-related categories; mean U/NU differences for non-GIS-related categories were very small or zero. Thus, it is clear that the users generated more information and a greater variety of information that was related to the GIS classifications.

A further analysis of the categories produced showed that on the Self College Questionnaire, for all respondents, there were 41 discrete categories. Users generated 38 of these, 11 of which were unique to them; non-users generated 30 categories, only 3 of which were exclusive to them. On the "ideal" instrument, the user plus the non-user groups produced

[1] On the Self College Questionnaire, for example, only 9 of the 268 statements were ambiguous or too vague to classify.

TABLE 14

MEAN SCORES ON COLLEGE AND CAREER INFORMATION QUESTIONNAIRES, FOR USERS AND NON-USERS*

College Questionnaire	Self			Ideal		
	Users (N=20)	Non-Users (N=28)	Mean Advantage to Users	Users (N=79)	Non-Users (N=83)	Mean Advantage to Users
N Statements	6.3	4.7	+1.6	8.8	6.9	+1.9
N Categories	5.9	4.5	+1.4	8.2	6.3	+1.9
GIS Categories	4.0	2.6	+1.4	5.9	4.3	+1.6
Non-GIS Categories	1.9	1.9	0	2.3	2.0	+0.3
Occupational Questionnaire	**Self**			**Ideal**		
	Users (N=69)	Non-Users (N=44)	Mean Advantage to Users	Users (N=63)	Non-Users (N=54)	Mean Advantage to Users
N Statements	6.5	5.7	+0.8	9.0	8.0	+1.0
N Categories	5.7	4.0	+1.7	8.0	6.8	+1.2
GIS Categories**	3.6	2.4	+1.1	3.1	2.7	+0.4
Non-GIS Categories	1.3	1.0	+0.3	4.2	3.6	+0.6
Irrelevant or Ambiguous Categories	0.8	0.6	+0.2	0.7	0.5	+0.2
Job-Oriented Categ.	4.0	2.8	+1.2	2.2	1.9	+0.3
Personal-Oriented Categories	0.9	0.6	+0.3	4.4	3.5	+0.9
Neutral Categories ("Consider," "Consult")	0.0	0.0	0	0.7	0.9	-0.2
Irrelevant or Ambiguous Categories	0.8	0.6	+0.2	0.7	0.5	+0.2

*Self College was given in School D; Ideal College in Schools B, D, and E; Self Occupation and Ideal Occupation in Schools B and E. No class or student took more than one of the four. For discussion of scoring, see text.

**Small portions of these means, nearly equal for users and non-users, represented GIS college rather than GIS occupational categories; mean GIS college categories: Self, U 0.4, NU 0.3; Ideal, U 0.8, NU 0.6.

statements that were classified in 55 distinct categories (U, 47; NU, 42); 8 of these categories were unique to the users' group, and again there were only 3 categories generated exclusively by non-users.

In terms of the statements made by respondents (U+NU), 63% and 62% of the statements made on the Self and Ideal College Questionnaires, respectively, were judged as GIS-related. That is, about two-thirds of what students listed on their questionnaires as important information about colleges is available to them in the GIS files. Both users and non-users tended to consider similar kinds of information important, but with somewhat differing emphases. The categories most frequently listed by both groups included the college's competitiveness, the fact that it offered a specific major, its tuition, location, and whether it was a two-year or a four-year institution (all in GIS); and its reputation. Where there were U/NU differences in this respect, on the "self" instrument users much more frequently described the wide range of majors available, in-college characteristics such as small classes or few lectures, the social climate, and special tests for admission. Non-users more frequently described transportation problems, tuition, and the physical plant. On the "ideal" instrument, the five most frequently mentioned categories (all in GIS) were: major field of study, competitiveness, tuition, location, and two-year vs. four-year institutions. More users than non-users made statements about competitiveness, location, total enrollment, and coeducation (all in GIS); and about "living away from home."

Results from the two open-ended college questionnaires were very similar. It is evident that CAG users have available more college-related information than non-users, and organize that information in terms of a wider variety of categories. The users' advantage can be attributed to their experience with CAG, since most of the U/NU difference lies in information available in GIS, information that tends to appear as unique user responses.

Although about two-thirds of the responses of both users and non-users involved information available in the TSC system, a little over a third of their interests are not reflected in the GIS files. Examples of these concerns include prerequisites for college majors, size and reputation of the college department, size of classes, lectures vs. seminars, and required and elective courses. In our opinion many of these concerns have legitimacy and lend support for system modifications more responsive to the New York City high school student.

Career Information. While the responses to the two college questionnaires were very similar in content, this was not as true of the two occupation instruments, which seemed to tap somewhat different student concerns. For this reason, the findings from each version will be discussed separately.

As Table 14 shows, on the Self Occupation Questionnaire the mean difference in number of statements and number of categories favored the users, and particularly so in terms of the variety of information generated (i.e., number of categories). As with the college instruments, a primary reason for this user advantage was the greater number of GIS-related categories they employed. Analyzing these GIS-related responses further, we found that (just as with the college questionnaires) about

two-thirds of all statements by both users and non-users reflected information in the TSC system (U, 65%; NU, 66%). These data strongly suggest that both groups are similar in what they think is important about occupations, and that GIS contains much information of general importance to students.

For all respondents combined, there were 92 distinct categories; users generated 85 categories and non-users produced only 54. There was also a striking difference in the number of unique categories (U, 38; NU, 7); more than half the 38 categories unique to the user group were GIS-related, but none of the 7 categories unique to the users were related to the TSC system.

In an attempt to identify more specifically the U/NU differences in kinds of categories produced, we next re-grouped all the statements into job-oriented and personal-oriented categories. Here the grouping depended on the student's wording--that is, whether the response referred directly to job characteristics (e.g., "This job requires heavy physical work") or whether it was personally oriented (e.g., "You must be strong"). Even though the content might appear similar, these were defined as different categories.

Job-oriented responses characterized about three-fourths of the statements of both groups (U, 71%; NU, 77%). But this does not mean the groups were alike in this respect. We see from Table 14 that the user group generated a greater number of job-related categories than did non-users (means = U, 4.0; NU, 2.8)--indicating more varied responses. For both groups, personal-oriented categories and irrelevant or ambiguous categories constituted only small portions of the total, and there were almost no "neutral" responses.

The final analysis of the Self Occupation Questionnaire (and not included in Table 14) concerned responses that were schooling- or training-related,[1] since 39% of the user respondent group (from Schools B and E combined) had experience only with GIS college data files. About two-thirds of the users (62%) made statements on the Self Occupation Questionnaire concerning the amount or kind of training needed for their chosen occupation. This is in sharp contrast to the one-third of the non-users (34%) who discussed the training or educational requirements for an occupation. (Similarly, users averaged more training categories than non-users--1.5 and 0.9, respectively.)

It is interesting to note that of the 113 students tested, only 2 did not even indicate an occupation they might like, and both were non-users. This recalls an analysis done of the 11th grade respondents at School D on a question on the Initial Survey asking them to list first, second, and third occupational choices. Although there was no appreciable difference between CAG users and non-users in terms of the numbers who listed one, two, or three choices, there was a difference in the percentages

[1]The schooling- or training-related categories include mention of a college or other place for training, years of education, or training needs for the occupation, kind of degree required, etc.

not responding to the question. Among the non-users, 7% gave no response, whereas every respondent who had used CAG listed at least one choice, if not more. A chi-square test of this difference was significant at the .02 level of confidence.

For the Ideal Occupation Questionnaire, Table 14 shows that the results were in many ways similar to those for the Self Occupation Questionnaire, and that the mean differences in the various scores again clearly favored the users. The "ideal" version, however, while generating more statements and categories, tended to yield fewer GIS-related categories and many more non-GIS-related categories than the "self" instrument; it also produced fewer job-oriented and many more personal-oriented categories.

Although users produced more and more varied responses than non-users, looking at the GIS/non-GIS breakdown in Table 14 shows that the mean U/NU differences were not large. Users employed on the average 3.1 GIS categories, and non-users 2.7. Both groups generated more non-GIS-related categories (means = U, 4.2; NU, 3.6), with a slightly greater advantage to users than non-users on this score. Thus, half the overall U/NU mean difference in total number of categories reflects information not available in the TSC system. Why the "ideal" version generated more (and more varied) non-GIS information than the "self" occupation version or either of the two college questionnaires is not understood. It could be that students' conceptions of giving career counseling were less well defined, possibly because of their relative inexperience with career counselors.

In examining the impersonal-personal breakdown, we see that the "ideal" version elicited many more personal-oriented statements (means: U, 4.4; NU, 3.5) than job-oriented ones (means: U, 2.2; NU, 1.9); and this is especially true for users. This finding is just the reverse of that for the "self" version. We suggest that the instructions make it more appropriate for a respondent to answer the "self" question in job-oriented terms, while for the "ideal" instrument it seems more appropriate to formulate questions about "Russ" in personal-oriented terms. Since these effects were more marked for users, it might be that they were more attentive to the specific wording of the question.[1]

Of the total of 78 distinct categories, CAG users generated slightly more than non-users (U, 70; NU, 64), but this difference was much less marked than on the Self Occupation Questionnaire (where users' responses were classified in 85 categories, and non-users' in 54). In terms of the proportion of responses related to GIS, users and non-users did not differ much--the mean advantage to users was 0.4, as compared with 1.1 on the "self" instrument. This finding and the analysis of job- vs. personal-oriented statements support our assumption that the two versions tap different student concerns.

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[1] Since using GIS (or other similar systems) requires the user to attend to the "wording" of his/her request, there might be some carryover effects. Also to be considered, however, are initial differences in this respect between users and non-users. Although we can present little additional evidence in support of either explanation, it suggests important future lines of inquiry.

Some final words about the content of the responses to the Ideal Occupation Questionnaire. A smaller proportion of users than non-users (U, 11%; NU, 27%) suggested specific occupations to "Russ" (e.g., "You should be a writer"), but when doing so, more users mentioned occupational clusters such as medicine, education, etc. (U, 16%; NU, 7%) and fewer job titles; thus, the users tended to adopt GIS's occupational cluster concept. In general, users were more concerned about training and schooling and made a greater proportion of statements about "Russ'" high school background. Non-users more frequently made statements about ("Russ'") hobbies and salary expectations.

To summarize the results of the two occupation questionnaires, it is evident that, in terms of descriptive skills and organization of information, CAG users produced more, and more varied, occupationally related information than did non-users. On the "self" version, users generated more GIS-related and job-related categories than non-users. They emphasized the schooling or educational requirement of occupations to a greater extent than did non-users. On the "ideal" instrument, users employed more non-GIS-related (and GIS-related) and personal-oriented information than the non-user group; much of the difference is accounted for by users' interest in schooling, other training, and background academic characteristics. Looking at both instruments, there is a suggestion that users are somewhat more responsive to the specific wording of the directions than are non-users. In addition, without judging which categories are "better," it is clear that the advantages to users reflect the constructs and content of the Guidance Information System.

Decision-Making

We hypothesized that students who had had CAG experience, as compared with non-users, would more consistently recognize and apply the principle that as the number of limits placed on a choice increases, the number of options decreases. Before considering the outcomes of the Decision-Making test, let us examine the ways in which users are exposed to the S decision-making or "narrowing" principle. The Student Study Guide directs the user to input requests for information in sequence from most to least important (although it does not explain why this should be done). In the classroom orientations we observed, there was little or no emphasis placed on the narrowing logic of the TSC system. The primary and in most instances the only way in which the user can "learn" or infer this principle is by examining the input-output interaction--either at the terminal as it is occurring or by studying the printout; in either instance this may be done with or without additional help from a staff member. This narrowing logic obtains only when GIS is used for searching; in descriptions of a specific college or career, no such logic is apparent.

The narrowing or inverted pyramid principle seems crucial to other, higher-order decision-making processes. To estimate its impact on students, we developed a six-item multiple-choice Decision-Making test. Five items

involved the narrowing principle; the last item asked the respondents to select the abstraction of the principle operative in the other items.[1]

Table 15 shows the results. As with the Vocabulary test, there was no statistically significant differential advantage to users in any particular school (use X schools interaction, not significant). Therefore, variations among schools in students and in CAG methods or procedures did not give users in one school a greater advantage than users in any other school.

TABLE 15

MEAN DECISION-MAKING SCORES FOR USERS AND NON-USERS, BY SCHOOL*

School	U+NU		Users		Non-Users		Mean Advantage to Users
	N	Mean	N	Mean	N	Mean	
A	84	3.0	46	3.6	38	2.2	+1.4
B	87	3.4	41	3.8	46	3.1	+0.7
C	92	3.9	33	4.4	59	3.6	+0.8
D	69	3.9	38	4.3	31	3.5	+0.8
E	87	4.1	50	4.2	37	3.9	+0.3
All Schools	419	3.7	208	4.0	211	3.3	+0.7

*Maximum possible score is 6.

However, users performed significantly better than non-users--as also was the case with the vocabulary test. The overall mean score for users was 4.0, and for non-users 3.3; the mean advantage to CAG users was significant at the .001 level. The same direction of difference prevailed at each school--users performing better than non-users. It is interesting to note, however, the variations in magnitude of the benefits of CAG use, in relation to what we know about the students, the schools, and the approach to implementation.

Although there is no statistical advantage to users in any particular school, the schools' differences between users and non-users may still be of interest. School A, which was poorest in average Decision-Making

[1] An example of one sample item and the last item follows: "Arnold wants to buy a blue compact car that costs less than $4,000. Larry wants to buy a blue compact which costs between $3,500 and $4,000. Who will have more cars to choose from?" (Arnold; Larry; both will have the same number of choices.)

"What rule or principle do you think was involved in the five questions? (1) The more restrictions that are involved in making a decision, the fewer possible choices there will be; (2) At least two restrictions must be considered in making any decision; (3) The more restrictions that are involved in making a decision, the more possible choices there will be; (4) The fewer restrictions that are involved in making a decision, the easier it will be to make a choice."

scores, and academically poorest of the five schools, had the largest U/NU difference (+1.4)--a difference nearly twice as great as in any other school. It could be argued that since School A students were lowest in initial levels, they therefore had a greater possibility of demonstrating, on this six-item test, the benefits of CAG use; whereas students in the other schools were already closer to the test ceiling, and thus had little leeway for demonstrating such score improvements.

Another possible explanation for school differences in mean advantage to users might lie in differences in CAG procedures employed in the schools. We know that students in School A received much more individual attention and did many more searches than, for example, students in School E, where the overall (U+NU) mean was highest but the U/NU difference smallest. Although users in School E benefited from CAG, they benefited least.

These comments suggest that the Decision-Making results reflect in part variations in school approach in implementation, particularly in the employment of the search aspect of the system. A further inference to be drawn from these findings is that students poorer in decision-making ability might benefit most from CAG search use. A definitive test of this hypothesis would require an instrument with a higher ceiling (more items), and independent control measures of individual ability, and assessment of decision-making before and after CAG searches. The prediction would be that students of lower ability would make larger gains in their decision-making scores as a result of CAG search than would students of higher initial ability. Because of School E's results, a test by grade level is needed.

Whether other variables concerning CAG use might be critical is uncertain; time did not permit more detailed analyses of the information that is available. It would be very interesting to reanalyze the data we collected, in relation to the Decision-Making and other impact tests, looking at the many possible cross-comparisons. For example, did the impact test scores of users depend on which file was used, whether the exposure was direct or batched, and whether the student engaged in a search or description? Or were scores related to the time lag between the use and the test? Answers to the numerous questions of this kind might be very enlightening. Even without these answers, however, one conclusion is clear: Users of GIS, not separating out circumstances of use--including the kind and amount of staff assistance and attention--have better knowledge of the decision-making process than do non-users.

In considering the implications of the impact test findings, it is important to bear in mind our assumption that ability was randomly distributed across the user and non-user groups, and thus does not in itself differentiate between them. We have little data about other differences that might have existed between the user and non-user groups. In particular, we have only a smattering of evidence about the question of self-selection of the users--and this suggests that self-selection as reflected in student recruitment differs among schools. Self-selection, however, does not account for all user/non-user differences. There are other important factors that have influenced the outcomes. Not unexpectedly,

the results on Vocabulary and Decision-Making reflect both the general academic levels of the individual schools and the unique procedures they developed for using the computerized system.

The findings of the impact measures have striking internal consistency. It is very impressive that on each one of the six cognitive measures, users performed better than non-users. Considered six-at-a-time, the benefit to CAG users is very dramatic. In viewing these findings in detail, consider that:

> Approximately half the user group tested had only indirect experience with the computerized system, through reading the materials (including the printout), and/or possibly discussions with a staff member.
>
> Approximately one-third of the uses were to obtain descriptions of specific colleges or occupations.
>
> Approximately half the users had had their only CAG experience from 6 months to a full year before these impact tests were administered.
>
> Approximately a third of the users had had experience only with the occupational file, conceded to be the weakest of the three major GIS files.
>
> Differences between users and non-users in preferences for various college and career informational sources were small and, more importantly, little related to their performance on the cognitive impact measures.

Epitomizing the details in major generalizations, it is apparent that:

- On every cognitive measure, CAG users outperformed students who had not had CAG experience. Users have a better understanding of the terms and concepts commonly employed to characterize colleges and occupations, and they are better able to describe and organize information in these areas. They are also superior in applying the implicit GIS narrowing logic to other decision-making problem-solving situations.

It is clear that much of the advantage to users can be attributed to experience with the Guidance Information System, since much of the user advantage is in terms of information in that system. Notwithstanding the finding that GIS contains much information about colleges and occupations of importance to students, from about a third to a half of what they want to know is not there. An improved system should build on and incorporate this desired information, which is available. Further, the fact that such a system has demonstrable impact on students in terms of affecting what they know about colleges and careers makes it essential that educators become involved in devising a perfected system.

CHAPTER IX

PARTICIPANTS' REACTIONS AND DISSEMINATION ACTIVITIES

The intent of this chapter is to put back into this report on the CAG project a sampling of the excitement and enthusiasm it generated, by describing the responses of the participants and the interest the project aroused both inside and outside the New York City public school system.

Participants' Reactions

As we discussed earlier, from its very inception the principals of the five pilot high schools afforded the project a hospitable reception. Perhaps of more significance than their documented reports were their actual deeds of support. Each assigned a liaison(s), generally acknowledged to be among the better faculty members. All found or made space available--not a small feat in schools with utilization rates of 165%. They made extra supplies obtainable, including postage for students' letters requesting additional information. Moreover, they established the kind of climate that enabled the liaisons to use classroom time for orientation sessions, and facilitated the flow of students to and from the terminal room. The administration provided the utmost cooperation for IRDOE's testing program as well, which often took entire class periods at several different times in the 15 months.

At the end of Period 1, the administrators' enthusiasm was at its highest. The principals wanted the program to continue and to be expanded to all grade levels with more on-line time. One way of estimating CAG's value was to ask principals to estimate its worth in monetary terms. IRDOE had calculated that, under the Period 1 arrangements and rate of utilization of the system, the cost per student user approximated $1.66--excluding all personnel costs; three principals valued it at $4.00, $5.00, and $9.00 per student. The principal of School D said, when pressed, "For my son it would be worth $50.00. But hypothetically, if we [i.e., the school] had to pay from our allotment, I would assign one unit [the equivalent of one full-time teacher] to CAG...."

One year later (in February 1975--Period 3) extremely positive feelings were still evidenced in all schools except School C, where interest and usage had dropped. The School C principal felt that his school's limited use was a function of the fact that "the novelty for the staff wore off"; because their students had "access to a variety of college informational sources other than CAG," and the "career file is confused," there was a decline in motivation and use.

The other principals remained excited, beginning to comment on CAG's serendipitous effects. Thus, for example, the principal of School D said

he "wished there was a procedure to keep the system in our schools" since "parental community, the students, the staff, and the administration agree that this tool provides us with information that would be very difficult to obtain in any other manner." School E's principal, likewise, described its broader effects: "CAG has had almost a galvanizing effect...for the first time in a decade there have been no community problems...the PTA has written a note of appreciation...both parents and the community seem satisfied with the College and Career Office." The principal at School A noted that CAG "caused a change in a school like —— ; for the first time in [their] experience, students [initiated contact by] trickling in themselves asking to use it."

The liaisons, again with the exception of School C, retained their very high level of zealousness throughout the project's duration. They too, however, became more cognizant of CAG's indirect effects, as a sample of responses in Period 1 and 3 will illustrate.[1] In Period 1 School C's liaison(s) felt that the "educational requirements in the occupational file presented a form of reality testing for students" and cited examples of students who revised their goals to better accord with their academic ability. The liaison(s) indicated that "the computer effects have been positive...where students had thought only of working in the school system with retarded children, they found from the file that there were possibilities in hospitals, institutions...that they had not even thought about before." By Period 3, School C was "enjoying our experience with the computer. The students are delighted with the instant responses and the long list of colleges and careers the computer gives them.... The job of the counselor is made easier, since CAG use means students must do some [advance] thinking about goals." Although the experience "has been pleasant," the School C liaison continues, "the system is too costly--useful as it may have been as a motivating factor and as an informational resource."

Early, the School E liaison noted that with CAG "the students feel that the school is taking a greater interest in them." Later in Period 3 she said: "CAG continues to stimulate interest in four-year and two-year colleges and hundreds of occupational fields. It has been accepted by guidance counselors and other segments of the school community. It has expanded students' horizons. It is a powerful weapon in improving community relations. In the light of this outstanding success achieved by CAG...[we] feel there will be a serious loss of services to the student body if there is any interruption in the availability of this most needed guidance tool."

In Period 1, the School D liaison(s) noted that "CAG has provided us with the opportunity to meet many more juniors at an earlier time and they have begun to become involved with their own futures earlier. Parents are aware of it and have expressed interest in [CAG's] role in planning for the future. Students scan their own printouts with interest--and see wider horizons via their friends' printouts." Despite the decrease in usage by Period 3, the liaison indicated that the "staff have uniformly benefited from having 'Alphonse'--he provides a marvelous resource of information for

[1] From the Liaison Questionnaire, administered in May 1974 (Period 1) and April 1975 (Period 3).

counselors. The students profit from the interaction--the computer-oriented approach sparks their interest and propels them to become more aware of what they might begin to do. It also enables the counselor to spend more time with students in guiding and advising them."

School A, with an enrollment of more than 6,000 students, was the school most attuned to the indirect benefits of CAG. The liaison(s) in Period 1 reported student users "who came to ask [the liaison(s)] about college, and about their general problems at school and at home." In her words "There is an awakening of interest in their future, some growth in decision-making abilities. CAG brought us into contact with confused students who cannot make choices...so we [CAG] became something of a referral agency." For this liaison, "CAG is most useful as a reality-testing and decision-making aid...." The most "satisfying aspect was when students' choices were brought more into line with reality by <u>their own</u> evaluation of the information on the printout."

In Period 3, the liaison (School A) noted that "use of CAG has become more creative with the passage of time and [thus] more adapted to the needs of the individual student." CAG became more integrated with the school-wide operation, and "counselor referrals are steady, and individual teachers approach [the liaison] and ask for appointments for their classes. Students are not threatened by CAG and after using it are more willing to see college advisors, guidance counselors, and other 'school helpers.'"

To some extent, according to these liaisons, the indirect benefits of CAG frequently outweighed the direct effects. The opportunity to interact personally with adult staff proved invaluable to many students (e.g., the student who was "saved" from becoming a "dropout" of a four-year college to which she should not have applied in the first place). Another very dramatic example involved a senior who was having trouble specifying characteristics for a college search; with minimal prodding, the student stated that her real problem was separating from her "best friend" after high school. Other examples abound, especially in School A, where the staffing, the large size of the student body, and the overlapping sessions were such that few students had an opportunity to spend any time with an adult professional in a non-classroom setting. The School A liaison(s) reported that CAG students would very often stop them in the halls to ask all kinds of questions; according to the liaison(s), CAG <u>increased</u> the desire for guidance in the school.

Liaisons reported a change in how students perceived the college office; according to one, the office became a place where "kids who weren't going to college could come." And they said more students were going to the college office, with the advantage that advisors could see students earlier in their high school careers. In general, the liaisons agreed that CAG stimulated questioning. Students asked more questions because "with CAG it is easy to do so," they get immediate responses, and they ask these questions at an earlier stage in their lives when it is easier to make changes.

Liaisons noted other indirect effects. Slow readers tried to keep up with the teletypewriter and its unfamiliar format as it was printing answers to their requests. Students made use of college and career materials in the

school library. They wrote postcards requesting occupational information from the sources listed in the printout. Liaisons felt the students were becoming increasingly aware of the relation between their high school courses and their future plans.

The teachers and guidance counselors who responded to the School Personnel Questionnaire given near the end of Period 3 unanimously agreed that CAG was a useful tool for advising students about colleges or careers. The reasons they gave varied. One counselor said that it reduced the technical aspects of his job, while another respondent viewed CAG primarily as a motivational tool. Its use was found to "give precision to the general ideas of many students and to remove incorrect notions." A grade advisor involved in CAG noted that it "compels students to make decisions"; one college advisor wrote that CAG "helped students make more realistic choices."

Almost all respondents noticed increases in the volume or changes in the type of student interest in college or career information. The changes described included increased student interest in, and consideration of, a wider range of occupational and college information. While most respondents realized they could not prove that CAG caused the observed changes, it is still interesting that at every school, faculty involved in the project noticed changes in students.

The questionnaire to librarians, also administered near the end of Period 3, examined how aware they were of CAG, their reactions, and whether they perceived any changes in student requests for information. All the librarians had heard of CAG from either teachers or students. Only the two School E respondents had actually seen a demonstration,[1] but most others had seen many computer printouts.

Overall, the librarians had a positive impression of CAG; the one neutral respondent, from School A, said she was not sufficiently acquainted with it to judge. The librarians (except at School A) noticed a change in the volume or type of interest students expressed in career and college information. One indicated that students came to the library with more specific focus, while another simply reported that students asked a greater variety of questions about jobs and colleges. Three librarians felt that the changes they noted were related to CAG.

In summary, it is apparent that the other members of the staff--librarians, guidance counselors, and involved advisors and teachers at each school--concurred with the liaisons in their positive impressions of CAG, as indicated by their reports of increased student interest in colleges and careers and in a much greater variety of colleges and careers, in motivational effects, and in greater student facility in making decisions and choices.

Dissemination Activities

Parents of students in all the pilot high schools have been exposed

[1] School E's terminal was located in the library.

to CAG. Indirectly, liaisons encouraged students to take their printout home and discuss it with their family. Directly, all schools discussed CAG at Parent Association meetings in one or several sessions, and four schools conducted actual demonstrations of the system. It is estimated that about 400 parents saw CAG in operation. Besides seeing it presented at public Parent Association meetings, parents had individual involvement, usually together with their child in a discussion with a counselor or teacher. The reported number of parents so involved ranged from 3 to 20 per school. The principals and liaisons reported that parents and community members were "impressed and happy" with CAG, "...pleased that their children are thinking about the future" and "pleased that they are taking their classwork more seriously."

Principals reported that parents of children attending other high schools phoned requesting that their children be permitted to use the computer. A large number and wide range of young people from other secondary schools used the Guidance Information System; they were referred by friends at the pilot schools, parents, teachers, and counselors. And they included siblings, and relatives of faculty.[1] The liaisons estimated that altogether, between 200 and 300 students from other public and private high schools received information, either directly in a visit on an on-line day, or through batching. The pilot schools hosted small groups of these visiting students, handled telephone requests, and did some followup over the phone, both for individual students requesting information and for teachers.

College students also used the program. Past graduates of the pilot high schools returned when they heard about it and asked to use it. The liaisons reported fulfilling requests for information from CUNY students in at least three community colleges and one four-year college. Demonstrations and requests for information came from the New York State Employment Service, IBM, Hewlitt Packard Data Systems, New York State Bureau of Labor Statistics, CUNY Office of Admissions Services (which was so taken with the concept that it subsequently applied for and received federal funds to establish Computer-Based Equal Opportunity Centers for ex-offenders, ex-addicts, and the handicapped disadvantaged population)--and from Boricua Universidad.

Demonstrations were conducted for various local groups and agencies representing bureaus and offices of the New York City Board of Education, First National City Bank, and the New York State Education Department. Included were (from the New York City Board of Education) the Director and staff of the Bureau of Educational and Vocational Guidance together with the High School Supervisors of Guidance and the Director of College Guidance; representatives from the Office of the Deputy Chancellor, Office of Career Education, Bureau of Business and Distributive Education, Bureau of Management Information and Data Processing; and the Advisory Council for Occupational Education. The Economic Development Council participated

[1] These included students from Tilden High School, William Cullen Bryant High School, George Washington High School, Brooklyn Tech, the Mary Louis Academy, the Hunter College Campus School, Great Neck High School, West Hempstead High School, and 7 or 8 public secondary schools in Queens.

in demonstrations, as did representatives of the Explorer Scouts and staff from the New York State Project to Improve Career Education.

At the New York State Education Department level, CAG was seen by representatives of the Bureau of Two-Year College Programs and the Division of Occupational Education Supervision (who, in 1974 began funding the companion project at the community college level); the Division of Adult and Continuing Education; and the Research Coordinating Unit.

Requests for information about the project were received from the State of Hawaii, Department of Education; West Point; the National Institute for Career Education and Counseling; the Minnesota Educational Computing Consortium; Project IRMA (New York City Mayor's Office); the Newark (Delaware) School District; the Queens Men's House of Detention; the New Rochelle City School District; Station WNDT-TV (Annendale, Virginia); the National Council of Jewish Women; Harshe-Rotman and Druck, Inc. (Chicago-based ITT Educational Services); Syracuse University; Brighton High School (Rochester, New York); the New York State Education Department Office of Vocational Rehabilitation; the Alleghany (Pittsburgh, Pennsylvania) Intermediate Unit; Long Island University; and from the Careers Research and Advisory Center (Cambridge, England).

Stimulated by a Press Conference on February 25, 1974 at Louis D. Brandeis High School, articles appeared in many local newspapers and magazines; the television media carried the story on ABC Eyewitness News (2/27/74, 6:00 p.m.), NBC Evening News (2/25/74, 6:00 p.m.), and on Channel 9 News (2/25/74, 11:00 p.m.). It was reported in the early and late edition of the New York Daily News (February 21, 1974); in the New York Post (February 26, 1974); in the New York Teacher (March 10, 1974); in Parade Magazine (March 31, 1974); in Business and Society (March 19, 1974); twice in the Staten Island Advance (February 20, 1974 and October 6, 1974); in a newspaper in Tucson, Arizona (1974); and in Senior Scholastic magazine (April 18, 1974).

It is difficult to estimate how many people have been exposed to the concept of"computerized guidance"through the CAG project in the New York City high schools. The nature and number of the inquiries we at IRDOE and the staffs of the pilot schools have received suggest that locally and nationally there is a high level of interest in the potential of the Guidance Information System and in other similar systems.

CHAPTER X

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This chapter concludes IRDOE's study of the feasibility and impact of the computer-assisted guidance project which operated in five New York City public high schools between February 1974 and June 1975. This report attempted to summarize the myriad of details--differences in implementation procedures and styles, and individual school variations in results--that characterized the demonstration project. This summary chapter seeks to focus on those aspects which--on the basis of our experience--seem crucially related to the success of similar ventures in the future.

That the CAG project was successful is not questioned; the enthusiasm of the participants, staff and students; the number and variety of students who were served; the integration of CAG with the schools other educational functions; the positive effects of usage on students' knowledge, organizational, and decision-making abilities; the indirect benefits to the schools' counseling and advising services; and the number of new projects generated as a direct spin-off from this one are ample evidence that serious consideration needs to be accorded to CAG.

Moreover, the CAG project is fun! Everyone we came into contact with at the pilot schools and the hundreds of outsiders who saw it in action, found it a pleasurable experience, including IRDOE staff. The highly enjoyable response CAG evokes should not negate the positive effects on students we have documented. All too often, new "specially funded" projects report that staff and students liked it, although there "were no other noticeable effects." The CAG project is an example of an enjoyable demonstration that worked.

Summary: Background and Objectives

Funded by First National City Bank and the New York City Board of Education's Division of High Schools, in February 1974 IRDOE initiated a computer-assisted guidance project in five high schools selected by the Borough Superintendents--Louis D. Brandeis in Manhattan, Herbert H. Lehman in the Bronx, Midwood in Brooklyn, Francis Lewis in Queens, and Port Richmond in Staten Island. Initially, the project was to be operative from February to June 1974 (Period 1) and from September to December 1974 (Period 2); the first extension--from January to June 1975 (Period 3)--was in response to early findings and the schools' positive reactions. A contractual modification for Period 3 enabled IRDOE to assess the direct effects of the computer experience on student users. The purpose of the second extension for the school year 1975-76 (see Postscript) was to permit the concerned agencies to discuss ways to modify and/or maintain the project in anticipation that all special demonstrations, no matter what the findings, must eventually stand on their own.

The initial objective of the project, targeted at students in grades 11 and 12, was to answer the question, "Is an automated, interactive information retrieval system a feasible way to provide students with college and career information needed to make plans for their future?" The feasibility question consisted of issues related to installation, maintenance, and functioning of the hardware; adequacy of the software; scheduling, and the assessment of the utilization of time; staffing patterns; and extent of usage by students. Also of interest was whether CAG use affected the number of students applying to colleges, the types of colleges applied to, and the rates of acceptances; and, the effects on career choices of students who were not college bound.

In Period 3, the evaluation objectives were expanded to ascertain the effects, if any, of CAG use on students' knowledge of college and career information, on their ability to conceptualize (i.e., organize) this information, and on their decision-making ability.

The computerized system used in the demonstration was the Guidance Information System of Time Share Corporation, a proprietary company which developed, maintains, and markets the system for national distribution at the secondary school level. GIS consists of four data files--one containing information on about 1600 four-year colleges, a file of information on about 1000 two-year colleges, information about 1300 occupations selected from the D.O.T., and a scholarship and financial aid information file. The scholarship file, though sorely needed, was little used and for all intents and purposes can be considered existing in a prototypical state. All 3 major files can be approached in two ways: to obtain a description of a prenamed college or career (description), or to obtain a list of colleges or careers that meet the user's input specifications (search). In conducting a search, the user is exposed to the narrowing logic on which GIS is based--namely, each additional input restriction narrows the remaining options. All the information necessary to operate the system is included in the User Manual and Student Study Guide.

In the New York City project, to access GIS, the user sat at a teletypewriter terminal (one per school) connected by phone line to TSC's computer. (S)he types in his/her instructions, employing letter and numerical codes. The computer responds by typing back on the keyboard. The interaction simulates a rudimentary conversation. The interaction can be direct with the student present, or indirect where a terminal operator processes the student's request in his absence. In this latter mode of use (batching), there is a delay between the time the student submitted his written request for information and the time he received that information. In direct interaction there is no such delay and, moreover, a student can modify his input on the basis of output he immediately received. Carbon paper was provided so that each student could retain a copy of his interaction, with a carbon for staff use.

Each school was assigned one day a week in which it had unrestricted access to the computer from 8:00 a.m. on (theoretically until the following morning at 6:00 a.m.). In Period 1, on-line days were rotated so that, for example, in the first month School A was assigned Mondays, in month 2 Tuesdays, and so on. In Periods 2 and 3 a set day of the week was

assigned to each school. Starting in Period 2, IRDOE initiated a similar project at the community college level--one of the unanticipated benefits of the two companion projects was an increase in the flexibility of scheduled time.

IRDOE's grant from Citibank covered all hardware and software costs, and costs associated with project management, monitoring, and evaluation. The Board of Education's contribution covered the salary of one full-time teacher equivalent at each of the five schools, and the telephone service charges.

The school administration assigned one or more members of the staff to act as project liaison(s). In 4 of the 5 schools the teaching equivalent salary was split either among two professionals, and/or between professionals, paraprofessionals, and secretarial aides. The liaison was responsible for in-school publicity, and student recruitment and orientation; operating or supervising the operation of the terminal; student followup after use; coordinating CAG with other school functions; and maintaining and expediting the evaluation records and test and questionnaire administration. The on-line day was largely devoted to helping students at the terminal; most of the other duties were performed on the days the school did not have access to the computer.

The participating schools varied on many dimensions, some of which were related to school-to-school differences in outcomes. They ranged in size from School E, the smallest, to School A which enrolled nearly three times as many students. School E was built about 50 years ago, while School B was newly opened and did not have a full graduating class until June 1975. About 70% of School A's students were reading two or more years below grade level, with the range at the other schools from 16% to 26%. In terms of academic climate and general SES level, Schools C and D served a relatively affluent community and had a reputation for academic excellence; Schools E and B were largely blue collar, and School A was the poorest, and with the largest proportion of non-white students (90%).

The schools' involvement in career education emphases differed as did the extent of their college advising services. These tended to covary: School B was the most career-oriented and had the least developed college advising services; Schools C and D had well-established college offices but much less well-defined career advisory services. School E had a combined career-college office. School A had a modest college office and little involvement in career education.

Although all schools tended to be overcrowded and short-staffed (especially in Periods 2 and 3 when there was a general worsening of economic conditions citywide), they made space for the project and assigned liaison responsibility to their "better staff members." A grade advisor was primarily responsible for CAG at School A and the terminal was located in a room within the college office. School B hired a full-time guidance intern and placed the terminal in proximity to its career advisory programs. At School C the terminal was in the college office and primarily supervised by a college advisor; a similar arrangement obtained at School D. School E's CAG operation was under the supervision of the college-career office advisor, and the terminal was located in the fourth floor library.

In March 1974, IRDOE collected baseline data on 11th and 12th graders plans with regard to education and careers, the factors involved in their decisions, and on the quality and quantity of their in-school interaction with counseling and advising staff.

Most students intended to go on to college, to a four-year rather than a two-year or vocational institution. In large measure, this resulted from CUNY's Open Admissions policy. Almost every student could state occupational goals, although there were marked differences in level and specificity ranging from cytotechnologist to plumber to painter. Twelfth graders, as compared with eleventh graders, tended to be more restricted in their occupational goals--suggesting a focusing or narrowing of choice as "closer-to-decision-time" approached. Most students indicated that it wastheir own interests and abilities that constitute the major influence on their future plans--far more important than friends, teachers, counselors, or written or media materials.

Most students surveyed said they had seen a counselor or advisor at least once for individual consultation and had received help, especially with their future plans for continued education. Sizable proportions of students reported wanting more help--especially with their college plans. Those who indicated wanting more help with occupational planning seemed interested in the educational component of careers; this interpretation is supported by the findings of the impact study. Thus, when the CAG project started, students evidenced a need for both career and college planning, whether specifically articulated or not.

IRDOE initiated the project by conducting school orientation and staff training sessions. Informal "training" and mutual learning continued with each of the 97 man-days of visits made in the 15 months of the project's duration. We designed several instruments and data collection techniques to collect time data, malfunctions, numbers and grade level of students who participated, file(s) used, and mode of interaction. Questionnaires were administered at regular intervals to liaisons and principals, and to the guidance staff, school librarians, and other involved teachers. Students were tested in 1975. College applications made by the 1974 and 1975 graduating classes were analyzed. Records were kept describing the quality of GIS and independent assessments were made on the accuracy, recency, and usefulness of the system. Anecdotal reactions & evidence concerning serendipitous benefits and problem areas were preserved.

Summary: Conclusions and Recommendations

Many of the specific recommendations follow directly from the stated conclusions. Instead of restating these in the "...should..." form, in this concluding section we will concentrate on two recommendations: implementation and modification of the software program. Throughout this report we have also stated or implied that there are still some very crucial research questions that should be addressed--either prior to or concurrent with any continuation, expansion, or change with regard to computer-assisted guidance in the New York City public high schools.

A total of 4137 different students (users) in the five high schools used CAG a total of 6789 times (uses) in the 15 project months. For an individual student, use can consist of one or more of the following experiences:

> Review of the Student Study Guide (or a modified facsimile) in whole-class orientation sessions, and/or in small-group or individual sessions;
>
> Single or repeated use of one or more of the GIS files;
>
> The conduct of a search, or a description, or both;
>
> The presence or absence of the student at the terminal when his request for information was being processed;
>
> Receipt and/or review of a copy of his printout; and
>
> Followup activities.

Each user averaged 1.6 uses; if these had included his presence at the terminal, the average length of time he spent at the terminal was 11 to 26 minutes--a very brief experience in one's high school career. About 62% of the students used CAG once; 38% returned two or more times. There were more than 130 individuals who returned 5 to 13 times.

For "all schools" and at each individual school, the total number of students served was greatest in Period 1 (total users, 2274) and least in Period 2, the Fall semester (total users. 1413). For each period, the separate schools maintained their respective positions, with School E consistently serving the most students (total all periods, 1167) and School C the fewest (total all periods, 498).

Taking into account the difference in period duration, the number of scheduled days, and the availability of extra time, use in Periods 2 and 3 was approximately half of what could have been expected on the basis of the least conservative prediction. The decrease was a result of several factors, including the fact that the novelty wore off, the impetus to serve as many students as possible declined, and schools began to use the system differently and with better integration with schoolwide affairs. The primary factor, however, appeared to be economic--despite the continued allocation of staff at the same level, actual staff time was reduced considerably in Periods 2 and 3, especially in Schools C and D.

In Period 1, the combined schools' average number of uses per day was 40.4, as contrasted with 18.8 in Period 2 and 18.6 in Period 3. This accords with the overall decrease, but also reflects the difference in availability of extra days: In Periods 2 and 3, the schools used more days, but had fewer uses per day.

On each on-line day, however, schools maintained a relatively constant pattern of use; that is, in Period 1, there was an average of 7.0 uses per hour. In Periods 2 and 3 the mean number of uses per hour was 6.3 and 7.4, respectively. Thus, the schools tended to process approximately

the same number of requests per hour of terminal time. Differences in mean number of uses per hour is directly related to the proportion of uses that involved direct interaction. Schools E and B which tended to average the largest mean number of uses per hour (all periods), tended to have the largest proportion of batched requests (all periods). When the overall proportions of direct use went from 29% to 48% to 28% (Periods 1, 2, and 3, respectively), minutes per use went from 9 to 10 to 8 minutes. To conclude:

- In the 15 months during which CAG was operational in the five public high schools, a total of 4137 different students used CAG a total of 6789 times--or an average of 1.6 uses per student.

- The total number of users and uses was highest in Period 1, followed by Periods 3 and 2. Thus, there is some suggestion that--all other things being equal--use can be expected to be higher in the Spring than in the Fall semester of the school year.

- Most students used CAG once; 38% of the total users used CAG more than once. Of the multiple users, a small number returned numerous times.

- The individual schools differed with respect to users and uses. Their relative positions were consistent over the three time periods; School E served the largest numbers of students and Schools C and D the fewest.

- Use in Periods 2 and 3 was about half of that in Period 1. The primary factor was the decrease in the actual amount of staff time that was devoted to the project; this reduction was related to worsening economic conditions that affected staff patterns most severely in the college offices at Schools C and D.

- The availability of extra time in Periods 2 and 3 resulted in the schools' use of a greater number of different days with less use on each of these on-line days. This is also related to staff cuts. Staff is available the same number of hours each day; in Periods 2 and 3, they had less time each day.

- On each on-line day schools processed approximately the same number of requests per hour: 7.0 in Period 1, 6.3 in Period 2, and 7.4 in Period 3. Individual differences among schools are related to the proportion of uses that were direct--the larger the proportion of direct use, the fewer requests processed per hour of time.

- In general, less time may be devoted to GIS in schools which have a large and well-established college advisory office, an academic reputation, and from which large numbers of graduates go on to college. CAG may be most useful in very large schools and/or those with less of an historical college bound orientation.

- Although there is little direct evidence, as a tentative

hypothesis, had GIS (including the Study Guide) been more appropriately designed for the City high school population as represented by these schools, the non- or lesser availability of staff may not have resulted in as great a decrease in student use.

* * *

The five pilot schools shared one port in the computer. In Period 1, IRDOE assigned each school one day a week on a rotating basis. In Periods 2 and 3 the liaisons indicated a preference for a regularly assigned weekday, which was instituted. Apparently, all liaisons (with the exception of School B) had other teaching and non-teaching responsibilities so that it was easier for them to plan their time on the same-day-a-week basis. In Periods 2 and 3 IRDOE also ran a companion project which enabled all high schools and community colleges access on extra days.

In Periods 2 and 3, schools traded fewer days among themselves and used a greater proportion of days assigned (or requested) than they had in Period 1. In Period 1, for all schools combined, 89% of the days scheduled were used; in Periods 2 and 3 the schools used 101% and 104%, respectively, of the original number of scheduled days(because they used extra days). While there was school-to-school variation in the amount of time used each day, all schools combined averaged 5¾ hours per day in Period 1, 3 hours per day in Period 2, and 2½ hours per day in Period 3. With the exception of School E (which maintained a steady daily rate of use in all three periods), mean hours per day for each of the other four schools decreased from Period 1 to Periods 2 and 3.

To some extent the reduction in average hours per day, as indicated above, is explained by the fact that the schools took advantage of extra days with the result that scheduling half rather than whole days might be better--might maximize use--in those situations where the staff does not have an entire day to devote to the operation of the terminal.

Although the school principals asked for more than one day a week access, the liaisons did not; they tended rather t ed to be able to divide one day's worth of access time among the school weekdays.

- One day a week worth of on-line terminal time appears to be an adequate amount for schools differing significantly in size. Obviously, smaller schools can (and do) process requests for a larger number of students, can can reach proportionally more 9th and 10th graders with the same amount of time than can larger schools.

- There is an inverse relationship between the number of different days an individual school made use of the computer and the number of hours it used that day: The greater the number of days, the fewer hours per day.

- Flexibility in scheduling the one-day-a-week equivalent is important. In Periods 2 and 3, such flexibility resulted from

additional computer ports; without this, assigning each school two half-days may be better than the assignment of one whole day of terminal time. If one day a week is assigned, school staff prefer the same rather than a rotating weekday.

- Schools vary with respect to the number of hours per day they use the terminal. Each school, however, tends to be fairly consistent.

- No school averaged more than 6¼ hours per day (the overall schools, overall periods average was 3¾), despite the fact that the computer was available for 22 hours a day. Coupling a high school CAG program with an evening program of some sort would use computer time to best advantage.

- More time may be needed by the high schools in the spring semesters. Since indirect use also predominated in the spring, perhaps had more time been available, a greater proportion of students could be present at the terminal when their requests were being processed.

* * *

All computer activities, including the CAG project, suffer from hardware malfunctions. It is evident that most major disruptions in equipment affecting CAG use occurred in the start-up months, and were related to the installation (or reinstallation in September 1974) of the terminals and the telephones. For Periods 1 and 2 the schools reported an estimated total of 63½ hours of time lost due to hardware problems; about three-quarters of the time lost were in the first two months of each period. Most of the difficulty was with "communications", including problems with the phone lines to the central computer (resolvable by the telephone company), as well as problems related to the computer itself (e.g., busy signals, no signal). In general, the liaisons rated TSC's service as "good" to "excellent"--wishing only that there be some way to forewarn users about central computer problems that could be anticipated.

The perception of the severity of hardware problems decreased with experience, as the liaisons learned the techniques for handling (at least) minor problems themselves. Similarly, the initial negative reaction to the noise the terminal makes abated, even though nothing was done to try to resolve this problem.

Within a short space of time the hardware became personalized--and the terminal, the computer, and TSC's manager of customer relations all received flattering nicknames. In the 15 months during which the hardware was in the schools, there were no security problems reported. Moreover, there was no instance of theft or abuse of the equipment, and not one of the malfunctions was a result of mistreatment.

- Thus, from a technical viewpoint, automated equipment for student use is secure in the high schools if normal precautions are taken. Staff and students alike learn to deal with the hardware and malfunctions with a minimum of fuss.

- TSC provided excellent technological support and maintenance services; the project goals were furthered by the very high quality of system and communications network functioning.

- A teletypewriter terminal, although the model used was noisy, was indestructible and provided a student with a hard copy of both his input and the output. Its relatively slow typing speed enabled a student to try to read the output as it was being generated.

* * *

Questions related to the software components of GIS--the Student Study Guide, the content of the files, and the basic structure and organization of the system--are somewhat more complex. There was a great deal of concern about the suitability of the Study Guide for the high school population represented by these five schools. All schools attempted one or another procedure to cope with the difficulty level, format problems, and instances of insufficient explanations. Many of the problems were handled by the liaisons in individual orientation with students in which they rephrased or redefined the written material. The schools also rewrote parts or excerpted sections of the materials themselves. Several of the problems (e.g., format, index of occupations by cluster) that we brought to TSC's attention were modified in their annual revisions of the Study Guide.

- TSC is responsive to consumer input, at least to the extent that the requested change does not violate GIS's national marketability.

- The Student Study Guide is too difficult for the New York City high school student, as represented by the pilot school enrollees. A tentative hypothesis, for which we have little direct supporting evidence, is that the reading level difficulty of the Study Guide reduces the probability that large numbers of students would be able to delineate and process their own requests for information by reading the Study Guide and operating the terminal themselves.

* * *

In general, the liaisons and our independent research supports the finding that the basic logic is sound, flexible, and relevant to the uses to which a school could make of a computerized system. Three schools tended to use the system as a "one-shot" experience, while the other two tended to encourage repeated exploration. For all schools combined, 62% of the students had had only one CAG experience at the terminal, although there was the occasional student who returned seven or more times.

All schools liked the search and description capabilities, and differed from one another in the degree to which they were stressed. In Periods 2 and 3 (for which these data are complete), about two-thirds (67%) of the uses were searches. Almost every use by Schools B and C, and A

(in Period 1) and D (in Period 2) were searches; only in School E did the proportion of descriptions outnumber searches by 2 to 1. The impact findings on the Decision-Making test clearly suggest that the advantages to user groups as compared with non-users is related to the proportion of users who requested a search--the capability that exposes users to the system's narrowing or "inverted pyramid" logic.

Another aspect of GIS flexibility is that it permits adaptation to direct use or indirect use. Indirect use, because it is faster (average 3-6 minutes as compared to direct use which averaged 7-16 minutes) and is not dependent on students keeping appointments, allowed the schools to serve a greater number of students. Direct interaction was reported to be the preferred mode, since it increased the opportunity for student-staff interaction, was fun for the student, and enabled him to revise his input immediately on the basis of the output. Despite the fact it was preferred, its supposed advantages did not outweigh time and demand considerations. In Period 1, 71% of the uses were indirect; in Periods 2 and 3 the percentages were 52% and 72%, respectively. Although there were school-to-school (as well as period-to-period) variations in the proportions of direct and indirect CAG experience, these were not reflected in the impact study results (neither Vocabulary nor Decision-Making).

The final aspect of CAG flexibility is that GIS is elastic enough to provide an experience to students in grades 9-12 with varying interests, attitudes, and abilities. Most of the users were in grades 11 and 12 as a result of priorities IRDOE established; in Schools B and E, however, from 21% to 48% of the uses were by 9th and 10th graders. (In the instance of School B because of two factors: no or a small twelfth grade in Period 1 and its career orientation which permeated grade levels. School E, because of its size,was able to serve large numbers of juniors and seniors with sufficient time left over to serve sophomores and freshmen.) The liaisons differed with respect to their opinions about who benefited most and least--although all agreed that CAG stimulated students' thinking about future decisions earlier in their high school careers. The impact test findings are inconclusive with respect to grade level since only School E tested a substantial number of 11th grade students on Vocabulary and Decision-Making.

- A system such as GIS offers the New York City secondary schools enough depth for repeated exploration and enough scope to process a "one-time" request for information.

- GIS can be used with success in grades 9-12, according to liaisons' reports; little other data with respect to the differentiated benefits by grade are available. Similarly, GIS can be used with students differing in ability level, area of interest, and motivational level. The Vocabulary and Decision-Making results (on a school-to-school basis) suggest that schools with greater proportions of lower ability students make the most dramatic gains as a result of CAG, although this might be an artifact of the low ceilings on these tests.

- The computerized system's search and description capabilities permit it to be of use to a variety of students, including

those who just want a description of a specific college or career or for those who have , more or less, defined those attributes they want in a college or career. Even for students who have made a firm decision or commitment, CAG was used as reality testing of that choice.

- Schools' own needs, philosophy, and size are related to their usage patterns. Some schools will encourage multiple uses by a single student; others will try to reach as many different students--at least once--as possible. From the data we analyzed, we cannot determine to what extent multiple use is related to the impact of the experience on the user.

- Although not tested on an individual-by-individual basis, the school-by-school evidence tends to support the conclusion that experience with the system's narrowing logic (i.e., the system's search capability) improves students' decision-making ability.

- Despite the professed preference for students' direct interaction, the schools tended to batch an average of six of every 10 requests for information. The proportion of requests that are processed with the student present at the terminal appears to be positively related to the ability level of the student body, the emphasis the liaisons established (or pressures they responded to), and whether students have free periods during the school day or free time after school. Student apathy or forgetfulness in keeping appointments and pressures to provide the service to as many students as possible increase the proportion of requests that are batched. We did not differentiate the benefits of direct vs. indirect use, on a schoolwide basis, on the Vocabulary or Decision-Making impact test results.

- Direct use, however, facilitates the positive involvement of students with staff, so that stronger personal relationships are established, and students feel more comfortable in sharing school-related and non-school-related concerns with the result that better and more realistic future plans are made. All direct users received a copy of their printouts, reportedly shared with friends and family, thereby causing a "ripple" effect --most noticeable in the increase in number of students who "heard about CAG from a friend" and dropped in to "use the computer."

- Indirect use increases the need to establish routines to insure that the printout is returned to the student and to arrange followup discussion about the output.

* * *

The liaisons rated the data files in GIS for completeness, accuracy, recency, clarity, and relevance or usefulness. Their ratings were supplemented by independent measures of these variables. The purpose was

two-fold: first, to attempt to separate the concept of computerized services from the specifics of the Guidance Information System; second, to provide a basis for the design of an optimal system that would be most meaningful for New York City students.

In looking at all four files, the two college files were judged to be fairly complete in that most (but not all) of the four-year and two-year institutions were included. As far as educational information is concerned, the liaisons--reflecting their experiences with students--indicated a need for additional files. The liaisons felt it would be most desirable to include selected graduate schools (e.g., university schools of journalism, optometry, etc.)--especially ones offering either fairly unique opportunities and/or ones accepting candidates who had not completed the traditional full four years of undergraduate school. Of more interest to them, however, was the need for a file of post-secondary vocational training schools, including specialized schools, and technical, trade, and business schools--particularly schools at which a high school graduate could obtain the training necessary for some occupations in the occupational file, not always in a two-year or four-year college setting. Thus, not only was there a stated need for institutions offering technical-plus training, but a strong desire for specific schools to match the range of occupations in GIS.

GIS's occupational file, containing a sample of 1300 occupations from the D.O.T. (which includes more than 20,000) was judged to be much less complete. The liaisons' problem with completeness was not so much in terms of number, but rather, in terms of why and how that particular set of 1300 were included. Several classes of occupations were not included, or emphasized enough (e.g., sports-related, artistic occupations); many specific occupations of interest to students were not included. On the other hand, there was a great deal of redundancy (e.g., eleven draftsmen), an overemphasis on disappearing occupations, and not enough stress on occupations in emerging fields. Furthermore, according to the liaisons, "there were too many requiring postgraduate degrees and too many at the lowest levels of employment." These opinions of experienced teachers are supported by the data collected in the Initial Survey: of the 341 different occupations listed by students as their first choice for future careers, 41% were in the occupational file, 35% were related to occupations in the GIS file, but 24% were not included at all.

Finally, the Scholarship and Financial Aid file, conceded by TSC to be the weakest file, was judged inadequate for the students in the five pilot high schools. The need for financial aid information was great; that the scholarship file did not begin to satisfy this was evidenced in the extent of use of that file: for all schools in all periods combined, less than 1% of the total uses were in the Scholarship and Financial Aid file--although, initially, a great deal of liaison time was spent in exploring this file.

While use or student awareness is one index of the "goodness" of the information in GIS, it is not an infallible indicator of importance. Slightly more than half (51%) of the total uses during the 15 months were

for college information; three-fourths of these were requests for information from the four-year college file. All schools made relatively little use of the two-year college file; this low usage probably reflects student desire for a particular kind of information, and not the quality of the information in this file. Overall, 49% of the uses were for occupational information. These data support our hypothesis that while students verbalize needing more help with educational planning, for very many this means education-as-related-to-occupational choice.

As could be anticipated, the two more academically oriented schools (C and D) made more use of the college files (84% and 78%, respectively) than the other three schools, and more use of the four-year college files (76% and 65%, respectively) than the other schools. Schools A and E, for all periods combined, requested information from the occupational file in 69% and 62% of the instances, respectively. Proportion of use of the files differs from period to period as well as from school to school, but not in response to the priorities IRDOE established. Furthermore, on a schoolwide basis, proportion of use of a file is not directly related to the benefits to users on the Vocabulary or Decision-Making tests. Thus:

- An ideal set of educationally related data files should include information on two-year colleges; four-year colleges; selected post-baccalaureate programs; and business, trade, technical and other vocational training schools. GIS's two college files were judged to be fairly complete.

- Students in New York City public high schools need more scholarship and financial aid information than is available in GIS.

- An occupational file, which cannot feasibly contain a complete set of all occupational titles, should sample occupations in relation to students' interests and to educational objectives and expectations. The occupations included should be non-duplicative, and representative of the greatest possible number of diverse occupations. It seems to us that a reasonable sample should include large proportions of occupations with expanding or stable employment opportunities, and fewer with declining outlooks. Furthermore, there should be a balance between occupations that students say they are interested in and occupations that "stretch" their interest.

- A set of files in an ideal system should be better interrelated than are the GIS files. For example, training places for an occupation should be available in (at least one of) the "schooling files."

- School variations in the extent of use of the GIS files is more related to in-school needs than to externally imposed priorities.

- The proportions of the schools' uses of a file do not seem to be related to the outcomes on the impact test measures.

The data was not analyzed in terms of the individual student's experience with one or another of the major files.

* * *

Completeness can refer to the number and kinds of categories on which colleges and careers are classified and on the range of characteristics within the categories. The college files contain more categories and characteristics than does the occupational file: 25 categories and 600 characteristics in the four-year college file; 21 categories and 350 characteristics in the two-year college file; and 7 (selector) categories and about 80 (selector) characteristics in the occupational file. This difference means that the user has less choice of input (and less information in output) in the occupational file than in the college files.

The liaisons rated the categories and characteristics highly complete in the college files. They suggested inclusion of other categories (e.g., size of college departments, and high school course prerequisites for college majors). The occupational file was not rated highly either for completeness of categories and characteristics, nor for clarity or logicalness. The liaisons suggested adding a category to the occupational file describing the educational courses or majors which relate to the occupations. IRDOE's analysis of student use of the available categories and characteristics revealed that certain categories are used much more frequently than others. Frequency of use relates to at least three factors: importance and relevance to the student; students' familiarity with the topic; and the quality of TSC's treatment of the category.

In the four-year college file, the categories of Majors and Location were employed in 98% and 81%, respectively, of a sample of student searches. Coeducation and Competitiveness were used in about two-thirds of the searches examined in February 1974. The next two categories in rank order were Size of Total Enrollment and Costs, both of which were used far less frequently (24% and 23%, respectively). There were 11 categories which were employed in 5% or fewer of the searches examined.

The use of two-year college categories differed slightly. Fewer of the available categories were used, and half were employed in 5% or fewer of the searches. Most frequently used were Curriculums Leading to Associate Degrees and Location.

Despite the fact that there were so many fewer (7) categories available for an occupational search, two categories were used in fewer than 9% of the searches. The remaining five were: Cluster (97%), followed by Interests (83%), Levels of Occupations (82%), Levels of Formal Education (73%), and Aptitudes(55%).

These frequency of use findings parallel the results on the Initial Survey (conducted one month after the frequency of use analysis) in which students indicated that majors offered, location, and tuition were of most importance in choosing a college. Similarly, in deciding on a future career, all respondents could name their first choice with varying specificity, and indicated that that choice was a function of their own interests and abilities.

Early in 1975 (January-February), students in three schools who had used the computer were compared with non-users in the same classes, on four instruments measuring the amount and variety of information they had about colleges and careers. On each and every one of these open-ended measures, users consistently produced more information and more varied information than non-users. Almost without exception, the content differences in mean number of statements and mean number of categories (in favor of the users) was with respect to information in GIS. That is, the differences between users (many of whom had indirect CAG experience, and experience that predated the test administration by 6 months to a full year) and non-users were almost entirely in content available in GIS. Moreover, a highly statistically significant difference on the Vocabulary test existed between users and non-users; the Vocabulary items were selected from the GIS Student Study Guide.

While it is quite clear that the CAG experience improved users' college- and career-related vocabulary, and their descriptive and organizational ability with regard to college- and career-related information, only about two-thirds to three-quarters of what students think is important about colleges and occupations are included in the Guidance Information System. Students want more specific information about college major fields of study--including the range of available courses, an estimate of a department's reputation vis-a-vis other colleges, a description of the colleges' educational style in terms of lectures, seminars, independent studies, and so on. Students consider some information (not in GIS) about occupations important as well; they are interested in knowing more specifically about the content of the training (i.e., necessary courses) in addition to where that training can be obtained. They are also interested in information about occupations in general that is available only in GIS as a descriptor about a particular occupation. And, they think it important to know about the life styles that are associated with occupations. In conclusion:

- The classification of college information (categories and characteristics) in GIS is fairly complete from the liaisons' point of view, but contains only about two-thirds to three-fourths of what students feel is important.

- The classification of occupational information in GIS is not as complete nor as extensive as the college files. Again, GIS contains only about two-thirds to three-fourths of what students want to know about occupations.

- Certain categories are used in searches conducted by students more frequently than other categories. In the occupational file, this is due to the limited availability of categories, and the ambiguity of at least two. In the college files, the most used categories reflected students' statements of what was most important to them. It remains for future research to determine whether the availability of clearer and more complete categories and files of information would alter what students ask about--i.e., lead to expanded inquiries.

- Students with CAG experience have more and more varied information about both college and careers than students who were not exposed to CAG.

- Much of the difference between users and non-users in amount and variety of information about colleges and careers reflects information available in GIS. Furthermore, in the test of meaning of items (vocabulary) selected from the Guidance Information System, users outperformed non-users. No data is available on the benefits to an individual who used any set of categories or characteristics in any file.

- A computerized approach to providing college and career information is a valuable approach for building or improving a career information program at the high school level.

- An ideal system should include categories of information students and professionals agree are important, but many of the less frequently used categories, or ones not usually considered, may not be irrelevant. The information they contain may be of a kind that students do not think to ask about at first. It may be important to retain some of these categories, since expanded choice may result from their availability in a system, at least by some students who become aware of their importance.

- To clarify the reasons for little or no use of certain categories, further study is needed to determine which may be truly irrelevant, which are little used because they are difficult or confusing in the GIS form, and which are important but not often thought about.

* * *

Other analyses of the GIS software components that were conducted reveal that much of the liaisons' day-to-day criticisms concerning accuracy of the information and recency of information had some foundation. Most of these have implications for data collection and update procedures and will not be discussed in this chapter.

As a summary statement about the Guidance Information System, we conclude that there are more problems with software- than with hardware-related aspects of a computerized college and career information retrieval system. Nonetheless, GIS is an effective system and(although not easily used by students alone without staff support) produces many benefits to students, staff, and the schools involved. We now turn to a summary section on these benefits--the direct benefits as reflected in college applications data, in vocabulary, decision-making, and the amount and variety of information obtained by student CAG users.

The number and types of colleges students apply to is more a function of costs and income, including scholarships and financial aid, than it appears related to CAG use. In this demonstration we could not directly compare applications of users with non-users; the closest approximation we could reach was a comparison of the applications of the June 1974 graduates with those of the June 1975 graduates. Better tests of the effects of CAG on college applications and on rates of acceptances and rejections are possible and might be considered in the future.

We looked at CUNY applications, SUNY applications, and applications to all "other" colleges. Combining all applications for all schools, there was an overall decrease in the average number of applications per graduate (APGs) in 1975, as compared with 1974, from 1.5 to 1.2. The total number of different colleges applied to also decreased, from 385 to 331. All schools except A and D showed a decrease in APGs, which was most dramatic at School C.

In 1974, 63% of all graduates applied to CUNY; in 1975, 54% applied. The SUNY APGs decreased from .41 to .31 while the other college APGs went from .47 to .37. There was, however, an increase in the total number of different SUNY colleges applied to. For both years, 90% or more of all applications were to four-year colleges. The individual schools maintained their rank order in both years: generally School C filed the most APGs followed by Schools D and E; Schools A and B were at the bottom.

Looking at the acceptances of applications with known outcomes, there was a slight increase in the percentage of non-CUNY acceptances in 1975; this was almost entirely attributable to a much higher rate of acceptance to SUNY colleges. The non-CUNY rate of acceptance was 75% in 1974 and 79% in 1975; the SUNY acceptance rate increased from 73% to 81%.

- The effects of CAG on college applications and acceptances are not clear from these analyses. Liaisons report many instances in which students located colleges through GIS and were accepted by them; the staff also reported that CAG frequently had the effect of modifying students' college choices (either expanding or constricting them), to better accord with reality. Obviously, better and more research is needed for systematically isolating the effects, if any, of CAG on college decision-making and choice.

- The overall decrease in APGs might be attributable to the fact that CAG may have brought about fewer, but more realistic, applications. This is supported by the increase in rate of acceptance to SUNY colleges. These findings, however, may have to do more with general economic conditions than with school-, student-, or CAG-related causes.

- The decrease in CUNY applications reflects a difference in CUNY's processing and differences in IRDOE's data collection in 1975.

- About 90% of all applications filed in both years was to four-year colleges. This agrees with students' preferences for this type of education, and their low use of the two-year college file. It does not necessarily mean that a two-year file is not important, nor that the GIS file is inadequate.

- There is some slight evidence to suggest that the particular high school a student attends greatly influences the colleges to which he will apply.

* * *

The findings with respect to the user/non-user differences on six measures of the direct impact of CAG were more clearcut, and have been referred to throughout this chapter.

The preference for the computer as a source of information about colleges or careers was in the middle of a list of sources. Overall, somewhat more users (36%) than non-users (28%) preferred the computer for college information, although it ranked below the college office-counselor, visits to colleges, and catalogs. Individual schools differed. School E's non-users preferred the computer more than users at other schools; at Schools D and C fewer users than non-users preferred the computer. In terms of careers, preference for the career office-counselor ranked first for all schools combined, followed by talking to people in different careers, and visiting work sites. Both users and non-users preferred the computer less for career than for college information, although users ranked it higher than non-users. The individual school differences were very similar to those obtained for the computer as a college informational source.

Preference for the computer as an informational source is not related to the benefits students get from the CAG experience in terms of cognitive measures. School E students were most enthusiastic about the computer, but in this school users differed least from non-users on Decision-Making; School C users were not ardent fans, but they did demonstrate superiority over non-users on Vocabulary and Decision-Making.

The difference between users and non-users on Vocabulary was statistically significant in favor of users. The individual school differences all favored users, but the variations in schools and in CAG method gave no significantly greater advantage to users. The data suggest that a school's performance on this measure is related to the general ability level of students.

The Decision-Making results are similar: users performed significantly better than non-users on this measure. Although the same direction of benefits held for each individual school, there was no statistically significant differential advantage to users. There was, however, a tendency for the users in schools of lesser academic level to show greater benefits, possibly because of the low test ceiling. With this instrument, there seems to be some positive relationship between the magnitude of advantage to users and the proportion of users in the school who conducted searches.

On the Self and Ideal College Questionnaires, users produced more information and more varied information than non-users; users employed a greater number of categories which were in the Guidance Information System. Moreover, about 30% of the categories generated by users (Self College) were exclusive to them--were not employed by non-users.

On the Self and Ideal Occupation Questionnaires (which appear to tap different student concerns), the mean differences in various scores (number of statements, number of categories, number of unique categories, categories related to GIS, and personal- vs. job-oriented categories) clearly favored the users. The users employed more and a greater variety of information and more GIS-related information. Users, moreover, tended to be

more concerned about the educational or training requirements of an occupation and seemed to be more attentive to differences in the wording of the questions on the instruments.

On all four instruments, approximately three-fourths of the information users and non-users thought it was important to know about was included in GIS; some of the information not in GIS might be considered in the redesign of the data files. To summarize:

- The computer as a source of college and career information ranks in the middle of a list of sources. It was preferred by students more for college than for career information, reflecting all our other data describing this file as less adequate than the college files.

- A larger proportion of users, overall, than non-users preferred the computer as an information source. There were variations among the individual schools; although the computer was ranked low in Schools C and D, non-users tended to rank the computer higher than users, indicating that these schools may have better sources for information and that users are better able to make that judgment.

- The students in School E, non-users and users, rank the computer highly as a source of information. Their preference for the computer does not influence the results on vocabulary or decision-making; on the latter measure in particular, user benefits accrue to schools with a great proportion of students who used CAG's search capability.

- The data on source preferences seem to suggest that students, especially users, do not differentiate clearly between "counselor" and the computer-assisted counseling experience. This question might be the basis for future research activity.

- Users performed significantly better than non-users on measures of Vocabulary and Decision-Making. The findings seem to indicate that students poorer in decision-making ability might benefit most from the CAG experience--especially from a file search.

- Users have more information and a wider variety of information about colleges and careers than do non-users. The advantage to users is attributable to CAG, since they employed a greater variety of GIS-related categories.

- Two-thirds to three-quarters of the information students consider important about colleges and careers is in the TSC system. The remainder of the information is not.

* * *

On the basis of all our experiences and findings we recommend that serious consideration be given to the expansion of a computer-assisted

guidance project. Such an expanded program should encompass or build on the components that have been tried successfully by the five pilot high schools.

Specifically, we recommend that a hardware configuration similar to TSC's be used. The teletypewriter terminal should be retained since it was indestructible and permitted the generation of hard copy with multiple carbons. There are more sophisticated models that are faster and less noisy, but in our judgment the noise and speed of the KSR-33 attracts students,and staff quickly adapts. In schools with students of lesser academic ability the slow speed enables them to follow the output; a variable speed model might be considered for high schools whose students are reading at or above grade level.

We recommend that schools be assigned time in advance; the equivalent of one day a week access per school is adequate. Maximal use will be attained if schools are scheduled half-days or smaller portions of days rather than whole days. A "buddy" system of pairing 3 to 5 schools would eliminate the need for external management. The schools in each buddy-group could arrange their own trades for special events, and would, if one experienced a breakdown, call a buddy to see if one of them could use the time.

A staff person in each school needs some time allotted for coordinating responsibility; half-time is suggested. This can, of course, be divided among different staff and every effort should be made to increase the number of in-school staff who are familiar with the operation. With a revised system, there should be less staff time needed to operate the terminal--with more time devoted to orienting students and following them up in an advising relationship. In time, students will learn of the availability of the system in their schools; with system improvements, more students should be able to access the information with considerably less staff help.

Except for research purposes, there seems to be little reason to establish external priorities for all schools for use by students in a particular grade level or at a particular time of year. The high schools are cognizant of their own needs and will adapt the system--provided, of course, it has built-in flexibility--to meet these needs. Schools will also establish their own patterns of use. We recommend, however, that direct interaction and the search mode be encouraged. Although the data with respect to direct interaction effects on students is not definite, there are other serendipitous benefits--including increased involvement with staff and increased flow of students to the area (office and personnel) in which the terminal is located. With CAG, students seek out help and advice more frequently and earlier in their high school career.

Searches are recommended because it is the only way students are exposed to (GIS's) decision-making logic. The data suggests that improved decision-making ability is associated with searches.

Without modification, GIS might be expanded most feasibly and usefully to schools of lesser academic ability, to very large schools, and/or to schools with less well-developed college orientation. However, GIS can

become the basis for building or improving a school's college office or career education thrust--provided, in the latter instance, that supervisory staff be assigned this function primarily. A modified system, with an improved occupational file, would be more adaptable for this purpose.

Whether a future system should build on GIS, or whether a new system with new data bases should be developed depends partly on funding. We will not deal with this issue here; instead, we will attempt to describe the ideal system that is more responsive to the needs of New York City high school students.

An ideal computerized system should provide much simplified access so that greater numbers of students could process their own requests for information. Similarly to GIS, a user should be able either to conduct a search or ask for a description of an item. An ideal system should retain GIS's narrowing--inverted pyramid--logic or a similar program structure. All files, however, should be similarly constructed (e.g., no division between selectors and descriptors as in the GIS occupational file), and should be cross-referenced: for every occupation included, there should be appropriate places for training.

The number of files needs to be increased to include vocational and business and trade schools and a working scholarship bank, at a minimum. Within each file, the information might be coded to meet the needs of special interest groups or subpopulations (e.g., the handicapped and the incarcerated). Great care should be exercised in developing and applying rigorous standards for inclusion in a permanent data file. The same standards that apply to two-year and four-year colleges should be applied to alternative schools. And we urge that in each and every educational file students be apprised that a degree from a not-yet-accredited institution may not have the general acceptability as does a degree from an accredited one.

There are some recommended changes that need to be considered in files of four-year and two-year colleges. The findings suggest that some GIS college categories and characteristics should be eliminated or shortened, while others should be added. As an offshoot of this demonstration study these data are currently available.

Changes in an occupational file will be more complex because of the necessity to sample occupations. It seems to us that the sampling should reflect the best opinions of professional educators--as well as an educational philosophy--and the state of the real world. We have already implied that, for example, more emphasis should be placed on occupations with stable or expanding opportunities and fewer occupations that are becoming obsolete. The file should also include occupations that stretch students' horizons and occupations most frequently asked about. They should be non-duplicative and representative of the greatest number of diverse careers; moreover, to the extent possible occupations that form career ladders should be included.

Most of the occupations should require a minimum of a high school education if the system is directed at secondary level students; some low

skill level occupations should be retained, however, to illustrate the "value"of education. Certainly, even for New York City students, the file should include occupations other than urban ones; but in what proportions? Similarly, there should be occupations at the lower and intermediate levels and at the college, postgraduate, and doctoral levels; these should possibly reflect their representation in the real world of work.

Within the occupational file, categories and characteristics need to be clarified and expanded. The data on which to base some modifications are available. To determine which of the suggestions are worthy of future adoption, there needs to be some consideration of what the use of an occupational file (or for that matter, what the use of college files) is intended to accomplish. Once there is some consensus, then the guidelines for selecting and sampling, expanding or restricting will follow.

POSTSCRIPT

The astounding demonstration of CAG's benefits to student users, together with urging of the school administrators and staff prompted the Board of Education's Division of High Schools and First National City Bank to continue the project in the same five schools for the 1975-76 academic year. This was considered an interim measure--a "holding pattern"--which would keep CAG operational at a minimal level so that decisions could be made with respect to future expansion of GIS and/or modification.

CAG, 1975-1976

Implementation in 1975-76 was considerably aggravated by New York City's budget crisis which resulted in cutbacks in personnel, including manpower shortages in the public schools. Due to the severity of the fiscal problems, the Division of High Schools was forced to reduce its contribution to the CAG project by half, from one full teaching unit allotment per school to one-half unit. They continued absorbing all telephone costs. Considering the extent of the Division's across-the-board cutbacks that year, the allotment of any proportion of a teaching unit indicates substantial interest and support.

Citibank's funding was also decreased, affecting only IRDOE's responsibility in 1975-76; we were to serve only in a managerial and supervisory capacity--developing and maintaining calendars and schedules, ordering CAG-related supplies, training staff, and so on. Although IRDOE staff time was insufficient for collecting elaborate data, and its contractual obligations did not include this type of activity, some data on time and uses were kept.

A one-week UFT strike in September 1976 increased the usual start-up problems. There were other delays as well; because of the teachers' contract, School B which had intended to retain the guidance intern (who served as the full-time liaison in Periods 1, 2, and 3) on a reduced time schedule could not do so. When school finally opened in September, School B had no liaison. A teacher of business education, interested in the project, was selected by the principal and was trained by IRDOE. The liaisons at the other four schools remained the same, although their other in-school responsibilities had to be adjusted to compensate for the reduced allotment.

During the 1975-76 school year, which corresponds with Periods 2 plus 3, the computer was used for a total of 464 hours. This is a 13% decrease from Periods 2 and 3. Considering that staff time decreased by 50%, the decline in number of hours is significantly less than was expected.

Moreover, and perhaps of more importance, was the separate schools' pattern: School A used about 111 hours in 1975-76 (115 in Periods 2+3); School B used 118 hours (an increase from the 89 hours used in Periods 2+3); and School E used 166 hours in 1975-76 (as compared with 191 hours in the previous year), a 13% decrease. The overall decrease is mostly attributable to Schools C and D which used about 15 and 53 hours, respectively, in 1975-76 (as compared with about 29 and 110 hours in Periods 2+3); the time used by these two schools decreased by about 50%.

Similar results were found in examining the number of student uses of the computer. In 1975-76, the computer was used a total of 2953 times--a 15% decline from the 3457 uses in Periods 2+3. Again, the decrease was far from consistent from school-to-school. Schools A and B increased their usage by 3% and 13%, respectively. School E evidenced a 26% decrease, while Schools C and D used the computer much less--54% and 59%, respectively. Thus, while Schools C, D, and E decreased usage, only in C and D was the decrease more than would be predicted from the reduction in staff time.

With the exception of School C,where after Period 1 interest in CAG had been moderate at best, enthusiasm at the other four schools remained high. There was a sense of disappointment about the reduced time, and an intense feeling of curiosity about CAG's future. The School B liaison, who was new to the project, was continually amazed about the kind and quality of service she was able to give students through CAG. The liaison at School A expressed her school's eagerness to see initiated the system improvements that she and other liaisons had so diligently suggested.

Project "ACCESS"

During the 1975-76 school year, IRDOE, Citibank, and the Division of High Schools explored the future of the project. Representatives from many other agencies were called in as more complex and detailed problems arose. These people met with their own staffs and advice, suggestions, and special-interest concerns were brought back for discussion.

Meetings between IRDOE and Citibank staff started in June 1975 and actually continued through August 1976. The first round focused on questions of "need": Is there a need for additional data files (e.g., vocational schools and scholarships and financial aid), and is there a need to extensively modify GIS's four-year college, two-year college, and occupational files? And, can the need to continue the service better be met by building on TSC's Guidance Information System or by starting to design a system designed for and owned by New York City?

IRDOE, with the cooperation of Citibank, prepared a proposal for Project ACCESS (Automated Career, College, Educational, and Scholarship Search), targeted to the needs of the New York City public high school students, and built on a complete and educationally sound data base. The major part of the proposal described key parameters of a computerized system including the validity of records, relevance of the taxonomy, and comprehensiveness of the subsystems. Several possible subsystems were

described--less-than-baccalaureate, four-year college, financial aid, and careers. Data file alternatives, program logic, and hardware and software system questions were examined. Although this proposal was budgeted in terms of developing a system that was designed to be the property and responsibility of the Board of Education of the City of New York and Citibank, its specifics were adaptable to modifying already existing programs.

The second round of negotiations involved systems and computer experts from Citibank, the Office of the Deputy Chancellor, the Bureau of Management Information and Data Processing, the Graduate School of the City University of New York, and IBM. These discussions took place during October-December 1975, and were concerned with hardware problems, communications, and on-going managerial (technical and educational update) issues. Differences of opinion among systems experts concerning whether or not a computerized information retrieval system could work at all, or could operate on the Board of Education's hardware flourished. Estimates of what it would cost to "put up" such a retrieval program on the Board's hardware ranged from a conservative $10,000 to a record high of a quarter of a million dollars. And this, of course, meant only adapting or upgrading the hardware, and did not include costs relating to the software package, the building of a data base, nor to on-going operational costs for 100 public high schools.

Interim measures were considered. The Graduate School offered free computer service to 10 to 20 high schools and use of their computers for research (i.e., file construction) purposes. IRDOE, the Graduate School, and IBM located several appropriate software packages, including an informational retrieval package that would have been available to the Board of Education at a nominal charge, since other city agencies had a licensing agreement with the developer. Other activities designed to move computer-assisted guidance into an expanded number of high schools included proposals to lease GIS, or to purchase TSC's mini-computer+GIS. IRDOE revised its plan so that data collection could be accomplished in smaller, less costly stages. Although Citibank favored one-source funding of a CAG project, a great amount of time was spent in considering the question of cosponsors.

It was at this point that a more basic stumbling block emerged--and one that continues to be the major obstruction. While both Citibank and the Division of High Schools were in favor of an expansion, Citibank needed a commitment from the Board of Education that it would implement and man a new system--either Project ACCESS or a much modified GIS. The Board, like all other agencies in New York City, budgets on a year-to-year basis. General revenues are divided among all city agencies, and economic conditions affect the budget allocations. Moreover, there was some question as to whether it was legal--binding--or appropriate for the Board to commit (earmark) funds in advance. Although very desirous of the continuation (and expansion to 10 high schools)--as evidenced by the Board's allocation of teaching units for the 1976-77 school year--Citibank needed assurance of a longer-range commitment to a project that would require so large an investment and had to vote it down. The last 12 students used the computer on June 22, 1976.

Far too frequently demonstrations conducted in school settings do not provide policy makers with sufficiently convincing data on which to base future decisions. More often than not, these evaluations report that although staff and students like the demonstration program, there were no measurable student gains. Such conclusions leave the reviewer without clear directions, implying perhaps that another year is warranted in which to improve implementation strategies or measurement techniques.

The results we reported as accruing from the CAG demonstration are clear and definitive. Despite the fact that a computer-assisted guidance project may be more useful in some schools than in others, all the evidence taken together indicates unequivocally that benefits accrue to students and to schools.

As professionals in educational research and development, we are somewhat saddened by the fact that CAG, like some other special-funded demonstrations, is "all dressed up with no place to go." Alternative suggestions for dealing with similar circumstances in the future may lie, in part, in long-range funding of essential City services at a minimal level, or in the initial planning of the project. In the latter instance, some provision could be made by all participants (funding agency, grantee agency, and site institution) to establish standards relating to cost and value which--if met by the project--would lead to its consideration as part of an on-going operation.

APPENDICES

APPENDIX A

TABLE A1

NUMBER OF JUNIORS AND SENIORS TAKING INITIAL SURVEY OF STUDENT ACTIVITIES AND PLANS IN MARCH 1974, WITH PERCENTAGE WHO HAD PRIOR CAG EXPERIENCE, BY SCHOOL

School	Grade 11		Grade 12		Total
	N Juniors	% With Prior CAG	N Seniors	% With Prior CAG	
A	236	16%	198	6%	434
B	246	13%	90	0	336
C	187	25%	198	0	385
D	201	40%	182	3%	383
E	193	33%	158	6%	351
All Schools	1063	25%	826	3%	1889

*Because entire classes were tested, some 10th graders took the Initial Survey. Their responses were not included in the analyses. Prior experience with CAG was determined by examination of User Sign-In records, which gave the student's name, grade, and date of use.

TABLE A2

DETAILS OF ADMINISTRATION OF INSTRUMENTS FOR ASSESSING IMPACT OF CAG ON STUDENTS, JANUARY-FEBRUARY 1975

A. NUMBER OF STUDENTS TESTED ON EACH INSTRUMENT, BY SCHOOL

Instrument	School					All Schools
	A	B	C#	D	E	
1. Preferred Sources of College and Career Information*	77	86	88	68	86	405
2. Vocabulary	75	79	92	86	81	413
3. Self College	-	-	-	48	-	48
4. Ideal College	-	51	-	56	55	162
** Closed-Ended College	-	-	-	54	-	54
5. Self Occupation	-	55	-	-	58	113
6. Ideal Occupation	-	60	-	-	57	117
7. Decision-Making	84	87	92	69	87	419
Date of Testing, 1975	1/20	2/18	2/21	1/10	2/28	
Grade Level	12	12	12	12	11, 84% 12, 16%	

*Two questions placed at end of Decision-Making instrument; the analysis used only respondents giving three choices.

**Data not presented in this report; the multiple-choice format precluded obtaining qualitative information, and user/non-user differences were slight.

#School C is the only one where the same students took both Vocabulary and Decision-Making.

B. TOTAL NUMBER OF DIFFERENT STUDENTS TESTED, NUMBER OF CAG USERS AND NON-USERS, AND TYPE AND RECENCY OF CAG EXPERIENCE, BY SCHOOL

School	N Students Tested			% Who Were Users	For Users, Percentage By:			
					Type of CAG Experience*		Time of Most Recent Use	
	Total	Users	Non-Users		Indirect	Direct	Period 1 (2/74-6/74)	Pd. 2 + 9/74 to Test Date
A	159	94	65	59%	48%	52%	57%	43%
B	166	76	90	46%	42	58	66	34
C	92	33	59	36%	64	30	76	24
D	155	81	74	52%	68	28	86	14
E	168	105	63	62%	48	48	23	77
All Schools	740	389	351	53%	52%	45%	57%	43%

*Where Direct and Indirect do not equal 100%, the remainder did not indicate the type of experience; for all schools, these uses totalled 3%.

TABLE A3

MEAN SCORES ON VOCABULARY AND DECISION-MAKING FOR HONORS AND NONHONORS SUBGROUPS, USERS AND NON-USERS, BY SCHOOL

A. VOCABULARY (MAXIMUM SCORE = 12)

School		Users			Non-Users					
		Honors	Non-honors	Honors Advantage	Honors	Non-honors	Honors Advantage	All Honors	All Non-honors	Honors Advantage
A	N	38	10		11	16		49	26	
	M	6.7	5.4	+1.3	5.8	4.2	+1.6	6.5	4.7	+1.8
B	N	0	35		0	44		0	79	
	M		6.5			6.6			6.6	
C	N	0	33		0	59		0	92	
	M		8.2			7.0			7.5	
D	N	3	40		10	33		13	73	
	M	10.0	8.2	+1.8	8.2	8.0	+0.2	8.6	8.2	+0.4
E	N	17	38		9	17		26	55	
	M	7.8	7.7	+0.1	7.3	7.2	+0.1	7.7	7.5	+0.2
All Schools										
	N	58	156		30	169		88	325	
	M	7.2	7.5	-0.3	7.1	6.9	+0.2	7.1	7.2	-0.1

B. DECISION-MAKING (MAXIMUM SCORE = 6)

A	N	36	10		17	21		53	31	
	M	3.8	3.2	+0.6	2.8	1.7	+1.1	3.4	2.2	+1.2
B	N	0	41		0	46		0	87	
	M		3.8			3.1			3.4	
C	N	0	33		0	59		0	92	
	M		4.4			3.6			3.9	
D	N	14	24		2	29		16	53	
	M	4.8	4.0	+0.8	2.0	3.6	-1.6	4.4	3.8	+0.6
E	N	13	37		16	21		29	58	
	M	5.2	3.8	+1.4	4.8	3.3	+1.5	5.0	3.6	+1.4
All Schools										
	N	63	145		35	176		98	321	
	M	4.3	3.9	+0.4	3.6	3.2	+0.4	4.1	3.5	+0.6

TABLE A4

STUDENTS' PLANS FOLLOWING HIGH SCHOOL GRADUATION, BY SCHOOL AND GRADE (RESULTS IN PERCENTAGES)*

Plans	School										All Schools	
	A		B		C		D		E			
	11	12	11	12	11	12	11	12	11	12	11	12
Four-Year College	30%	22%	19%	13%	55%	38%	40%	50%	23%	24%	32%	31%
Two-Year College	3	12	5	11	5	10	6	8	5	8	5	10
Special Training (e.g., Trade School)	7	2	9	8	5	4	2	4	6	4	6	4
Job and School	42	41	34	34	24	34	37	26	38	44	35	36
Job & School Later	7	10	8	7	5	5	7	2	8	8	7	6
Get a Job	4	6	16	21	4	8	3	5	13	7	8	8
Military	3	2	5	1	1	1	0	1	3	1	3	1
Other	2	1	4	2	1	0	4	3	3	3	3	2
No Response	2	4	0	3	0	0	1	1	1	1	1	2
Total % Planning Further Schooling	89	87	75	73	94	91	92	90	80	88	85	87
Total % Planning Work & Schooling	49	51	42	41	29	39	44	28	46	52	42	42
N:	236	198	246	90	187	198	201	182	193	158	1063	826

*From Initial Survey of Student Activities and Plans, March 1974.

TABLE A5

MEAN LIAISON RATINGS OF THE ADEQUACY OF THE GIS COLLEGE FILES
(Categories Listed in Order of Rating of Frequency of Use)

Category	N Characteristics		Variables Rated					
	COL4	COL2	Completeness	Accuracy	Clarity	Appropriateness	Relevance	Frequency of Use
Academic Programs of Study ("Majors")	327	106	2.6	2.7	2.4	2.6	2.8	3.0
Geographic Location	63	63	2.9	3.0	3.0	2.6	2.9	2.8
Financial Aid	13	13	2.8	2.7	2.9	3.0	3.0	2.5
Competitiveness*	6	-	2.6	2.5	1.9	2.2	2.1	2.4
Coeducation	5	5	3.0	3.0	2.4	2.3	2.3	2.3
Control(Pub. vs. Priv.)	2	2	2.9	2.9	2.8	2.5	1.8	2.3
Size of City or Town	5	5	3.0	3.0	3.0	2.5	2.5	2.2
Costs**	22	24	2.2	2.1	2.4	2.2	2.2	2.0
Annual Tuition & Fees**	(10)	(12)	2.4	2.1	2.5	2.4	2.4	2.0
Size of Total Enrollment	5	5	2.9	3.0	3.0	2.6	2.6	1.8
Athletics Available	31	31	2.9	2.9	2.9	2.7	2.3	1.6
Special Programs (pre-(med, remedial, etc.)	12	8	2.6	2.5	2.5	2.6	2.1	1.6
Admissions Information	16	8	2.7	3.0	2.8	2.0	1.6	1.6
Calendar Plan	9	8	2.9	2.9	2.9	2.4	1.8	1.4
Applications Deadline	5	5	3.0	2.8	3.0	1.9	2.0	1.4
Type of Institution (univ., seminary, etc.)	9	8	2.9	3.0	2.9	2.1	1.5	1.4
Regional Accreditation	3	3	2.9	3.0	2.8	2.2	1.5	1.4
Religious Affiliation	5	5	3.0	3.0	3.0	2.5	1.9	1.3
Emerging Fields*	7	-	2.8	3.0	2.9	2.5	2.2	1.2
Academic Characteristics of Students	20	22	2.8	3.0	3.0	2.6	1.9	1.2
Campus Life (cultural, social, etc.)	15	15	2.8	3.0	2.6	2.4	1.9	1.2
Campus Activities (chorus, radio station, etc.)	12	12	2.8	3.0	3.0	2.7	2.1	1.0
Faculty Qualifications	2	2	2.8	3.0	2.8	2.5	2.3	1.0
Graduate Students*	2	-	2.4	2.8	2.8	1.6	1.8	1.0
Mean Rating Total	600	350	2.8	2.8	2.7	2.4	2.2	1.7

*COL 4 only

**Each rating was on a 3-point scale (1=negative, 3=positive). Liaisons were not asked to rate the ROTC category (COL 4 only; 4 characteristics). The category of "Costs" subsumes "Annual Tuition and Fees" and "Annual Tuition, Fees, Room and Board." All means for these 2 subheadings were identical.

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MEAN LIAISON RATINGS OF THE ... ...ACY OF THE GIS OCCUPATIONAL FILE, INCLUDING SELECTOR AND DESCRIPTOR CATEGORIES*
(Listed in Rank Order of Overall Mean Rating)

Category	N Characteristics	Variables Rated			
		Completeness	Relevance	Clarity	Logicalness
Selectors					
15 Occupational Clusters	15	2.5	2.8	2.8	2.6
Formal Education	14	3.0	3.0	2.2	2.5
Special Vocational Training Time	15	2.7	2.6	1.9	2.5
Occupations Within Industries	9	2.5	2.2	2.1	2.6
Training Other Than Foraml Education	9	2.9	2.2	2.1	2.2
Aptitudes	11	1.9	1.6	1.8	1.9
Interests	10	1.5	2.0	1.4	1.5
Mean Selector Ratings	83	2.4	2.3	2.0	2.3
Descriptors					
15 Occupational Clusters	15	2.9	2.7	2.6	2.6
Formal Education	14	3.0	3.0	2.0	2.7
Occupations Within Industries	92	2.3	2.3	2.6	2.7
Special Vocational Training Time	15	2.6	2.7	1.6	2.7
Training Other Than Formal Education	9	2.9	2.0	1.9	2.3
Aptitudes	11	2.1	1.7	2.0	2.3
Interests	10	1.7	1.8	1.6	1.7
Physical Demands	14	2.9	2.7	3.0	3.0
Working Conditions	21	3.0	2.5	3.0	3.0
Work Activities	12	2.9	2.5	3.0	3.0
Other Qualifications (e.g., license)	4	2.4	2.8	2.7	3.0
Employment Outlook	3	1.7	2.7	2.6	2.9
Special Conditions (e.g., summer only)	3	2.1	2.3	2.4	2.9
Areas of Work	22	2.1	2.0	2.8	2.3
Entry Level Earnings*	13	2.3	2.0	2.1	2.7
Mean Descriptor Ratings	271	2.4	2.4	2.4	2.7

*Each rating was on a 3-point scale (1=negative, 3=positive). Mean ratings for the category of "Highest Level Earnings" were identical to those for "Entry Level Earnings."

TABLE A7

FOUR-YEAR COLLEGE FILE: FREQUENCY OF USE OF EACH CATEGORY IN SEARCHES, FEBRUARY 1974 (Results in Percentages)

Categories Used* (in Rank Order)	School					All Schools	Total N
	A	B	C	D	E		
Academic Programs of Study ("Majors")	100%	96%	100%	98%	95%	98%	265
Geographic Location	83	92	98	60	86	81	220
Coeducation	33	23	81	77	48	66	178
Competitiveness	33	38	90	51	65	66	177
Size of Total Enrollment	50	0	3	54	11	24	65
Costs (inc. Tuition & Fees)	0	0	2	58	5	23	63
Admissions Information	33	8	5	33	8	17	45
Control (Public vs. Private)	17	54	4	0	57	15	40
Financial Aid	33	6	3	18	24	14	38
Size of City or Town	0	0	13	5	51	14	37
Athletics Available	17	12	11	14	7	13	36
Special Programs	0	0	26	2	8	11	31
Tuition + Fees + Room & Board	0	0	9	4	8	6	16
Type of Institution	17	0	6	1	16	5	14
Religious Affiliation	17	0	3	0	24	5	13
Campus Life	0	0	9	1	0	4	10
Special Campus Activities	0	0	5	4	0	3	9
Emerging Fields	0	0	0	2	0	1	2
Academic Characteristics of Students	17	0	0	0	0	0	1
ROTC	0	0	0	1	0	0	1
Total Number of Searches Examined	6	26	100	101	37		270

*Within any one search, multiple use of characteristics in a given category was counted only once. The categories of Graduate Students, Application Deadline, Regional Accreditation, and Calendar Plan were not used at all. (The Faculty Qualifications category was inadvertently omitted from the counting, but was little used.)

APPENDIX B

In this Appendix, we will discuss the issue of student ability level in relation to the special assessment of the effects of CAG on vocabulary and decision-making. We had originally hoped to compare honors and nonhonors students as one of the dimensions in our study of the effects of using the computer. However, our sample had no honors students in Schools B and C, and very few in School D.[1]

Altogether, honors students constituted less than one-fourth of those taking either test. Because of the unequal Ns, we could not use analysis of variance and thus could not compute the triple interaction of schools, use of CAG, and honors/nonhonors. Instead of analysis of variance, we used a multiple regression program ("Glypoth") to analyze significance of differences.[2]

When we inspected the cell means for Vocabulary and for Decision-Making, we found that wherever comparison with respect to honors status was possible (specifically, where the cell N was more than 2), honors students, whether users or non-users, performed better than the corresponding nonhonors students. But we also found that honors students at School A, which was the poorest academically, performed more poorly than nonhonors students at other schools. Thus, the honors designation seems to indicate quite different levels of ability in different schools, and is not a suitable estimate of ability across schools. It would therefore not be appropriate to combine all honors students (or all honors users, etc.) and compare them with all nonhonors students.[3]

The fact that the schools differed in ability level causes no problem in data analysis, but whether ability was equally distributed among users and non-users is not so clear. That honors students did better than comparable nonhonors students is not surprising, and does not by itself interfere with analyzing effects of the use and schools' variables. The important question, however, is whether being an honors student gave users any <u>extra</u> advantage over non-users. As explained above, we could not computer the triple analysis of variance interaction; however, with the Glypoth program, we examined the use X ability interaction separately for School A and for School E.[4] In both schools this interaction was essentially zero on both tests, suggesting that honors status gave no additional advantage to users. This result lends support to the procedure we adopted, namely of combining honors and regular users, and comparing them with honors plus regular non-users, without distinguishing between honors and

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[1] For example, at School D: Vocabulary--of 86 students tested, only 3 were honors users; Decision-Making--of 69 students tested, only 2 were honors nonusers.

[2] See footnote 1, page 23.

[3] Table A3 gives the overall means for all honors and nonhonors subgroups on the Vocabulary and Decision-Making tests, but only for comparison purposes; the distortion caused by the unequal Ns is obvious.

[4] In these two schools the cell Ns were all 9 or more.

nonhonors students. In further support of this procedure, the liaisons reported that student ability was fairly homogeneous within the classes tested--a situation which would lead to the unequal Ns we obtained. And, considering that we tested in 22 English classes and 6 homerooms, it seems reasonable to expect an even distribution of ability differences between the user and non-user groups. (Remember that the users and non-users being compared came from the same classes.) We are willing to assume, then, that no important initial ability differences existed between users and non-users that would account for the obtained results.