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ABSTRACT

This paper describes the procedures and results of a pilot study of a computer-based System of Interactive Guidance and Information (SIGI) which was designed to help community college students make rational career decisions. A number of the important features of the system are summarized in terms of the source of the value dimensions used in SIGI, the source and rating of occupational information, the derivation of regression equations for prediction, and the strategy to reach tentative career decisions. An illustration with a concrete example of a student's response clarifies the complex processes involved. The pilot study was evaluated in terms of: the responsiveness of SIGI to the needs and purposes of students, and the responsiveness of students to SIGI. Further study is required to generalize the results. (CH)

SIGI: REPORT OF A PILOT STUDY UNDER FIELD CONDITIONS

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EDUCATIONAL TESTING SERVICE
PRINCETON, NEW JERSEY

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PREFACE

There are people who want to know only outcomes and payoffs. "What is the bottom line?" they ask, impatiently. If they read detective stories, they presumably turn quickly to the last chapter and see whether the butler did it. The interplay of action, dialogue, motivation, characters, and ratiocination leaves them cold. They have time to gulp down only a capsule of compressed findings. These people will want to pass over the body of this report and turn directly to the last chapter, "Evaluative Highlights."

Of course, the whole truth, or even a major portion of the truth, can rarely be encapsulated. The act of compression may preserve some of the nourishment but loses all of the flavor. There is usually more sustenance in the seekings than in the findings. Lessing said, "If the Lord God held out to me in his right hand the whole of truth and in his left hand only the way to seek truth--I would reach for his left hand."

To those who share with Lessing the joys of inquiry, we offer this lengthy report in all its detail. We invite them to share with us the process as well as the outcome of our efforts to search out the effects of a computer-based System of Interactive Guidance and Information (SIGI) on the career decision-making of some students.

Besides the three principal authors and the three other members of the Guidance Research Group who assisted in the writing of this report and are named on the title page, special acknowledgment is due to William

Godwin for the hardware configuration and system design; to him and Ronald Bejma for SIGI programming, assisted by Christine Sansone; to Fred Kling for periodic and always helpful advice on technological and other problems; and to Madeline Bara, secretary for the project, who typed, retyped, and re-retyped the report.

We also wish to acknowledge our debt to the personnel at Mercer County Community College whose assistance made this study possible: Dr. Richard Greenfield, President, who helped smooth our path at the college and also served on the SIGI Advisory Committee; Dr. Salvatore Campanile, Dean of Students; Walter Meyer, Director of Counseling; and Michael Schaefer, Director of Admissions, who took care of the innumerable administrative details associated with a project such as SIGI; Sue Lenox, who functioned as our right arm in the terminal room at the college; the many members of the faculty and counseling staff who answered our questions and contributed their advice; and the students who so cheerfully gave up their time to interact at the terminal and put up with our interview. It took them all to make the study a reality.

Finally, we thank the members of the SIGI Advisory Committee, whose responses and suggestions at various stages of development were stimulating and helpful:

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CHAPTER I

SIGI: RATIONALE AND DESCRIPTION

This report describes the procedures and results of a small-scale pilot study of the System of Interactive Guidance and Information (SIGI) developed at Educational Testing Service by the authors under grants from the Carnegie Corporation. Elements of the pilot study were supported by funds from the National Science Foundation.

SIGI was designed to help community college students make informed and rational career decisions. In this guidance system, the student interacts with a computer in such a way as to examine and explore his own values, obtain and use relevant information, interpret predictive data, and formulate plans. This interaction helps the student to arrive at tentative career decisions and to modify them as he gains new insights and additional information. The decisions involve both educational and occupational options. The emphasis, however, is not merely on the content of decisions, but on the process of decision-making. As the student progresses through SIGI, he learns to move freely within the structure of the system. In gaining control of the system, he develops competencies and masters strategies for rational behavior in the face of uncertainty--which may be the closest we can get to wisdom.

Rationale for SIGI

What is the rationale for stressing the process of decision-making over the content of the decision?

Humanistic ethic. It should be emphasized, first, that the ethic of this system is humanistic rather than mechanistic. There has long prevailed a stereotype associating computers with dehumanized control. Indeed, as far back as 1928, Clark Hull (in his book Aptitude Testing), gazing prophetically into a brave new world of psychometrics and computers, proposed that a single universal battery of 30 or 40 aptitude tests be given to 8th-graders. Scores would be fed into a machine that would already contain forecasting formulas for the major occupations. The student would then choose one of the three or four occupations "in which his chance of success is greatest."

Developments in measurement, data processing, and statistical techniques over the intervening decades created a rush of excitement about the possibilities for translating Hull's dream into a reality. But the vast technological gains appeared to invoke a law of diminishing returns. Neither Hull nor his successors anticipated the stubbornness with which the data (reflecting the multipotentiality of individuals) would resist neatly differentiated forecasting formulas.

Faith in the prospects of the trait-and-factor model have persisted. The main objections to this model, however, lie not in its inaccuracies but in its premises. It assumes that prediction of occupational membership and success is the main--virtually the sole--business of guidance. It starts with the explicit hypothesis that occupational sorting does tend to take place in a certain way--through trait-matching. It proceeds on the less clearly explicit conviction that occupational sorting should take place in this way--only more so. Trait-and-factor theory seems to hold that the individual is

in effect "keyed" to one or a few "correct" occupations, that the key should be recognized early in adolescence, and that all subsidiary decisions--as of education--should be fitted to it. Application of this theory would presumably result in a more exact homogeneity of membership in each occupation, and would purport to reduce waste, vacillation, or error along the way. It would also tend to reduce the student's role in decision-making to one of passivity.

This is essentially a "manpower" model rather than a guidance model. The manpower model is an attempt to follow some general optimization rule for matching people to jobs. For example, an inventory of the pool of abilities on the one hand and the requirements of occupations on the other might be matched according to certain assumptions about national priorities--that is, the highest priority occupations would be filled first from the top of the suitable applicant pool, the next highest next, and so on. Or a rule analogous to minimizing the sum of squared differences between traits and requirements might be applied.

The evidence that individuals are multipotential and occupational requirements are flexible is damaging for the manpower model. But it supports a guidance model which maximizes individual freedom of choice. A guidance model hinges on satisfaction of individual values, with manpower needs helping to determine the opportunities and means for gaining such satisfactions. There is better evidence for the assumptions underlying the guidance model than the manpower model. For example, the validities of differential predictions of <u>interests</u> tend to be much greater than the validities of differential predictions of achievement (Norris & Katz, 1970).

This finding does not mean that predictions of success are useless in occupational choice. Clearly, there is ample justification for using actuarial data to estimate an individual's resemblance to an occupational population and the probabilities of his entering an occupation, persisting in it, and (although standards are difficult to define and data hard to come by) achieving some measure of success in it. There is much less justification for using actuarial data to determine choices. Yet the implications and practice of trait-and-factor theory have often exceeded the descriptive and tended toward the imperative. This creeping control might tend to improve some kinds of predictions by making them virtually "self-fulfilling prophecies."

If computers are used only to power a directive trait-matching approach, as appears to be proposed in Department of Labor pilot projects (U. S. Department of Labor, 1971), the stereotype of computers as encroaching on and restrictive of free decision-making by individuals will be perpetuated. One purpose of the job-matching model is to help individuals make appropriate choices. But the method excludes the individual from the decision-making process; it rests all control in external agencies, leaving the individual only the choice of acting or not acting on the output.

SIGI, on the other hand, assumes that guidance should shun even such benevolent control. It assumes that we don't know what will be best for the individual (or society) except freedom to work things out. Thus, we define the best choice as the choice that is most nearly free. But we do not define freedom as laissez faire. Rather, it is the freedom (expressed by

Shaw in the preface to Man and Superman and quoted by Freud in contrasting his "reality principle" with his "pleasure principle") "to be able to choose the line of greatest advantage instead of yielding in the path of least resistance." Advantage in this sense involves some assessment of utility as well as probability. Freedom involves active participation and control. It also incorporates the notion of career decision-making as a continuous process rather than a "one-shot" episode. This sense of continuity encourages people to formulate their plans as theories to be tested, and to revise or confirm their decisions in the light of the feedback they get from outcomes. This approach allows them to learn from experience.

Process of choosing. So without directing the content of an individual's choice, it seems possible to help him in the process of choosing. This emphasis on process does not pretend to insure the "right" choice--except insofar as the right choice is defined as an informed and rational choice. Our bias--our conviction--is that in education enlightened processes are intrinsically important. Therefore, we bend our efforts to increase the student's understanding of the factors involved in choice (imperfect though our own understanding may be) so that he can take responsibility for his own decision-making, examine himself and explore his options in a systematic and comprehensive way, take purposeful action in testing hypotheses about himself in various situations and exercise flexibility in devising alternate plans.

The student's interaction with the computer embodies this model of guidance. As the student learns to control the computer and move freely

through the system, he is also developing competencies for independent decision-making. The computer does not just give him an "answer" to a question; it also suggests questions for which he can provide answers. Thus in his dialogue with the computer, the student both receives and generates information, and learns how to connect the two kinds of information. Throughout, his role is active. He can change his inputs as he recycles through parts or all of the system to see what effect new premises may have on the outputs.

In short, we don't want to play the decision-making game for the student. We want to help him master the strategies for rational behavior in the face of uncertainty so that he can play the game effectively himself.

Emphasis on values. Such a system implies some principle for choosing. Otherwise, how is the individual to make order out of the rabble of impulses that beset him? He is at their mercy unless he recognizes that, essentially, he must choose between competing values. Neither suppressing nor blindly obeying his impulses, he can control them by bringing them under the rule of reason, giving each "equal time" and attention. The individual must hold himself open and receptive to different values, allowing each to speak to him as loudly as the others. This process involves active and systematic exploration of competing values so that he can answer the central question, "What do I want?"

Therefore, values are at the heart of the SIGI system. They provide the dimensions along which students analyze their own desires and along

which they construe occupational characteristics. They are the theme that runs through the separate sections of SIGI, tying them together into a comprehensive whole.[1]

Description of SIGI

The four major sections. Early in the introduction, the student sees a list of the four major sections of SIGI. Each section deals with distinctive topics, which are later brought together in a section called STRATEGY. The first section of SIGI asks the student about his values: What satisfactions does he seek in an occupation? How much importance does he attach to vari us values? After the Values section has helped the student to define what he wants, the Information section helps him identify occupations that may fit his values and allows him to get a great deal of occupational information. The Prediction section deals with his probabilities of success in programs at his own college that tend to prepare him for entry into various occupations. The Planning section helps him figure out how to get from here to there; it deals with educational requirements, courses of study, financial aid, and so on.

These four sections are characterized more fully in Chapter III, where the behavior of an actual student is used to describe SIGI dynamically.

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[1] More detailed and comprehensive discussions of the principles of guidance that underlie the rationale for SIGI appear in various monographs and articles by the principal investigator (Katz, 1954, 1963, 1966, 1968, 1969a, 1969b, 1969c, 1969d).

Hardware configuration. The prototype on-site SIGI configuration used in the pilot study consisted of a Digital Equipment Corporation PDP-11/20 processor with 28k of core memory, an RF-11 fixed-head disc with 512 words of storage, a 1.2 million word RK03 moving head disc, and a TU56 dual DEC tape drive. The two terminals were driven through DC-11 asynchronous serial line drivers at 1800 baud, one connected locally to a Delta Data 5000 cathode ray tube terminal in the computer room, and the other via Bell 202 dataphones and C-2 conditioned private line to a second Delta Data 5000 terminal at Mercer County Community College. Hard copy was provided at the remote site by a Versatec nonimpact line printer connected to the terminal.

It should be stressed that this hardware is not the final SIGI configuration. The outlines of the hardware for the final version of SIGI with multiterminal capability were not clear at the time this report was written. The description above applies only to the equipment used in the pilot study.

CHAPTER II

DATA SOURCES, PROCEDURES, AND INSTRUMENTS

A theory of guidance that emphasizes the primacy of values creates special problems in the treatment of occupational data. It is first necessary to define a set of value dimensions that will allow expression of individual differences, will be sufficiently independent of one another to avoid redundency, and will provide opportunities to differentiate between occupations. Moreover, the problem of obtaining accurate and up-to-date occupational information is compounded by the necessity to rate a sizable portion of it on what it says about opportunities to satisfy values. This chapter deals first with the source of the value dimensions used in SIGI; the source and rating of occupational information; the derivation of regression equations for the Prediction system; and the source of curricular data for the Planning system. Then, it describes the test instruments and procedures applied to the students who participated in the pilot study.

SOURCES OF DATA

Selection of the Ten Value Dimensions

The ten values selected for use in SIGI are High Income, Prestige, Independence, Helping Others, Security, Variety, Leadership, Work in a Particular Field of Interest, Leisure, and Early Entry. Where did these ten value dimensions come from, and why did we settle on them?

We did a number of studies of our own, and of course took into account the research of others. For example, we asked students, in structured interviews, a series of questions designed to elicit the dimensions along which they construed occupations. We asked them to tell us what they knew about an occupation of interest to them, and to indicate what other information they would like to have; what appealed to them most about it, and what least; what events or additional information might make them change their preference for that occupation; what characteristics an "ideal" or "dream" occupation would have, and also a "nightmare" occupation--the worst they could imagine. In a simulated occupational choice procedure, we gave students an opportunity to ask us questions about a set of unknown occupations; from the information we gave them, they would choose one as most attractive. Classifications of their questions and their evaluations of the occupations in light of the information they received gave us an additional check on the comprehensiveness and relevance of our values dimensions. In a variation on Kelly's REP test (Kelly, 1955), we gave them triads of occupations, asking them to indicate which two of the three seemed to offer satisfactions and rewards that were more nearly alike than the satisfactions and rewards offered by the third one. From their responses we were able to determine the dimensions along which they construed similarities and differences in occupational satisfactions.

In addition, as part of a questionnaire follow-up of a large national sample of secondary school students one year after completion of high school (Norris & Katz, 1970), we asked them to weight the importance of some dozen values dimensions; we computed the intercorrelations among the

weights, and did an unrestricted maximum likelihood factor analysis of the intercorrelation matrix. (We also put into the matrix aptitude and interest scores, and found that the three domains--aptitudes, interests, and values--were independent.)

Despite all this research, we are sure there will not be universal agreement with some of our omissions. For example, we decided that we could not formulate a good enough operational definition of Creativity for this purpose. And a value called Sense of Accomplishment, or Pride in Work, did not seem useful in differentiating between occupations of concern to community college students (although it might differentiate between specific jobs or positions within an occupation and clearly differentiated between many unskilled and higher-level occupations). Incidentally, in the pilot study we found that students do perceive the dimensions as independent (intercorrelations of the weights tend to be quite low), each of the values is regarded as important by many students (as indicated by the mean weights), the weight given each value varies greatly across students (as indicated by the standard deviations of the weights), and students did not feel that values of importance to them had been omitted (as determined by interviews after their use of SIGI).

The inclusion of Interest Field as one of the values dimensions may be a bit confusing. This value is defined in terms of the importance to the individual of working in a field in which the activities are of primary intrinsic interest rather than in some other field. The student indicates his preferred interest field from six options, each defined and

illustrated: scientific, technological, administrative, personal contact, verbal, and aesthetic. The designation of these six areas obviously takes cognizance of the massive body of research on interest measurement and dimensions of occupational interests.

Data for the Information System

The Information system consists of LOCATE, COMPARE, and DESIRABILITY. The occupational information feeding these subsystems is stored in the form of responses to the 27 questions available to the student in COMPARE. The list of questions appears in Figure III-2, Chapter III.

Where did all this information come from, and how accurate is it? It came from more sources than we have space to list, and it is as accurate as we can make it with the help of specialists in many fields--including national sources such as the Bureau of Labor Statistics and various other bureaus of the Federal Government, professional organizations, labor unions, occupational briefs and monographs; a similar variety of regional and local sources, including many state agencies; plus a miscellany of sociological and psychological studies of occupations, college handbooks, assorted publications, and a wealth of cooperative and informed people in the various occupations.

Data from different sources sometimes failed to agree. We searched into such discrepancies very carefully. For example, when data were derived from different surveys, we evaluated sampling procedures and response rates, and made some judgment about the trustworthiness of each source.

Although SIGI emphasizes national rather than local occupational information, we checked national data against representative regional and local data, and often incorporated regional differences when they were significant.

Documentation for all the information is on file in our office library, and is continually brought up to date, with changes edited into the computer periodically.

All but four of the questions can be answered by "hard" data found in solid studies from multiple sources. To single out one, by way of acknowledgement of the kind of cooperation we received: a prepublication copy of Paul Siegel's University of Chicago doctoral dissertation, Prestige in the American Occupational Structure (Siegel, 1971), gave us most of our prestige ratings. The four that required more active inference on our part are questions 24, 25, 30, and 31. For each of these "soft" areas, four levels of degree were operationally defined. Then, in addition to our readings, we directed questions based on these definitions to representative members of each occupation to elicit their experiences and observations. For example, concerning Variety: How many different problems and activities do you (and others in your occupation) typically work on each week, month, or year? How many different people do you deal with? To how many places does your work take you? We did not have time or resources to poll a large sample from each occupation on these questions. (We hope to extend our activities in that direction later.) So the responses for each occupation were pooled with our readings as a basis for inference and consensus among our own staff.

Rating Occupations

Ratings of occupations are used directly in LOCATE, DESIRABILITY and STRATEGY; indirectly in COMPARE.

Method of Rating. Every occupation was rated on the ten value dimensions: High Income, Prestige, Independence, Helping Others, Security, Variety, Leadership, Interest Field, Leisure, and Early Entry. A rating indicates the opportunity an occupation provides for the kind of satisfaction represented by each value (including each of the six Interest Fields). For all values except High Income, the rating scale ran from 4 (maximum opportunity) to 1 (minimum opportunity); for High Income, the scale ran from 5 to 1. No occupation was rated at 0 on any value, since all occupations were judged to offer some opportunity to satisfy a given value, even though the opportunity may not be very great.

The ratings were determined in the following manner:

1. The definition of the value to be rated was carefully framed. This is the definition that is presented to the student in the Values system when he is weighting his values. The values are defined in operational rather than theoretical terms.

2. Each of the four (for High Income, five) categories of rating for each value dimension was also defined in operational terms. With respect to High Income, Early Entry (i.e., minimum education for entry into the occupation), Prestige, and Leisure, the definitions were expressed in quantified terms directly supported by existing research and survey data.

The quantity for Income was median annual income; for Early Entry, minimum years of preparation beyond high school; for Prestige, the numerical rating assigned the occupation in Paul M. Siegel's Prestige in the American Occupational Structure (Siegel, 1971)[1]; and for Leisure, the number of hours worked per week, the amount of annual vacation time, and the amount of overtime and shift work. Ratings on the remaining dimensions depended on inferences derived from psychological and sociological studies of occupations and from analyses of work activities and roles. For example, rating the occupations on each of the six Interest Fields drew heavily on a large body of research in interest measurement, but did not slavishly follow any one interest inventory.

3. Relevant occupational information was then interpreted in terms of the categorical definitions, and the ratings were assigned independently by staff members of the Guidance Research Group.

4. Discrepancies between various staff members with respect to which categories an occupation might fit were discussed until consensus was reached.

5. The occupational ratings were articulated with the answers to relevant questions in COMPARE so that, for example, a student asking about opportunities for variety in a certain occupation would get a verbal description equivalent to the definition of the rating category.

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[1]Grateful acknowledgement is made to Dr. Siegel for permission to use this material.

The definitions of the ten values and an explanation of the rating categories appear as Exhibits II-1 through 10 at the end of this chapter.

Distribution of ratings. Table II-1 shows how the ratings are distributed with respect to each value among the 119 occupations now in SIGI. The value Interest Field has been broken up into its six components, and the distribution is shown for each one. It may be noted that no attempt has been made to force the ratings into a normal distribution. For some of the values dimensions, the bulk of the 119 occupations are rated at 2 or 3, with fewer rated at 1 and 4, but even these are not always distributed symmetrically. Obviously, the ratings depend closely on the definition for each level or category. It may be that the distributions for most dimensions (except Interest Field) will more closely approach the normal as more occupations are added. But no attempt has been made to select occupations on this basis for inclusion in the system. Major criteria for inclusion have been suitability for community college students and availability of appropriate programs in the community colleges. For example, as can be seen in the number of occupations with Early Entry ratings of 4 and 3, over half of the occupations require two years or less of education beyond high school; these would be of interest to students who do not expect to continue formal education beyond the community college level.

TABLE II-1

DISTRIBUTION OF RATINGS

Value	Rating	No. of occs.	Value	Rating	No. of occs.
Income	5	28	Early Entry	4	47
	4	13		3	20
	3	39		2	40
	2	22		1	12
	1	17	Scientific Interest	4	34
Prestige	4	19		3	10
	3	49		2	5
	2	29		1	70
	1	22	Technological Interest	4	28
Independence	4	26		3	7
	3	46		2	7
	2	31		1	77
	1	16	Administrative Interest	4	22
Helping Others	4	23		3	4
	3	17		2	3
	2	30		1	90
	1	49	Personal Contact Int.	4	37
Security	4	21		3	9
	3	53		2	4
	2	21		1	69
	1	24	Verbal Interest	4	15
Variety	4	30		3	2
	3	41		2	1
	2	37		1	101
	1	11	Aesthetic Interest	4	13
Leadership	4	13		3	2
	3	21		2	1
	2	43		1	103
	1	42			
Leisure	4	10			
	3	40			
	2	43			
	1	26			

With respect to any Interest Field category, one would never expect a normal distribution; an occupation tends either to "belong" to some extent, or to be almost completely excluded, with the odds greatly favoring exclusion because there are six fields. Therefore most occupations are rated 1 within any single field. No occupation was rated at 0 on any value, since the judgment was made that some opportunity exists to satisfy every value. Mean ratings and standard deviations for all values except Interest Field across the 104 occupations available to the experimental students appear in Table II-2. It will be observed that the means for Helping Others, Leader-

TABLE II-2

MEANS AND STANDARD DEVIATIONS FOR
VALUE RATINGS OF 104 SIGI OCCUPATIONS

Value	Mean	S.D.
High Income	3.1	1.4
Prestige	2.6	1.0
Independence	2.7	0.9
Helping Others	2.1	1.1
Security	2.6	1.0
Variety	2.7	0.9
Leadership	2.0	1.0
Leisure	2.3	0.9
Early Entry	2.9	1.0

ship, and to a lesser degree Leisure are somewhat below the midpoint of the scale range, which is 2.5 for all except High Income. Early Entry has a mean well above the midpoint, as would be expected from the rationale for choosing occupations for the system.

Regression Equations

The Prediction system makes available grade point average (GPA) predictions for first semester grades in 19 of the Mercer County Community College curricula. For each of these curricula a student can learn what his chances in 100 are of obtaining a GPA of A or B, C, and below C. These predictions are based on the experience of students with test scores and high school rank like his, who have already gone through each of the MCCC curricula.

Separate regression analyses were carried out to predict GPA in all Mercer curricula for which data were available for at least 50 students enrolled during the period extending from fall 1971 through fall 1972. Predictors were selected from the optimal combination of high school rank and selected scores from the Comparative Guidance and Placement (CGP) test battery (which includes Reading, Verbal, Sentences, Mathematics, Year 2000, Mosaic Comprehension, Letter Groups, Academic Motivation, and Comparative Interest Index scores).

Predictor variables were entered into the regression equation in a controlled manner until a multiple R of at least .40 was reached. These guidelines were followed wherever possible:

1. Only two independent variables were included in any one equation.
2. High school rank was one of the independent variables.
3. The other independent variable was one that was logically related to the curriculum.

It was possible to adhere to these guidelines for ten of the 19 prediction equations. Of the remaining predictions, three (Business Administration, Marketing, and General Studies) required three predictors in order to achieve a multiple R of .40; five programs required only one predictor (General Business, Nursing, Mathematics/Physical Sciences, Electronics/Electrical Engineering Technology, Communications Media); six programs did not use high school rank as a predictor (Business Administration, General Business, Nursing, Drafting, Electronics/Electrical Engineering Technology, Communications Media). Table II-3 gives the multiple R's for predicting GPA.

TABLE II-3

MULTIPLE R'S FOR FRESHMAN GPA

Curriculum	R
Accounting	.50
Business Administration	.40
Marketing	.50
General Business	.45
Secretarial Science	.65
Data Processing	.52
Laboratory Technology	.49
Nursing	.55
General Studies	.40
Humanities and Social Science	.43
Physical Science/Mathematics	.46
Biology	.65
Engineering Technology	.42
Drafting & Design Technology	.40
Electronics/Elec. Eng. Tech.	.40
Architecture	.60
Fine Arts/Advertising Design	.40
Communications Media	.43
Ornamental Horticulture	.78

In the fall of 1972, a cross-validation study using a new sample was made for two of the curricula (Architecture and Secretarial Science). Correlations between predicted and actual grades in both these curricula closely approximated the original multiple R's. The multiple R for Architecture shrank from .60 to .52; the multiple R for Secretarial Science went from .65 to .64. Since Mercer is in the process of changing its grading system, no further cross-validitation studies were undertaken.

Prediction equations were also developed for grades in sixteen "key courses." A key course is defined either as a course required for completion of a curriculum or a course taken by most students enrolled in that curriculum. Identification of key courses was undertaken with cooperation of the MCCC counseling staff.

A student is given access to a key course prediction in the Planning (rather than the Prediction) system. In the Planning system, curricula and key courses are matched to occupations. As he goes through PLANNING, the student is given a chance to see both the GPA and key course predictions for the curricula appropriate to the occupation he is considering.

In carrying out the analyses for key course grades, guidelines similar to those for GPA were followed. The one major exception was that, where possible, high school rank was not included as one of the predictors. This was done to give the student predictions based on more recent performance as represented by his test scores rather than on earlier performance as represented by high school rank. High school rank was used for

only two key course predictions (MA 111 and OH 103) because the minimum level of R = .40 could not be achieved without using this variable. Table II-4 shows the multiple R's for predicting key course grades.

TABLE II-4

MULTIPLE R'S FOR KEY COURSE GRADES

Key Courses		R
BA 101	Business Organization and Management	.42
BA 103	Business Mathematics and Machines	.62
AC 101	Principles of Accounting 1	.49
DP 119/ 120	Basic Data Processing Systems Computer Programming 1	.41
AD 105/ 106	Design and Color Design Workshop	.42
NS 101	Nursing 1	.43
MA 103	College Mathematics 1	.48
MA 109	Technical Mathematics 1	.53
CH 101	General Chemistry	.55
SS 101	Contemporary Society 1	.45
PY 101	Introductory Psychology	.47
HY 101	History of Western Civilization	.59
BY 101	General Biology 1	.56
MA 111	Mathematical Analysis 1	.40
OH 103	Ornamental Horticulture 1	.63

Data For the Planning System

In the Planning system, the student sees the two-year program of study offered at his community college that is recommended as preparation for his selected occupation, the high school prerequisites for entry into the program, and follow-on institutions that the student can transfer to in order to complete his preparation. Since this pilot study was limited to Mercer

County Community College, only programs of study offered by that institution were used.

There were exceptions to this general pattern. If Mercer College did not offer a curriculum that prepared for a particular occupation, the high school prerequisites and program of study displays were replaced by another display telling the student the name and location of nearby institutions that did have appropriate offerings. Also, with respect to some occupations, such as Clothing Designer, only a one-year program was displayed with the advice that the student transfer after that time to a specialized institution. And of course no list of follow-on colleges was displayed if the student could complete his preparation in a two-year program.

Programs of study. With the exceptions noted above, the programs of study were taken directly from the Mercer County Community College catalog. A determination was first made of the best courses to take to prepare for each occupation, regardless of the offerings of any particular institution. This determination was based on a review of our occupational information as described above; we consulted experts in the occupation, the Occupational Outlook Handbook, briefs, monographs, and the catalogs of colleges with curricula leading to specific occupations to see what courses were typically associated with the occupations. When the recommended curricula differed in details, we tried to arrive at a consensual digest. This digest was used in COMPARE as the answer to question no. 17, "Related college courses?" and was also the basis for the overview display in PLANNING, which gives the student an agenda for preparing for his selected occupation.

Once we knew what was required for preparation, we applied our knowledge to the curricula listed in the Mercer County College catalog, in accordance with the following principles:

1. If the occupation demanded no other preparation than completion of a two-year Mercer program, we used the catalog curriculum without change. Examples: Dental Assistant (Dental Assisting); Engineering Technician (choice of Civil Engineering Technology, Electrical Engineering Technology, Electro-Mechanical Engineering Technology, or Mechanical Engineering Technology).

2. If preparation required transfer to another institution after completion of study at Mercer College, an attempt was made to adjust the appropriate Mercer curriculum so as to satisfy the requirements for the AA degree at Mercer, for admission into the upper division of the most likely follow-on college, and for preparation for the occupation. The most likely follow-on institution was deemed to be Trenton State College; if Trenton State College did not offer an appropriate curriculum, we tried to find other New Jersey State colleges that did offer it. If none of them offered the desired curriculum, we then examined the catalog of Rutgers, the New Jersey State University. In some instances, it was necessary to go out of state, in which case we used as models the curricula of Philadelphia and New York City institutions. Adjustment of the Mercer College curriculum was limited to filling the elective slots in the catalog listing with courses most appropriate for the occupation and most likely to meet requirements for transfer. We also recommended in some cases that the student take the highest level mathematics course that he could qualify for.

3. No elective slot was filled unless we could clearly justify doing so by the requirements for transfer with upper division standing or by the demands of the occupation. We left the student as much freedom as possible.

4. If Mercer College did not offer a curriculum appropriate for the selected occupation, we attempted to find a New Jersey public community college that did offer it. This procedure allows the student to take advantage of the New Jersey "chargeback" program, which permits a student to enroll in an out-of-county community college without paying the higher tuition charged to nonresidents. For example, students interested in Hotel/Motel Management were told to enroll in Camden County College, Bergen Community College, Middlesex County College, or Union County Technical Institute.

It was not always easy to adjust the Mercer College curriculum so as to meet the requirements for graduation from Mercer, for admission as a junior in a selection of follow-on colleges, and for preparation for a specific occupation. Most four-year colleges in New Jersey demand an AA degree for transfer, with the result that students have to meet the graduation requirements of both institutions. These requirements may not be additive. For instance, Mercer College required six units of English for graduation, whereas Trenton State College, the leading transfer institution for Mercer, required three of English and three of Speech. Also, there were often differences between the lower division curriculum of the four-year transfer college and the best approximation of that curriculum

at Mercer College. For this reason, it was necessary to tell the student that successful completion of the recommended program would guarantee his graduation from Mercer, but did not guarantee acceptance with junior status by the transfer institution.[2]

Whenever our research showed that more than one curriculum could lead to entry into an occupation, we made programs of study for all the appropriate curricula and left the choice up to the student. For example, a Market Researcher might wish to concentrate on the psycho-social, statistical, or business aspects of this occupation. Depending on his choice, he could enroll in Humanities and Social Science, Mathematics, or Business Administration. The student may choose the program that most interests him.

All programs of study were reviewed by Mercer College staff before inclusion in SIGI. They are checked annually against new editions of the college catalog.

High school prerequisites. Associated with each Mercer College curriculum is a list of high school prerequisites for entry into the curriculum. The student sees the list associated with the program for his occupation. If several programs serve a single occupation, as is true for Market Researcher, the student sees the prerequisites for the program he has chosen.

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[2]New Jersey State colleges have relaxed many of these restrictions since the Planning system was designed. Revisions in the system will take these new practices into account.

The list is taken directly from the college catalog and is embedded in a display stressing the importance of fulfilling the prerequisites and telling the student how he may overcome any deficiency. The subject of prerequisites was emphasized at the request of the Mercer College counseling staff because of their unhappy experience with students who had somehow enrolled in courses for which they were not qualified.

Follow-on colleges. Preparation for many occupations requires transfer to four-year colleges or specialized institutions, such as conservatories of music or schools of fashion design. We compiled a list of appropriate transfer institutions for each program of study requiring one. We adopted the following procedures in composing the list:

1. We examined the catalogs of all New Jersey State colleges and Rutgers University (all campuses) and included them on the list if they offered an appropriate curriculum.

2. We used The College Blue Book (Max Russell, Editorial Director, Degrees Offered by Subject (Volume 4 of The College Blue Book 1969/70), New York: CCM Information Corporation, 1970) and the computer-based College Locater Service (Educational Testing Service, Princeton, New Jersey) to compile a list of selected colleges and universities that offered an appropriate curriculum. Where many institutions had such offerings, the list was confined to colleges in New Jersey, eastern Pennsylvania, and the New York City area. It was necessary to go farther afield in some cases, but we always attempted to identify the institutions closest to Mercer College.

3. We checked the catalogs of all institutions in the list to make sure that they really offered a degree program in the subject area rather than merely a course or two.

4. Where graduate study was required for entry into an occupation, we compiled separate lists of four-year institutions and graduate schools.

5. Since the list was compiled on a regional basis, a disclaimer was added to all displays telling the student that the list was not necessarily complete and urging him to inform himself further.

6. A list of follow-on colleges was identified, if required, for each distinct route into an occupation. That is, a would-be Market Researcher would see one set consisting of program of study, prerequisites, and follow-on colleges if he chose Humanities and Social Science, and a different set if he chose Mathematics or Business Administration as the route he wished to follow.

PROCEDURES

The Sample for the Pilot Study

Overview. Sampling procedures were designed to approximate a stratified random sample. The student pool at Mercer was first stratified by curriculum, with a sample of students chosen randomly from each curriculum list in numbers approximating the percentage of students currently enrolled in that curriculum. The sample was also stratified by sex, and the percentages of males and females approximated their representation at Mercer.

Finally, the experimental and control groups were matched on reading and math test scores. Because of incomplete data or scheduling difficulties, there was considerable sample attrition, with the result that some curricula were not represented and some were over-represented. But in the main, there was a broad array of curricula, and the distribution in the sample matched fairly well the distribution in the freshman class at Mercer County Community College.

The sampling procedure. Students in their first semester, students in their second semester, and those about to enter Mercer (but still in high school) comprised the main pool of subjects; a very small number were in their third and fourth semesters. A list of students in each curriculum group was made up from this pool. The groups were General Studies, Health Fields, Business and Data Processing, Human Services, Fine and Applied Arts, Liberal Arts and Sciences, Engineering and Technology, Aviation Technology, Communications Media, and Ornamental Horticulture. Second, students were stratified by sex. Then each cell defined by curriculum and sex was sampled at random to make up the mailout list. The mailout, inviting participation in the SIGI project, was made to this sample in December of 1972 (Exhibit II-11).

From the group of "yes" responses to this original mailout, matching pairs of subjects were identified. These students were matched on curriculum, sex, and Comparative Guidance and Placement (CGP) test scores. One member from each pair was then randomly assigned to the experimental group, and the other to the control group.

It was necessary to eliminate incomplete data cases from the group of "yes" responses--i.e., students whose high school rank in class was not available or who had failed to take all tests in the Comparative Guidance and Placement (CGP) battery, which is routinely administered to entering freshmen. Other students were dropped because of scheduling difficulties. Largely as a result of the delay in installing the terminal, students who had earlier indicated willingness to participate later found that they were unable to do so: they had changed their schedules, had taken part-time jobs that ate up all their spare time, or had dropped out of school. To get replacements, a second small mailout, following the same guidelines, was made in early April, but it did not yield enough additional subjects. Since time was then very tight, a few other Mercer students were added on a catch-as-catch-can basis. One was a student in a class at Mercer taught by a SIGI staff member. Two more who could not decide on a curriculum were referred by the Mercer County Community College Admissions Office. And another volunteered herself after hearing about SIGI from a friend.

Table II-5 shows, for each curriculum group, the number of students in the experimental group and the control group. There is a broad array of curricula represented in the sample, with concentrations in Business and Data Processing and in Liberal Arts. It can be seen that the number of experimental group students in each curriculum group is generally about equal to the number of controls. An exception is Communications Media with 4 experimentals to 1 control.

TABLE II-5

CURRICULUM LIST

Curriculum	Experimental	Control
General Studies	2	3
Health Fields		
Dental Assisting	-	1
Nursing	-	1
Business and Data Processing		
Accounting	1	1
Marketing	1	-
General Business	-	1
Business Administration	2	2
Secretarial Science	1	1
Data Processing	-	-
Industrial Supervision	-	1
Human Services		
Community Service Assistant	-	1
Educational Assistant	-	-
Library Assistant	-	-
Fine and Applied Arts		
Architecture	3	2
Fine Arts	3	1
Advertising Design	-	1
Liberal Arts and Sciences		
Social Sciences and Humanities	7	8
Science-Math	2	1
Laboratory Technology	-	1
Engineering and Technology		
Engineering Science	-	-
Architecture Technology	2	-
Civil Engineering Technology	-	-
Drafting & Design Technology	-	-
Electrical Engineering Technology	1	2
Electronics Technology	-	1
Electro-Mechanical Engin. Technology	-	-
Electric Power Technology	-	-
Mechanical Engineering Technology	1	-
Machine Shop Technology	-	-
Aviation Technology		
Aviation Instrument Technology	-	-
Aviation Electronics Technology	-	-
Flight Technology	1	-
Other		
Communications Media	4	1
Ornamental Horticulture	-	-
	N=31	N=30

Post hoc analysis shows that the sample was also balanced by sex, close to the proportion of males and females that prevails at MCCC. Mercer's freshman class in fall 1972 was approximately 58% male and 42% female; our experimental group was 55% and 45% respectively; and our control group 57% and 43% respectively.

In addition, experimentals and controls were matched on math and reading scores on the CGP. As indicated in Table II-6, the mean CGP math score for experimentals was 53.42 (S.D.= 9.71). For controls it was 53.26 (S.D.= 9.78). A t test showed no significant difference between the two groups. The mean CGP reading score for experimentals was 54.85 (S.D.= 8.59). For controls it was 52.84 (S.D.= 9.58). Again, a t test showed no significant difference between groups.

TABLE II-6

DESCRIPTION OF THE SAMPLE

	Experimental	Control
Males	17	17
Females	14	13
CGP Reading		
Mean	54.85	52.84
S.D.	8.59	9.58
CGP Math		
Mean	53.42	53.26
S.D.	9.71	9.78
Enrollment Status		
About to enter	8	
In first semester	8	
Completed 1 or more	13	
Other	2	
Age		
15-22	28	
23-30	2	
Above 30	1	

Site Arrangements

The student's terminal was placed in a private room at Mercer County Community College where the student would be completely free from any intrusions. This room was situated within the counseling center, and one of the clerks was available to unlock the door, turn on the terminal and printer, help schedule the students, verify appointments, take messages, and so on. The keyboard of the terminal was covered except for a bank of response keys containing the ten response digits, a "PRINT" key which the student pressed to get hard copy of a display, and the space bar, which was marked "NEXT" and which was used to bring on the next display when no other response was appropriate. Beside the terminal was a bright red telephone which was connected through the switchboard to the Educational Testing Service computer room. A card displayed the telephone number of the computer room and told the student to dial if he needed help.

Scheduling Appointments

The staff at Educational Testing Service called students at their homes to schedule their first appointments. Subsequent appointments were scheduled by either the clerk at the MCCC counseling center or the staff at ETS over the telephone. When it was impossible to reach students by telephone, appointments were arranged by mail. The staff at ETS also called each student the day before he was scheduled at the terminal to remind him of the appointment and verify his intention of keeping it.

Most sessions were scheduled for two hours. A few students for whom no other arrangements could be made came to ETS at night or on Saturdays and used the terminal in the computer room. They were given complete privacy like their counterparts in the college terminal room.

Counselor Workshops

The design of the pilot study originally called for a series of meetings between the SIGI staff and the counselors at Mercer College. The purpose of the meetings was to familiarize the counselors with the theory and content of SIGI, to explain the anticipated relationship between the counselors and SIGI with respect to helping the student in career decision-making, and to solicit the counselors' help in better defining that relationship on the basis of their experience with participants in the study.

Counselors were to be invited to go through SIGI before any of the students. This interaction was to be followed by one or more group discussions. At the conclusion of the study, another group meeting would assess what had been learned. It was hoped that a handbook for counselors could then be produced based on actual field experience.

So much for plans. Unfortunately, there were delays in getting revisions in the SIGI script programmed and "debugged," and further delays in getting the terminal installed at Mercer College. The secretaries at the college went on strike in February of 1973. They set up a picket line that telephone workers refused to cross to install the remote line from the ETS com-

puter. The result was a second delay. By the time the first student got on line, the schedule was jammed and there was insufficient time for systematic scheduling of the counselors.

Nevertheless, it was possible to retrieve something of the original plan. After the study was under way, SIGI staff met with the counselors for a group demonstration of SIGI and for explanation of the system and its objectives. Moreover, several counselors took advantage of occasional gaps in appointments to use the terminal. Also, it was possible to produce a preliminary version of a handbook for counselors based on data collected from observation at the slave terminal at ETS, from the computer-generated record of student responses (see Chapter III), and from the intervention interviews with 12 experimental students. The SIGI Counselor's Handbook was completed in June 1973 and was distributed to the counselors in a final meeting before the close of the school year. At that meeting, the SIGI staff went over the handbook and discussed their first impressions of student reaction to SIGI. They also received the counselors' suggestions for modifications of SIGI.

The SIGI Counselor's Handbook is attached to this report as an appendix. It must be stressed that this is only a preliminary version of such a handbook. Revisions in the SIGI script will make many of the observations in the handbook obsolete.

INSTRUMENTS

Overview

An overview of the data collected for the field trial appears in Figure II-1.

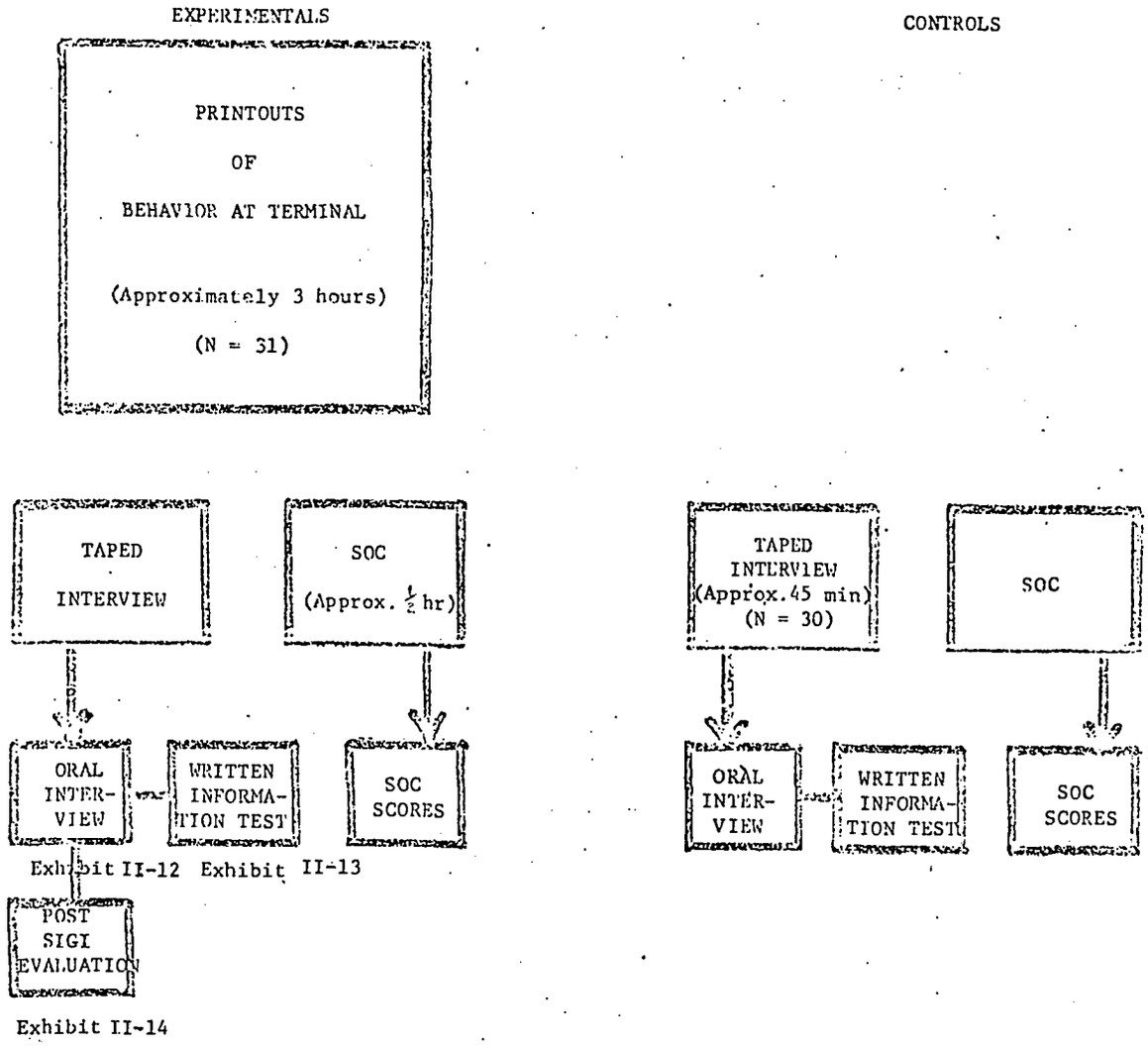

FIGURE II-1

BASIC DATA COLLECTION

Interview sessions were conducted with experimentals about one week after completion of SIGI and with controls before use of SIGI. During this session a student participated in an oral interview (Exhibit II-12), responded to a written information test (Exhibit II-13), played a decision-making game (Exhibit II-15), and (experimentals only) made a personal evaluation of SIGI (Exhibit II-14). The entire interview session (exclusive of SIGI evaluation questions) generally took 1 1/2 hours. Because of time pressures, most of the controls were interviewed before most of the experimentals, although there was considerable overlap. The first control interview was conducted March 15, 1973; the first experimental used SIGI on March 16. The last control interview took place on June 8; the last experimental on June 6.

The Oral Interview

Uniform procedures for the oral interview were established for all subjects without regard to experimental or control status. The questions and vocabulary were designed so that the role of the interviewer would be the same in all sessions. The interviewer needed only to convey the questions and show a willingness to listen without supplying further elaboration or encouragement. All interviews were taped so that scoring could be checked by independent scorers.

In order to achieve uniformity between interviewers, one person interviewed and the other observed alternately during five trial interviews with subjects not in the study sample. Both interviewer and observer took notes and scored each interview independently, discussing the results at the conclusion of each.

On the basis of these trials, an introduction was devised to put the subjects at ease. The interviewer explained that the questions would deal with career decisions and occupational choice. All students freely gave permission to the interviewer to tape record and take notes upon assurance that all remarks would be confidential and used for research purposes only. In general, interviewers strove to present oral questions in a uniform way.

Interviews were conducted in a small private office set aside for the SIGI project within the counseling complex. The interviewer and subject sat at a table with the microphone between them and the recording equipment to one side. Notes were taken in addition to the taped record.

The questions asked were the same for both experimentals and controls with one obvious exception. Experimentals were asked to evaluate various sections of SIGI. Controls were not asked these questions since they had not yet used SIGI.

SOC

At the conclusion of the oral interview, the interviewer administered the Simulated Occupational Choice (SOC) game. In this game the student is given the task of choosing from five occupations the one he would most like to prepare for. These occupations are fictitious, each represented (and named) by a color. The interviewer possesses a complete array of information about these occupations. This information has been manufactured with an eye to verisimilitude and also to systematic variation so that none of the occupations is likely to appear uniformly attractive or

unrelievedly dismal. Thus, the student's own values will determine which occupation is most desirable--if he asks the right questions. (See Game Directions, Exhibit II-15).

The student's questions and the answers are recorded on a tablet with a color-coded column for each occupation. The student has in view a continuous record of every question asked and every answer received. He reacts to each item of information by moving discs, colored to correspond to the occupations, along a scale representing degree of attractiveness. The scale is graduated from 0 to 10, and the discs are started at the midpoint, which is defined as the neutral or indifference level. The interviewer records the movement of the student's disc on the scale. When the student is ready (is satisfied that additional information would not affect the outcome), he indicates his choice of one of the five occupations.

Information Test

In the final part of the interview session the student completed a written information test in which he was asked to answer questions about his first choice occupation. These questions were designed to assess a student's knowledge about the satisfactions derived from an occupation, typical activities, working conditions and entry requirements. Examples of questions from this section are: "Typical working hours are _____? How often would you be expected to work overtime? (Rarely/Sometimes/Frequently/Can't say). Would you work the same hours every day? (Yes/No/Can't say)." (See Exhibit II-13).

Description of Intervention Interview

At the beginning of this pilot study it was decided to select a small group of people to be interviewed at a midpoint in their use of SIGI. The purpose of such interviews was to try out possible counselor roles in relation to SIGI. This experience was expected to be useful in preparing a counselor's handbook. Furthermore, it was felt that conversations with a small subsample of students midway through SIGI could point up any necessary script revisions.

Twelve experimentals received intervention interviews. Half were selected by chance. The remainder were chosen on the basis of behavior at the terminal which seemed to warrant inquiry. In the latter group, for example, was one student who gave a final weight of four to all values. The interview attempted to discover whether her values were really undifferentiated in importance or whether there was some other explanation. If the student did not differentiate between values, the interviewer could stimulate her to think more about her values. On the other hand, the student could be given an opportunity to reweight her values if she wanted to. In this particular case, although the student did reweight, indicating an ability to distinguish between values, it is not clear whether she did so to reflect her feelings or to accommodate the interviewer.

Under usual conditions of use, the student's behavior at the terminal is entirely confidential. The counselor would not know which responses the student had made unless the student told him.

Oral Interview Scoring

Two scores were derived from the oral interview. Constructs consisted of questions 1-3 and 5 dealing with constructs, or perceived characteristics of occupations, and Planning consisted of questions 4 and 6-11 dealing with plans. Questions 1-3 and 5 were scored together. The interviewer checked off each characteristic mentioned by the student in response to any of these questions. One point was given for each checked characteristic. Duplications were not scored.

Preliminary agreement was established about the meaning and appropriate categorization of student remarks by use of the five trial interviews mentioned earlier. It will be recalled that the interviewer and an observer took notes simultaneously. Then the two compared notes at the end of the interview.

Final agreement was reached by comparing the interviewer's tallies with those of two other scorers who had played back and scored the taped interview. Disparities were discussed and reconciled. This method was used for both the constructs checklist and the questions concerning plans.

The planning questions are numbers 4 and 6-11. Scoring for these items was as follows:

Number 4: +1 for one to two sources; +2 for three or more sources mentioned.

Number 6: +1 for each reason other than strong desire. (Strong desire=

"I'll apply myself, try harder; if you're interested and want to, you can do anything.")

Number 7: +1 for "get more information"; +1 for ability to connect desire and probability of success.

Number 8: +1 for naming plans; +2 for detailed plans; +3 for detailed plans plus recognition of contingencies.

Number 9: +1 for one or two reasons; +2 for three reasons or two reasons with one in depth.

Number 10: +1 for alternative; +2 for specific plan plus alternat ve.

Number 11: +1 for "get more information"; +2 for mention of specific information needed.

Information Test Scoring

The final section of the interview contains fact questions to be answered, in writing, about a student's first-choice occupation. Answers were evaluated on the basis of the SIGI occupational data base. Answers were scored right (+1) and part right (+1/2). The part score was used when some part of the response to a question was correct and the other part was either wrong or omitted.

SOC Game Scoring

There are two separate procedures involved in SOC. In the first, a student asks for and receives information about five occupations. The informa-

tion a student gets in answer to his questions is designed to have the potential to produce a large response as evidenced by movement of the discs. This is accomplished by two types of systematic variation of information: (1) For each question, variation in the information across the occupations. For example, in reply to a question about beginning salaries, the information set would be--$5000, $7000, $9000, $11,000, and $13,000. And (2) variation in information across questions for each of the occupations. For example, an occupation may have high income, low security, medium variety, etc.

The actual responses by a student are largely a function of the particular set of information he gets and the importance (to him) of the question asked. The more important the question, the greater the impact of the information and, therefore, the greater the responses. The positions of the discs prior to receiving new information and the order of the questions are also important, but these effects are likely to be balanced out over a series of questions and over a number of students.

Since the responses a student makes over a series of questions reflects the importance of the questions asked, they can be regarded as a measure of the efficiency of the information search. The following measure (E) is used to describe efficiency of information seeking:

$$E = \frac{1}{N} \sum d^2$$

where N = the total number of questions asked, and d^2 = the squared (Euclidean) distance between a set of disc positions before and after receiving information.

Another measure describing how a student interacts with information is obtained from the variability of responses. This measure (S) reflects the level of differentiation among the five occupations and is here defined as:

$$S = \frac{1}{N} \sum_{i}^{N} s_i^2$$

where s_i^2 = variance of a set of scale positions.

The degree of certainty or assurance (a) contained in a set of responses can be described by the following:

$$a_i = \sum_{j}^{5} p_j^2$$

where p_j = scale position of occupation j divided by the sum of the scale positions of all five occupations.

This measure is a close approximation to a measure of entropy ($H = \sum -p \log p$) used in information theory. It has a maximum value ($a_{max} = 1$) when the response set includes one occupation at 10 on the scale with the remaining ones at 0; it has a minimum value ($a_{min} = 1/5$) when all occupations are at the same level. It can be interpreted as the average amount of information contained in a set of observations and as such provides another kind of efficiency measure.

The average amount of information (A) for the question asked in SOC is defined as:

$$A = \frac{1}{N} \sum_{i}^{N} a_i$$

The first procedure in SOC ends when the student thinks he has asked for enough information to enable him to choose one of the occupations. Then, in the second procedure, he is given unsolicited information. Each time a student gets additional information, he is invited to move the discs from the scale positions they occupied at the time he made his decision. Information that is not important to a student will produce little or no change in the attractiveness of the occupations, and hence little movement in the discs, the implication being that the student's search for information was sufficient for his purposes. Larger changes will result from the impact of important information, implying that the student's search was insufficient. Thus, the responses made by a student reflect the comprehensiveness of his information search.

The following measure (C) is used to describe comprehensiveness of information seeking:

$$C = \frac{1}{n} \sum_{1}^{\infty} d_o^{\,2}$$

where n = number of questions not asked for which information is given, and $d_o^{\,2}$ = the squared distance between a set of disc positions and the disc positions at the time an occupation choice was made.

EXHIBIT II-1

DEFINITION AND RATING CATEGORIES FOR HIGH INCOME

Definition of Value

HIGH INCOME: Some minimum income (enough for survival) is essential for everyone. But beyond that, how important to you are the extras? People have different ideas about how much income is "high." Therefore, HIGH INCOME is not defined here as a specific amount. It means more than enough to live on. It means money to use as you wish after you have paid your basic living expenses. You can buy luxuries and travel first-class.

Definition of Category

Rating	
5	Median income of $14,000 or more
4	Median income of $12,000-$13,999
3	Median income of $9000-$11,999
2	Median income of $7000-$8999
1	Median income of $6999 or less

NOTE: These definitions of these categories are reviewed annually because of rapid changes in salaries.

EXHIBIT II-2

DEFINITION AND RATING CATEGORIES FOR PRESTIGE

Definition of Value

PRESTIGE: If people respect you, look up to you, listen to your opinions, or seek your help in community affairs, you are a person with PRESTIGE. Of course, PRESTIGE can be gained in several ways. But in present-day America, occupation is usually the key to PRESTIGE. Rightly or wrongly, we respect some occupations more than others.

Definition of Category

Rating	
4	A great amount: 64.0 and above on Siegel scale[1]
3	A more than average amount: 52.0-63.9 on the Siegel scale
2	An average amount: 42.0-51.9 on the Siegel scale
1	A less than average amount: 41.9 and below on the Siegel scale

SIGI occupations not included in Siegel's study were assigned the ratings of occupations most like them in the study.

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[1] Paul M. Siegel, Prestige in the American Occupational Structure (unpublished dissertation prepared for the University of Chicago Department of Sociology, 1971). Used with permission.

EXHIBIT II-3

DEFINITION AND RATING CATEGORIES FOR INDEPENDENCE

Definition of Value

INDEPENDENCE: Some occupations give you more freedom than others to make your own decisions, to work without supervision or direction from others. At one extreme might be talented freelance artists or writers who may work without supervision. At the other extreme might be military service or some big business organizations with chains of command which severely limit the decisions that each person can make.

The four categories correspond to different frequencies of evaluation and supervision.

Definition of Category

Rating

4 A great amount (Less than weekly supervision): Self-employed or responsible to someone else only in extraordinary circumstances. Shares in setting overall objectives or decides what work needs to be done. Seldom evaluated by others. Top management level.

3 A more than average amount (Weekly supervision): Follows overall objectives set by top management. Quality of work is evaluated at long intervals.

2 An average amount (Daily supervision): Works under supervisor who assigns and schedules work daily. Free to decide details of work. Not responsible beyond immediate supervisor.

1 A less than average amount (Hourly supervision): Most activities are directly supervised, with little opportunity to act independently beyond immediate supervisor.

EXHIBIT II-4

DEFINITION AND RATING CATEGORIES FOR HELPING OTHERS

Definition of Value

HELPING OTHERS: Most people are willing to help others, and show it every day outside of their work. They put themselves out to do favors, make gifts, donate to charities, and so on. THIS DOES NOT COUNT HERE. The question here is, Do you want HELPING OTHERS to be a main part of your occupation? To what extent do you want to devote your life work directly to helping people improve their health, education, or welfare?

There are two elements involved in helping others for the purpose of rating this value: (1) the presence of face-to-face contact with the people being helped; and (2) the level of help being offered. By applying both elements, we would rate an architect higher on Helping Others than a businessman because the former is performing a public service (i.e., improving the appearance of the environment); but an architect would not rate as high as a doctor, who is performing a public service with face-to-face contact. Slightly more emphasis is placed on the beneficial quality of service than on the presence of face-to-face contact.

Definition of Category

Rating	
4	A great amount: Working with people directly to improve their health, welfare, or education.
3	A more than average amount: Providing a service that makes life better for the general public in a significant way (for example, legal, aesthetic, or environmental); or having meaningful, but not vital, influence on individual clients.
2	An average amount: Providing for specific segments of the public a service that makes life more convenient or pleasant; face-to-face contact with other people at a lower level as a main part of the occupation.
1	A less than average amount: Helping others is not a major part of the occupation.

EXHIBIT II-5

DEFINITION AND RATING CATEGORIES FOR SECURITY

Definition of Value

SECURITY: In the most SECURE occupations, you will be free from fear of losing your job and income. You will have tenure--that is, you cannot be fired very easily. Employment will tend to remain high in spite of recessions, and there will be no seasonal ups and downs. Your income will generally remain stable and predictable; it will not vanish with hard times. Your occupation is not likely to be wiped out by automation or other technological changes.

There seem to be three aspects of Security to consider: (1) Are there guarantees of employment? (2) What is the supply of qualified workers? and (3) How sensitive are jobs to economic fluctuations or technological innovations? The four categories of Security combine these three elements.

Definition of Category

Rating

4 A great amount: Some guarantee of employment and income, such as tenure or union contract provisions.

3 A more than average amount: Shortage of qualified workers in the field or not sensitive to fluctuations in the economy or technological obsolescence (i.e., good outlook).

2 An average amount: Average labor supply and mildly sensitive to fluctuations in the economy or technological change.

1 A less than average amount: Keen competition for most job openings or strong dependence on economic conditions or risky income, such as from commissions, or highly susceptible to technological obsolescence.

EXHIBIT II-6

DEFINITION AND RATING CATEGORIES FOR VARIETY

Definition of Value

VARIETY: Occupations with the greatest VARIETY offer many different kinds of activities and problems, frequent changes in location, new people to meet. VARIETY is the opposite of routine, predictability, or repetition. If you value VARIETY high, you probably like novelty and surprise, and enjoy facing new problems, events, places, and people.

Definition of Category

Rating

4 A great amount: Substantial variety in problems and in either place or people.

3 A more than average amount: Either a substantial variety in problems (but not in place or people); or a moderate variety in problems and in either place or people.

2 An average amount: Either a moderate variety in problems (but not in place or people); or little variety in problems with considerable variety in people or place.

1 A less than average amount: Very little meaningful variety in problems, place, or people.

NOTE: "Variety in people" must also involve at least moderate adjustment of work to fit client's personality or needs.

EXHIBIT II-7

DEFINITION AND RATING CATEGORIES FOR LEADERSHIP

Definition of Value

LEADERSHIP: Do you want to guide others, tell tham what to do, be responsible for their performance? People who weight LEADERSHIP high usually want power to control events. They want to influence people to work together effectively. If they are mature, they know that RESPONSIBILITY goes with LEADERSHIP. They are willing to accept the blame when things go wrong, even though they were not at fault.

Leadership is judged to combine three factors: (1) getting others to do one's bidding; (2) having an impact on policy or on events in general; (3) having responsibility for the behavior of others.

Definition of Category

Rating

4 A great amount: Must have a great influence on policy-making decisions or on the lives of many others.

3 A more than average amount: Must be responsible for the performance of a large number of employees or have considerable influence on others.

2 An average amount: Must supervise a small group of workers or have moderate influence over the people worked with.

1 A less than average amount: Little or no influence over clients or other employees.

EXHIBIT II-8

DEFINITION AND RATING CATEGORIES FOR THE SIX INTEREST FIELDS

Definition of Value

FIELD OF INTEREST: Some people have only one main field of interest (Scientific, Technological, Administrative, Personal Contact, Verbal, or Aesthetic); others are interested in two or more of these fields. Some insist that their occupation must be in one of their major FIELDS OF INTEREST. Others are willing to work in a field that is less interesting; they feel they can satisfy their main interest in their spare time.

Definition of Six Interest Fields

(1) SCIENTIFIC--data, knowledge, observations, analysis, mathematics.
Examples: physicist, chemist, engineer.

(2) TECHNOLOGICAL--things, machines, manipulative and mechanical skills.
Examples: toolmaker, mechanic, technician.

(3) ADMINISTRATIVE--business, finance, records, systems.
Examples: accountant, secretary, bank teller.

(4) PERSONAL CONTACT--people, selling, supervising, persuading.
Examples: salesman, social worker, stewardess.

(5) VERBAL--words, reading, writing, talking, listening.
Examples: journalist, teacher, advertising copywriter.

(6) AESTHETIC--painting, sculpture, design, music.
Examples: artist, interior designer, musician.

All occupations are rated on all six fields. The rating for each field is determined by an analysis of job activities.

Rating	Definition of Category
4	The interest field in which most job activities and concerns are located. All occupations have at least one top-rated field; occasionally, an occupation has more than one top-rated interest field.
3	An interest field in which a substantial number of job activities occur.
2	An interest field represented by occasional job activities.
1	An interest field not represented or represented only to a very small degree by the job activities.

NOTE: If the student selects Interest Field as one of his five values for retrieving occupations in LOCATE, any occupations with a rating of 2, 3, or 4 on the field specified will meet the Interest Field test.

EXHIBIT II-9

DEFINITION AND RATING CATEGORIES FOR LEISURE

Definition of Value

LEISURE: How important is the amount of time your occupation will allow you to spend away from work? LEISURE may include short hours, long vacations or the chance to choose your own time off. To give a high weight to LEISURE is like saying, "The satisfactions I get off the job are so important to me that work must not interfere with them."

Three considerations are involved in this definition: (1) amount of time spent in work (e.g., length of work week, length of vacations); (2) irregularities in the work schedule (e.g., shift work, overtime, weekend work); and (3) control over one's work schedule (e.g., 4-day week with longer work day, control over time of arrival and departure, work at home).

Definition of Category

Rating

4 A more than average amount: A less than 40-hour work week or 40 hours with control over work schedule; more than two weeks' annual vacation.

3 An average amount: A 40-hour work week free from irregularities and two weeks' annual vacation.

2 A less than average amount: A 40-hour work week with occasional overtime or shift work or work on weekends.

1 A small amount: A longer than 40-hour work week or frequent overtime or other irregularities.

NOTE: The verbal "tags" for the scale ratings for Leisure differ from the other values dimensions, because deviations above the "average" and modal work week are too infrequent to warrant two higher scale steps. It was possible, however, to identify two lower scale steps that differentiated a significant number of occupations. In other words, relatively few occupations offer "more" leisure than the modal amount; a substantial number offer "less."

EXHIBIT II-10

DEFINITION AND RATING CATEGORIES FOR EARLY ENTRY

Definition of Value

EARLY ENTRY: You can enter some occupations with very little education or training. Other occupations require years of expensive education. (The cost includes loss of income from a job you might have if you were not in school.) Think about the time (and money) you are willing to spend on education. Also think about your attitude toward school: Is education a satisfying experience? Or does it seem like a drag?

Definition of Category

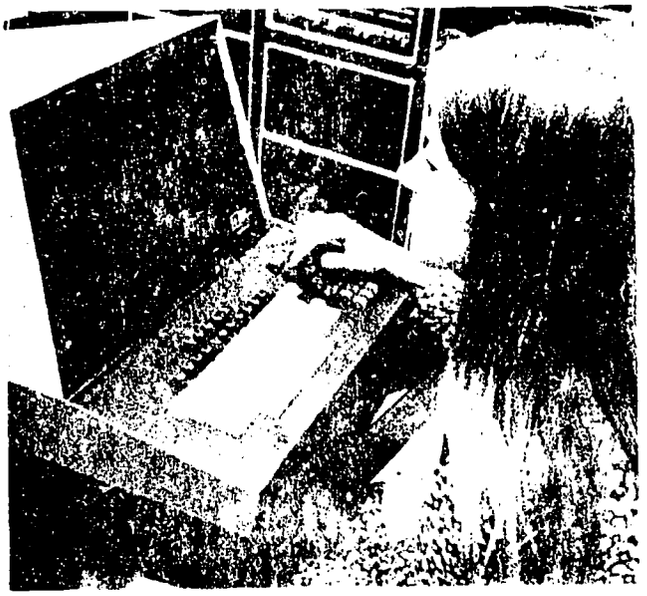
Rating	
4	Entry after one year or less of preparation beyond high school.
3	Entry after two or three years of preparation beyond high school.
2	Entry after four years of preparation beyond high school and/or requirement of a bachelor's degree.
1	Entry after five or more years of preparation beyond high school.

EXHIBIT II-11

EDUCATIONAL TESTING SERVICE PRINCETON, N.J. 08540

Area Code 609
921-9000
CABLE-EDUCTESTSVC

Developmental Research Division



SIGI IS COMING!!

And it can help you make decisions about your future in the world of work.

You are one of a small group of students who applied to Mercer County Community College who have been invited to use SIGI, a computer based vocational guidance system. We hope you'll want to participate. Here are some of the specifics:

TIME: We expect that most students will spend at least three hours with SIGI, spread over several sessions. But you will be free to spend more time if you want.

LOCATION: SIGI will be located at Educational Testing Service in Princeton and in the Administration Building, room 117 at the Mercer County Community College Campus in West Windsor.

INTERVIEW: After completing SIGI you will be interviewed so that we can see what your reactions are to the program.

If you would like to participate in the program, please sign and return the enclosed postcard. This will show us that you're interested and also will give us permission to use your test scores and high school rank on file at Mercer County Community College for computing the predictions you will see at the SIGI terminal.

We need to get a definite answer from you. So if you agree, please check the "Yes" box, then sign and return the enclosed postcard. (Have your parent sign too if you're under 18.) If you don't want to participate, please check the "No" box on the postcard and sign and return it.

If you have any questions about SIGI, please call Katie Bode at ETS (609-921-9000, Ext. 2394).

Sincerely,

Katie Bode

Katie Bode
Guidance Research Group

EDUCATIONAL TESTING SERVICE PRINCETON, N.J. 08540

Area Code 609
921 - 9000
CABLE-EDUCTESTSVC

Developmental Research Division

DESCRIPTION OF SIGI: SIGI is a computer-based System of Interactive Guidance and Information. It has four parts:

1. You can explore your own Values and decide which are most important to you in your search for a satisfactory occupation. These are the values: making a lot of money, the opportunity to help others, freedom to make decisions, prestige, security, variety, leadership and responsibility, working in your main field of interest, leisure, early entry into the occupation or low cost of education. SIGI will help you clarify what you want, what satisfactions you seek, what is important to you.

2. You will discover where these satisfactions can be found. SIGI contains information about 120 occupations which you can explore; you can find out how well they fit your values.

3. You can ask the system to predict for you what your chances are of success in preparing for each occupation. The predictions will be based on your high school rank and test scores on file at Mercer County Community College. SIGI will predict how well you can expect to do in a particular curriculum or course, judging by the experience of other students with test scores and high school rank like yours.

4. Finally, you can plan what steps to take next in your tentative career decisions. You can lay out your educational program, and you can make alternative plans to fall back on in case you change your mind.

EXHIBIT II-12

INTERVIEW SCHEDULE

Name _____ Date _____

Interviewer _____ Tape # _____

I.D.# _____

1. What occupation do you expect to enter after you have completed your college program?

_____

(What occupation are you considering as a possibility?)

Have you ever worked as a _____ No [ ] Yes [ ]

What appeals to you about _____ as an occupation? What characteristics do you like about it?

_____ Income
_____ Leis
_____ Pres
_____ Ind
_____ Help
_____ Sec
_____ Var
_____ Lead
_____ Int
_____ E.E.
_____ Ability
_____ Clients
_____ Associates
_____ Activities
_____ Occ Training
_____ Coll Courses
_____ Pers Qualif.
_____ Other Req.
_____ Surrounds
_____ Conditions
_____ Fringe
_____ Outlook
_____ Location
_____ Advancement
_____ Ratio

NOTE ABOUT SCORING: If a concept listed in the column on the left was mentioned in answer to question 1, 2, 3, or 5, it was scored only once, no matter how frequently it was mentioned.

2. Make believe that you could order up the perfect occupation. It would be something that doesn't exist in the real world, but would be specially made up to fit your every wish. As a result this occupation would have the characteristics that you want most. What would these characteristics be?

(Prompt: For example, suppose you want an occupation which would pay a thousand dollars an hour.)

_____ Income
_____ Leis
_____ Pres
_____ Ind
_____ Help
_____ Sec
_____ Var
_____ Lead
_____ Int
_____ E.E.
_____ Ability
_____ Clients
_____ Associates
_____ Activities
_____ Occ Training
_____ Coll Courses
_____ Pers Qualif.
_____ Other Req.
_____ Surrounds
_____ Conditions
_____ Fringe
_____ Outlook
_____ Location
_____ Advancement
_____ Ratio

NOTE ABOUT SCORING: If a concept listed in the column on the left was mentioned in answer to question 1, 2, 3, or 5, it was scored only once, no matter how frequently it was mentioned.

3. Suppose that I (interviewer) were an experienced _____, and I were available to answer any question you asked. What questions would you ask me about this occupation?

_____ Income
_____ Leis
_____ Pres
_____ Ind
_____ Help
_____ Sec
_____ Var
_____ Lead
_____ Int
_____ E.E.
_____ Ability
_____ Clients
_____ Associates
_____ Activities
_____ Occ Training
_____ Coll Courses
_____ Pers Qualif.
_____ Other Req.
_____ Surrounds
_____ Conditions
_____ Fringe
_____ Outlook
_____ Location
_____ Advancement
_____ Ratio

NOTE ABOUT SCORING: If a concept listed in the column on the left was mentioned in answer to question 1, 2, 3, or 5, it was scored only once, no matter how frequently it was mentioned.

4. (If you did have a question later on): Where else would you go to find out the answers to your questions? Who or what source would you go to other than a person in the field?
   ____ Counselor ____ Reference Book ____ Teacher
   ____ Professional Org. Other _____

5. Think back on how you decided on, or why you considered (first choice occupation). What were your reasons for choosing it?

_____ Income
_____ Leis
_____ Pres
_____ Ind
_____ Help
_____ Sec
_____ Var
_____ Lead
_____ Int
_____ E.E.
_____ Ability
_____ Clients
_____ Associates
_____ Activities
_____ Occ Training
_____ Coll Courses
_____ Pers Qualif.
_____ Other Req.
_____ Surrounds
_____ Conditions
_____ Fringe
_____ Outlook
_____ Location
_____ Advancement
_____ Ratio

NOTE ABOUT SCORING: If a concept listed in the column on the left was mentioned in answer to question 1, 2, 3, or 5, it was scored only once, no matter how frequently it was mentioned.

6. What has led you to feel that you can succeed in preparing for this occupation? (If motivation named as reason, prompt for other reason)

_____ Specify relevant abilities _____ Previous experience

_____ School performance _____ Strong desire

_____ Other _____ _____ Test scores

[6. Scoring: +1 for each reason other than desire]

7. a) Suppose you learned you had only a 20% chance of passing the courses required for (1st choice occupation), but you had an 80% chance of passing courses for an occupation you never heard of (for example, TORPIST). What would you do?

DO NOT READ CHOICES

_____ prepare for 20% occupation _____ prepare for 80% occupation

_____ get more information _____ other

b) Why?

[7. Scoring: +1 for statements about desirability; for recognition of overlap between probabilities]

8. What are your educational and occupational plans for the next two years?

Next year:

Following year:

[8. Scoring: o-No mention; +1-Names plans; +2-Recognition of contingencies]

9. Suppose that a year from now I met you. You were no longer planning to become a _____. Can you imagine any reasons why your choice might have changed?

_____ Financial problems _____ School performance

_____ Boy/girlfriend _____ New occupation info

_____ Family problems _____ Changes in values

_____ Other _____

[9. Scoring: o-No mention; +1 Total]

10. If you could no longer become a (first choice occupation), what would you do instead? What alternative plans would you make?

Alternative: _____

Plan: _____

[10. Scoring: +1 for alternative; +1 for plan]

11. A teacher whom you respect urges you to plan for a career in an occupation you really know very little about. Your mother, who knows you well, agrees with the teacher. A friend says he thinks it sounds like a good idea. Would you now start planning for this career? Why or why not?

_____ Would stay with old career. Why? _____

_____ Would start on new career. Why? _____

_____ Get more information. What kind? _____

[11. Scoring: +1 for good reason or get more info.]

EXHIBIT II-13

PLEASE WRITE CLEARLY

PART II. WRITTEN

Name _____ Date _____

Curriculum _____

High school courses required to enter this curriculum _____

_____

Circle the ones that you have not taken.

Write brief answers or complete the following statements about the occupation you are most seriously considering. If you do not have enough information to answer the question, write "can't say" under the question.

Name of Occupation _____

1. The work activities include: _____

_____

_____

2. Contact with other people (such as clients or co-workers) is (check one):

High _____
Medium _____
Low _____
Can't Say _____

Contact with others consists mainly of: _____

3. To enter, you need at least (check one):

Associate Degree _____
Bachelor's _____
Masters _____
PhD _____
Can't Say _____
Other _____

If other, describe: _____

4. Some of the required college courses are _____

_____

5. A worker in this occupation should have the following personal traits:

_____ _____

_____ _____

6. Are there licensing requirements, state examinations, or any other requirements? Are any additional skills or knowledge required?

Yes _____
No _____
Can't Say _____

If yes, what? _____

7. Typical beginning salary is $_____.
The average salary is $_____.

8. Opportunities for helping others are (check one):

Great _____
Medium _____
Small _____
Can't Say _____

In what ways can a worker in this occupation help other people?

_____

_____

9. Opportunities for leadership are (check one):

Great _____
Medium _____
Small _____
Can't Say _____

In what ways does a person in this occupation direct others?

_____

_____

How many people is that person usually responsible for? _____

10. What interest field(s) is this occupation in?

Scientific _____
Business _____
Technological _____
(things, machines, mechanical skills)
Can't Say _____

Personal Contact _____
Verbal, Writing _____
The Arts _____
(painting, sculpture, music)

11. In the eyes of the public, the prestige level of this occupation is (check one):

Great _____
Medium _____
Low _____
Can't Say _____

12. The physical surroundings on the job are (check one):

Office _____
Outdoors _____
Laboratory _____
Store _____
Other _____

If other, describe: _____

13. Typical working hours are: _____

How often would you be expected to work overtime?

Rarely _____
Sometimes _____
Frequently _____
Can't Say _____

Would you work the same hours every day?

Yes _____
No _____
Can't Say _____

14. How much freedom from supervision would a person in this occupation have?

A small amount _____
A moderate amount _____
A great amount _____
Can't Say _____

15. How much variety does this occupation provide in people, places and activities?

	Variety Level			
	High	Medium	Low	Can't Say
People	_____	_____	_____	_____
Places	_____	_____	_____	_____
Activities	_____	_____	_____	_____

16. Fringe benefits (extra benefits beyond salary) to employees in this field consist of:

_____

_____

17. For the future (5-10 years), the employment outlook in this occupation is (check one):

Good _____
Fair _____
Poor _____
Can't Say _____

Why? _____

18. Name some businesses, industries (etc.) which employ workers in this occupation. _____

_____

19. The job security is (check one):

High _____
Medium _____
Low _____
Can't Say _____

Is there is anything about the occupation that might affect job security?

Yes _____
No _____
Can't Say _____

If yes, describe: _____

_____

20. What are chances for advancement in this occupation?

High _____
Medium _____
Low _____
Can't Say _____

What skill, experiences, etc., are required to advance in this occupation?

_____

_____

21. Here are statements by five different people. Which one do you think best fits your attitude toward choosing an occupation?

_____ I would choose the occupation which I'm most likely to be a success in.

_____ I'll probably take whatever job comes along when I need work.

_____ I would choose the occupation that offers most rewards.

_____ I'll probably choose an occupation that I can get into and which looks reasonably appealing.

_____ I would follow the advice of a person whom I respect.

22. How well do you know what occupation and program you want?

I have no idea what I want to do _____

I have several alternatives _____

I know for sure what I want to do _____

23. What are your chances in 100 of getting a grade point average at the end of the semester

	Chances in 100
A or B (4 or 3)	_____
C (2)	_____
Below C (Less than 2)	_____

24. a) A student was told that previous students with abilities like his had performed as follows:

Chances in 100 of getting:

A or B	C	Below C
10	30	60

What is his probability of getting a C or better? _____

b) Look at your previous answer. Suppose this was YOUR probability of passing the program you needed to enter the occupation you are considering. Would you take the program?

_____ I certainly would take it because _____

_____

_____ I probably would take it because _____

_____

_____ I certainly would not take it because _____

_____

_____ I probably would not take it because _____

_____

EXHIBIT II-14

SIGI EVALUATION

Circle the grade that you would give SIGI on each of the following:

1. Grade SIGI on how interesting it was: A, B, C, D, or F
2. How clear were SIGI's directions? A, B, C, D, or F
3. Overall, how helpful was SIGI--give it a grade-- A, B, C, D, or F
4. Give SIGI a grade showing how useful it was in each of the following:
5. Helping you become more aware of your values? A, B, C, D, or F
6. Helping you understand that values are related to career decisions? A, B, C, D, or F
7. Helping you find out which occupations might fit your values? A, B, C, D, or F
8. Helping you get information about occupations? A, B, C, D, or F
9. Helping you understand that predictions of GPA are expressed in probabilities? A, B, C, D, or F
10. Helping you estimate probabilities of success in one or more programs? A, B, C, D, or F
11. Giving information about programs of study at MCCC? A, B, C, D, or F
12. Helping you plan a program appropriate for an occupation you are considering? A, B, C, D, or F
13. Helping you learn how to make career decisions? A, B, C, D, or F
14. To get help on occupational and educational decisions, you can go to SIGI and a counselor. What can you get from each one that you can't get from the other?

SIGI Alone	Counselor Alone

15. Have you talked with a counselor since you started to use SIGI?

___ Yes ___ No What did you discuss with (him/her)?

_____

16. Do you feel as if you need to get advice from a counselor now? (other than approving your program) Yes ___ No ___

17. If yes, what kind? _____ occupational choice _____ personal life
_____ curriculum choice _____ financial aid
_____ course selection

18. When you first came to SIGI, how well did you know what occupation and program you wanted?

___ I came to SIGI not knowing what I wanted to do.
___ I came to SIGI having several alternatives.
___ I came to SIGI knowing for sure what I wanted to do.

19. Now, how well do you know what occupation and program you want?

___ I'm still uncertain.
___ I have a much better idea now.
___ SIGI helped me to choose one.
___ SIGI helped confirm the choice I had already made.
___ SIGI suggested other things which I am considering.

20. What was the most useful section of SIGI for you?

___ Values ___ Information ___ Prediction ___ Planning ___ Strategy

21. Is there anything SIGI didn't cover that you would like it to cover?
What: _____

22. Is there any area you would like to have covered more fully? ___ Yes ___ No
If yes, it was _____

23. Did you have any trouble locating an occupation you were interested in (in LOCATE)? ___ Yes ___ No

24. Were there any occupations missing from SIGI that you were interested in?
___ Yes ___ No: _____
Name of Occupations

25. Do you expect to return to MCCC next fall? ___ Yes ___ No

26. If so, would you want to use SIGI again? ___ Yes ___ No

27. How often do you think you would use it? ____ Once ____ Twice
___ Three times or more Which sections would you use most?

___ Values ___Information ___ Prediction ___ Planning ___ Strategy

28. Is there anything else you would like to tell us that would help us improve SIGI? _____
_____

29. Have you told any of your friends at MCCC about SIGI? If so, how many? _____

30. Would you advise friends in your class at MCCC to use SIGI?

31. Would you be willing to answer a few questions about your occupational and educational plans a year from now? ___ Yes ___ No

EXHIBIT II-15

GAME DIRECTIONS

This is a game in which you choose an occupation that you'd like to prepare for.

There are five occupations from which you can choose. They are called (pointing to each) orange, green, blue, yellow, and pink. They are not real occupations; we made them up.

We have all the information you would need to know about those occupations.

To help you choose which one of the five occupations that you'd most like to prepare for you can ask me questions. Ask any question you like as long as it can be answered by one of three kinds of responses: Yes-No, High-Medium-Low, or a specific word or number. For example, you might ask, "Is travel required?" You would be given a yes or no reply for each occupation. If, instead, you asked, "Compared to the other occupations, how much opportunity will there be for traveling?" you would get a reply of high, medium or low for each occupation. If you asked, "How many hours a week would I spend traveling?" you would get specific responses such as 3, 24, etc. I will record your questions, in short form, in this column (pointing) and the replies under each occupation (pointing).

As you ask questions, we would like to see how the information you receive affects the way you feel about the occupations. Use these coins (pointing) to show how attractive each occupation is. Notice that the colors of the coins match the occupations. We start the game with all the coins at the middle of the scale (pointing to 5). This represents an indifference point; that is, you feel neither positive nor negative about the occupation. If you receive information that makes an occupation more attractive to you, you should move the coin up the scale as many points as you want (demonstrate); if you receive information that makes an occupation less attractive to you, you should move the coin down the scale as many points as you want (demonstrate). If the information you receive does not affect the way you feel about an occupation, you do not have to move the coin.

While you are playing the game, keep in mind that these are made-up occupations and that you are trying to decide which one of the five you would most like to prepare for. When you are ready to make your choice, let me know.

Now, ask me questions that will help you judge how attractive these occupations are to you.

Take all information into account, not just the last question.

CHAPTER III

ILLUSTRATION OF USE OF SIGI

SIGI is a career decision-making "treatment" defined by each student's interaction with the system. The treatment is structured by the courseware, software, and hardware (along with whatever human counseling is joined to it), but it is not a fixed treatment. Rather, it is variable, responsive to individual needs and uses.

The basic structure is comprised of eight separate but interrelated subsystems: INTRODUCTION, VALUES, LOCATE, COMPARE, DESIRABILITY, PREDICTION, PLANNING, and STRATEGY. One way to clarify the function and the interdependence of these subsystems is to follow the path of a student as he goes through SIGI. During each session, the computer makes a record of the student's behavior at the terminal which includes his responses to key displays, the list of occupations that meet his values and specifications in LOCATE, the occupations examined in COMPARE, DESIRABILITY, PLANNING, and STRATEGY, and the amount of time spent in each system. (Response latency is not recorded, since this information is irrelevant in SIGI.) Consequently, it is possible to reconstruct a student's behavior from the printout of this record. For purposes of exposition, we will track one student on his path through SIGI. Since every student used the system in a unique way, it is difficult to identify a "typical" student. We chose Student 23 because his record readily illustrates a number of the most important features of the system.

Student's Path Through SIGI

Figure III-1 is a schematic representation of the paths the student can follow in SIGI. The novice (broken line) must adhere to a prescribed sequence, starting at INTRODUCTION and progressing through VALUES, LOCATE, COMPARE, and so on until he has been through PLANNING with one occupation. While in any one of these sections, he may use it as extensively as he wishes and may sign off when he has finished with it, but when he returns to SIGI he must begin with the next section. After his first trip through PLANNING, however, he becomes an initiate (solid line). In this status, completion of any system generates a menu display that allows him to go wherever he chooses (except to INTRODUCTION) or to sign off. If he is returning as an initiate. he goes to the menu and begins in whichever system he elects.

This plan admits two sources of variability in the way students use SIGI: within systems and between systems. Both novices and initiates may vary in the amount of interaction they undertake within any system. In addition, initiates may vary in the paths they choose upon release from the novice restrictions.

The subject of variability in the way students use SIGI is discussed later in this report. It is introduced here as an aid in interpreting the student printout.

Student Printout

The record of Student 23 has been cut up and reproduced in Exhibit II-1a-1p at the end of this chapter. The interpretation that follows refers to that exhibit. The left hand column of the printout contains the descriptive tags

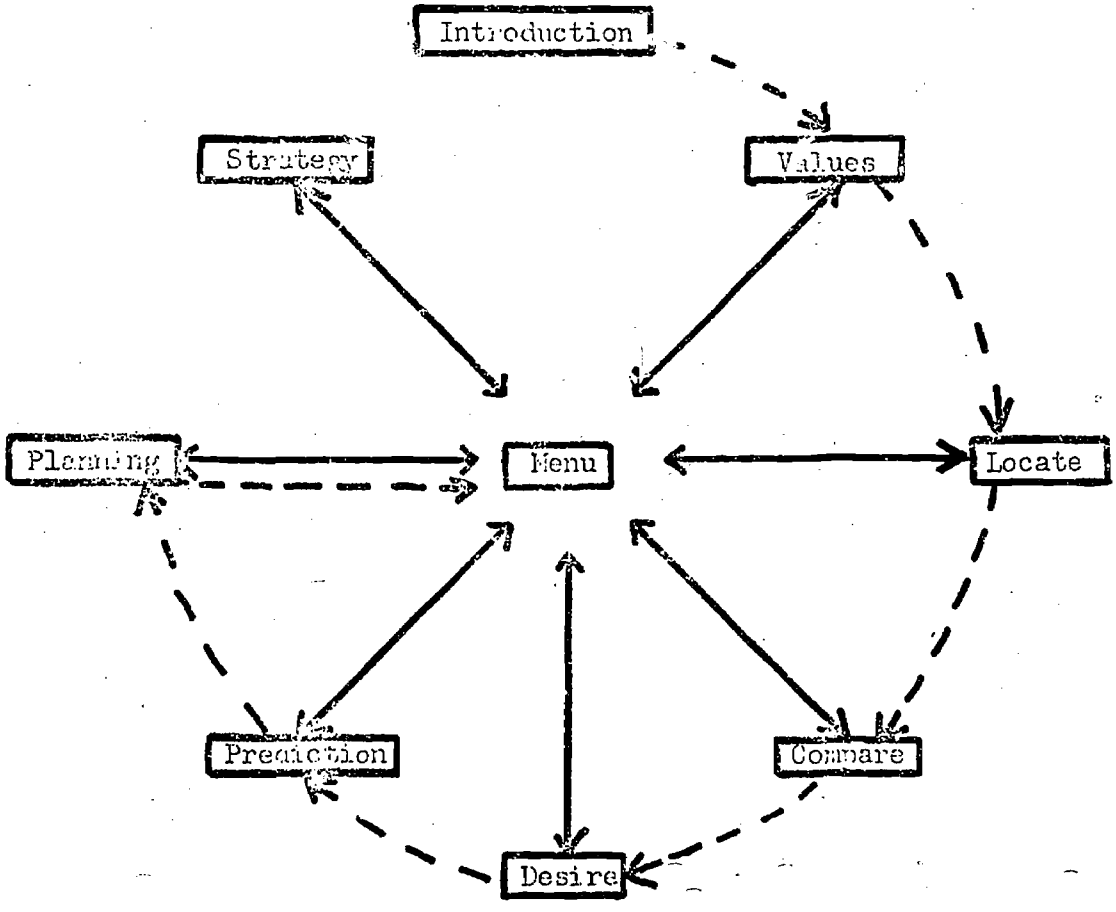


FIGURE III-1

STUDENT'S PATH THROUGH SIGI. THE NOVICE (BROKEN LINES) FOLLOWS A PRESCRIBED PATH. THE INITIATE (SOLID LINES) IS FREE TO GO FROM SYSTEM TO SYSTEM IN ANY ORDER.

("INTRO," "VAL 26," etc.) that identify the information contained in the columns farther to the right. The material in typewriter characters is information added to the original printout to aid in its interpretation.

Behavior as a Novice

INTRO. (Exhibit III-1a) The student must record his status every time he signs on to SIGI, since he may have completed a semester at his college since last signing on. If Student 23 had completed one or more semesters, the computer would have set a switch to insert appropriate displays in PREDICTION, where grades are discussed, and PLANNING, where programs of study are formulated. The last four columns opposite INTRO record the student's present knowledge about his values, occupations of interest, probabilities of success in college, and plans for preparing for his occupation. The exploration of these subjects introduces the student to the four main sections of SIGI: VALUES, INFORMATION, PREDICTION, and PLANNING.

INTOUT. Clock time in and out is recorded for each system.

VL1IN. As a novice Student 23 must now go to VALUES. He begins with a sequence culminating with VAL 26 in which he assigns a numerical weight ranging from 0 (no value) to 8 (highest value) that shows the importance to him of each of ten occupational values, operationally defined.

VAL 22. The student selects the field of work most interesting to him. The choices are Scientific, Technological, Administrative, Personal Contact, Verbal, and Aesthetic--again, each one defined. Student 23 chose the Technological field. The weight assigned to the value Interest Field will now show

the importance of working in the Technological field.

VAL26. The numbers show the weight assigned to the labeled values when they were weighted one at a time. The values and their weights are then gathered into a single display so that the student can see them in relationship to one another and may readjust the weights if he wishes. The result of the readjustment is recorded in VAL31 (Exhibit III-1b) which represents the student's value profile before he played the Values Game. Since VAL31 is in this instance identical with VAL26, the student accepted his original weightings without change.

VG IN. The novice must play the Values Game. The initiate returning to VALUES would have the option of bypassing the Game.

END 2, END 5, INCON2, or INCON4. (Exhibit III-1, a-b) Each game terminates in a series of displays showing the choices made during the play. The student plays the game by accepting an imaginary job featuring one of the ten values. This value is listed in the first column to the right of the tag (Variety in Game 1). As he "works," he is confronted with situations in which another value competes with the one featured in the job. These values are listed in columns 2-7 (not counting the tag) in the first line and columns 1-3 in the second line with respect to END 2 and INCON2, and in columns 2-3 with respect to END 5 and INCON4. The digits 777 designate empty slots and should be ignored. The student resolves the conflict either by continuing in his job or quitting it.

END 2 records the instances in which the student decided to keep his job; that is, the value featured in the job is deemed to be more important than the competing value. For example, in Game 2, the student preferred Prestige to Security, Independence, Leadership, or Helping Others.

END 5 records the opposite situation: the student quit his job. In Game 2, he abandoned Prestige because his job lacked opportunities for Leisure.

INCON2 (Games 1 & 2) and INCON4 (Game 4) record inconsistencies between choices made in the game and value weights previously assigned. For example, in Game 2 the student preferred Prestige (weighted 4) to Independence (weighted 5); in Game 4 he chose Independence (weighted 5) over High Income (weighted 6). The inconsistency messages are presented merely as information, with no implication that the inconsistency is necessarily undesirable or that the student must reweight his values to conform with his choices in the game.

The purpose of the game is to stimulate thought about values. No scaling is possible, since fewer than the 45 possible pairings actually occur. Taken together, the outcomes of the five games of Student 23 seem consistent with his rather flat profile of value weights.

VL2IN. The initiate returning to VALUES would start here if he elected to bypass the Values Game.

VAL33. The student may play as many games as he wants, provided each value has appeared at least once. When he finally quits, he must reweight his values, this time with the restriction that the sum of the weights equal 40. Student 23 was only 3 over the mark. He reduced High Income, Independence (perhaps because of the inconsistency messages in Games 2 and 4), and

Leadership. The resulting profile is quite flat. Except for Interest Field, the range is from 5 to 3; only two values, High Income and Interest Field, are weighted above the mean.

LC IN. Upon completion of VALUES, the novice may either sign off or go to LOCATE. Student 23 chose LOCATE. If he had signed off at this point, the computer would have restarted him in LOCATE upon his return. It may be noted that Student 23 has spent about 36 minutes at the terminal so far. If he had been scheduled for one hour (actually, he had been scheduled for two), he would not have been pressed for time. (The mean time for novices to get this far is approximately 48 minutes.)

LC IN2. If the student had entered LOCATE as an initiate, he would have bypassed some introductory displays. Timing would have started here.

LOC12A, LOC12. (Exhibit III-1c-d) In LOCATE, the student selects five values as a screen for sifting occupations and specifies a minimum that he will accept for each value. LOC12A is a record of these five values and their specifications. For clarity, in this printout each specification has been bracketed with the value it is associated with. LOC12 is the list of occupations that pass through the screen and hence meet or exceed the specifications. (If no occupations were retrieved, the tag "LOC12B" would appear in the printout. If more than 20 occupations were retrieved, the tag would be "LOC12C." The student would have to loosen or tighten his specifications until he retrieved a manageable list of occupations. Student 23 did not encounter these situations.)

The student is invited to start with the five values to which he assigned the greatest weight, but he is later encouraged to substitute other values. (Student 23 never did this.)

Student 23 began by specifying 4 years of education (the value Early Entry). He next raised the specification to 2-3 years, reducing his list of occupations from 12 to 3. He then kept altering his specification for High Income (his second ranked value by weight), covering almost the entire range of possible specifications and retrieving three new occupations (Machinist, Inhalation Therapist, and Business Machine Serviceman), when the specification was 2 (more than $7000). His use of LOCATE is systematic and consonant with his value weights. He used his two top weighted values (Interest Field and High Income), selecting occupations only from the field of paramount interest (Technological) and experimenting with Income. He set an education level (2-3 years) that fitted his career goals as he perceived them at this time (in an interview he said he wanted to be a draftsman), and he apparently saw no reason to try other values. Perhaps a more sophisticated person would have "fished" for Draftsman to see which specifications were blocking its retrieval. (The reason why Draftsman did not appear is that its rating on Income is 1--less than $7000 per year--and Student 23 never reduced his specification for Income below 2. Draftsman met his specifications with respect to Interest Field, Independence, Early Entry, and Leisure.)[1]

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[1] Student 23 would have retrieved Draftsman if his interaction had occurred four months later. The income rating for Draftsman was raised from 1 to 2 in the annual revision of occupational information.

LC OUT. The novice must go to COMPARE, although he may sign off before doing so. The time Student 23 spent in LOCATE, 11:43, is near the mean of 12:36.

CMP[illegible]OUT. (Exhibit III-1d) In COMPARE the student can ask up to twenty-seven questions about any set of three occupations. The list of questions appears in Figure III-2. For the novice, a restriction is placed on his first set of three: he must select them from the list assembled in LOCATE. For Student 23, this list compiled by the computer now consists of 15 occupations. He chose Science Laboratory Technician, Mechanical Engineering Technician, and Flight Engineer. After his first question, the student may inquire about any occupation in SIGI. Student 23 chose Draftsman in this manner after five questions, and the computer added that occupation to the special list. Thus the student's list of "choice" occupations is augmented whenever he shows an interest in a new occupation. When the list exceeds 40, it is abandoned as being too unwieldy to be of further use.

In the printout, the number of the question asked (as listed in Figure III-2) is in the left hand column, and the three occupations asked about are in succeeding columns. An abbreviated form of the question has been typed in for quick reference. Student 23 asked five questions about his first set of occupations; four of the questions concerned his two highest weighted values, Interest Field and High Income. He then selected another set of three occupations, one of which--Draftsman--had not been retrieved in LOCATE.

DEFINITION AND DESCRIPTION

(11) Definition of occupation?
(12) Description of work activities?
(13) Level of skill in interacting with data, people, things?
(14) Where to get more information?

EDUCATION, TRAINING, OTHER REQUIREMENTS

(15) Formal education beyond high school?
(16) Specific occupational training?
(17) Related college courses?
(18) Personal qualifications?
(19) Other requirements?

INCOME

(20) Beginning salary?
(21) Average income of all people in this occupation?
(22) Top salary possibilities?
(23) How salaries vary?

PERSONAL SATISFACTIONS

(24) Opportunities to help others?
(25) Opportunities for leadership?
(26) What fields of interest?
(27) Prestige level?

CONDITIONS OF WORK

(28) Physical surroundings?
(29) Leisure (hours)?
(30) Independence on the job?
(31) Variety?
(32) Fringe benefits?

OPPORTUNITIES AND OUTLOOK

(33) Employment outlook?
(34) Where are the jobs?
(35) Job security?
(36) Advancement?
(37) How many women?

FIGURE III-2

LIST OF QUESTIONS FOR COMPARE

He continued exploring different occupations until he had asked a total of 18 questions. Of the occupations under consideration, five (Draftsman, Aircraft Mechanic, Surveyor, Meteorologist, and Geographer) were not retrieved in LOCATE.

DES IN. The novice must go from COMPARE to DESIRABILITY, although he may sign off before entering the new system.

INCHAC. (DESIRABILITY was once called "Information Chart"; hence the tag "INCH.") In DESIRABILITY the student compares three occupations at a time to see how well they fit his values. For the novice, the first set of three must come from the choice list, which now contains 20 occupations for Student 23; after that, the student can select any occupation in SIGI.

The occupations in SIGI have been rated in accordance with their capacity to satisfy each of the ten values. This rating is expressed as a number ranging from 1 (low) to 4 (high)--but for Income, the range is 1 to 5. For example, Draftsman carries a rating of 1 on Income (median income less than $7000 per year) and a rating of 3 (more than average) on Prestige. Meteorologist has ratings of 5 (more than $14,000 per year) and 4 (a great amount) on these values. When a student's weight given to a value is multiplied by the occupation's rating on that value and the resulting products for all ten values are summed, the result is a "Desirability Sum" that expresses numerically the relationship between what the student wants and what the occupation offers.

The value weights, occupational ratings, multiplication, and addition are worked out for the student on the screen. (See Figure III-3.) Whenever a rating appears, he may ask to see the basis for it, in which case he would see a display like the answer to a value question in COMPARE. For instance, if Student 23 wanted to know why the ratings on Leisure for Draftsman, Surveyor, and Meteorologist were 3, 2, and 1, he would get the same display he would have seen if he had asked question no. 29 Leisure (hours)?-- (Figure III-2) in COMPARE.

After selecting occupations, the student ranks them in order of preference. The tag INCHAC shows that the order in which Student 23 ranked them did not agree with the rank order by magnitude of Desirability Sum. Meteorologist clearly outranked the other two.

The student must get a printout of the display showing the multiplication and addition which make up the sum so that he can see how the difference came about. (Figure III-3) In this instance, the two highest weighted values cancel each other. Meteorologist, with its high rating on Income, gains 20 points over Draftsman and 10 over Surveyor. But Draftsman is more firmly based in the technological interest field, and the student's high weighting on Interest Field makes Draftsman 14 points higher than Meteorologist or Surveyor with respect to this value. If these were the only occupations of interest, the student might have difficulty in deciding which of his top values to give up.

	VALUE	WT.	OCCUPATION					
			DRFTSM		SURV		METLST	
(1)	INCOME	5	1	5	3	15	5	25
(2)	PRESTIGE	4	3	12	3	12	4	16
(3)	INDEPENDENCE	4	2	8	3	12	3	12
(4)	HELP OTHERS	3	1	3	1	3	2	6
(5)	SECURITY	3	2	6	2	6	3	9
(6)	VARIETY	3	2	6	2	6	3	9
(7)	LEADERSHIP	3	1	3	2	6	2	6
(8)	INTEREST FIELD	7	4	28	2	14	2	14
(9)	LEISURE	4	3	12	2	8	1	4
(10)	EARLY ENTRY	4	4	16	4	16	2	8
		SUM =	99		98		109	

YOUR WEIGHT FOR INCOME 5 X THE RATING OF DRFTSM ON INCOME 1 = 5 ETC.

THE SUM OF THE PRODUCTS APPEARS AT THE BOTTOM OF EACH COLUMN.
THE OCCUPATION WITH THE HIGHEST SUM IS PROBABLY THE ONE THAT WOULD FIT YOUR VALUES BEST. THE HIGHEST POSSIBLE SUM IS 168; THE LOWEST IS 40.
IN GENERAL, A DIFFERENCE OF 10 POINTS OR MORE BETWEEN SUMS IS SIGNIFICANT.

YOU WILL WANT A COPY OF THIS CHART. PRESS PRINT.

FIGURE III-3

DESIRABILITY SUMS AND THE BASIS FOR THEIR CALCULATION

One purpose of DESIRABILITY is to allow the student to assess occupations that were not retrieved in LOCATE and that are consequently unknown quantities with respect to their capacity to satisfy his values. It will be observed that the three occupations which Student 23 selected--Meteorologist, Draftsman, and Surveyor--were in this category. It would have been to the student's advantage to test the Desirability Sums of some of the occupations retrieved in LOCATE and see how they compared with the sums he did see. However, he later returned to DESIRABILITY, and he apparently saw no need to carry his interaction farther in this session.

PRD IN-PRDOUT. (Exhibit III-1e) The novice must go next to PREDICTION, with the option of first signing off. In PREDICTION, the student may ask for a display showing the probabilities that he will obtain a grade of A or B, C, and below C in a curriculum at his college. The derivation of the probability figures is discussed elsewhere in this report. The novice first sees a sequence of displays showing that his probability figures are based on the grades earned by previous students who resembled him with respect to their test scores and rank in their high school class. He then sees as illustrations his probability figures for three curricula: Humanities and Social Science, Data Processing, and Accounting or Nursing. After that the student is free to ask for his probabilities in any curriculum. (See Figure III-4.) The initiate returning to PREDICTION goes directly to the display of curricula.

In the printout, the number to the right of the tag "PREDIC" indicates the number of the curriculum listed in Figure III-4 for which a prediction was sought. All of the curricula sought by Student 23 were in his main field of interest. However, his use of PREDICTION was inefficient. The first request, No. 50 (Technology curricula), included all the curricula numbered in the 50's, so that there was no need to ask for Nos. 51, 52, and 53. He also asked for No. 51 twice in succession. This behavior is hard to explain, especially since it occurred again when this student reentered PREDICTION. Perhaps he was testing the consistency of the system! Or perhaps he just didn't remember and wanted another look. (His printouts were not accessible to him until the end of his session at the terminal.)

PLN IN. The novice must go from PREDICTION to PLANNING, with the option of first signing off.

TERM02. The tag "TERM" indicates that the occupation selected for PLANNING, Draftsman, required less than 4 years of preparation beyond high school. The interaction in PLANNING varies somewhat depending on the amount of education required for entry. In the case of TERM occupations, the student is asked, first, whether or not he is willing to undertake 2 years of education. The "1" in the third column indicates that Student 23 was willing to do so. Column 2, Draftsman, indicates the occupation he selected. As a novice, the student had to select one of the occupations on the choice list of those retrieved in LOCATE or asked about in COMPARE and DESIRABILITY. Although Draftsman had not

Press the number of the program for which you want a prediction. If you want predictions for all the programs in a group, press the number (ending in Ø) for that group. (Example: press 11 to get accounting. Or press 1Ø to get all six programs listed under business.)

(1Ø) Business
11 Accounting
12 Business Administr.
13 Marketing
14 General Business
15 Secretarial Science
16 Data Processing

(2Ø) Health & Human Serv.
21 Laboratory Technology
22 Nursing
*23 Dental Assisting
*24 Library Tech. Asst.
*25 Community Serv. Asst.
*26 Education Assistant

(3Ø) Developmental
31 General Studies

(4Ø) Liberal Arts and Science
41 Humanities & Social Sci.
42 Engineering Sci., Mathematics, Physics, Chemistry
43 Biology

(5Ø) Technology
51 Architectural Tech., Civil Eng. Technology, Electro-Mech. Eng. Tech, Electric Power Tech., Mechanical Eng. Tech.
52 Drafting & Design Tech.
53 Electric Eng. Tech., Electronics Tech.

(6Ø) Fine/Applied Arts
61 Architecture
62 Fine Arts, Advertising Design
63 Communications Media

(7Ø) Agriculture
71 Ornamental Horticulture

*(8Ø) New Programs
*81 Aviation Instr.
*82 Aviation Electronics
*83 Flight Technology
*84 Industrial Supervsn.
*85 Law Enforcement
*86 Government Aide

*NO PREDICTION AVAILABLE

FIGURE III-4

DISPLAY SHOWING MCCC CURRICULA. PREDICTIONS ARE AVAILABLE FOR ANY CURRICULUM NOT PRECEDED BY AN ASTERISK.

been retrieved in LOCATE, the student had asked eleven questions about it in COMPARE and had measured it against his values in DESIRABILITY.

PRPLTE. Having signified his willingness to undertake the required education, the student is asked about his ability to pass the college courses involved. He is shown the display that he would see in COMPARE if he asked question No. 17, "Related college courses?" (Figure III-2). The "1" in column 3 shows that this student thought he could get the necessary grades.

PRPL04. The student can test his estimate of his ability against his probability of getting a GPA of C or better. This student asked to see the probabilities. The computer displays the probabilities for the curriculum (or, if more than one, for each curriculum) that is appropriate for the selected occupation. These are the same figures that the student may have seen in PREDICTION if, like Student 23, he happened to call for the curriculum appropriate for his occupation.

PRPL11. The student may also call for the probability of succeeding in the key courses associated with the curricula appropriate for his occupation. This information is not available in PREDICTION. If the occupation selected requires postgraduate work, the key course prediction gives the probability of obtaining a grade of B or better. Since Draftsman is not in that category, this student saw the probability of getting C or better in MA 109, Technical Math.

BACH24. After seeing the probability figures, the student may change his mind about his ability. If he does so, or if his original estimate was that he lacked sufficient ability, he would interact with a sequence of displays discussing the risks and rewards of undertaking a trial semester in the selected curriculum as opposed to switching to an easier curriculum. Student 23 did not change his estimate of ability and therefore bypassed that sequence.

CURR4M. This tag identifies an occupation to which entry can be gained by more than one curriculum--in this case, Drafting and Design Technology or Architectural Technology. If only one curriculum will serve, the tag is "CURR4S." Student 23 chose Drafting and Design Technology.

The selection of curriculum is followed by a sequence showing the high school prerequisites for the program, the program itself as it appears in the college catalog (the elective slots filled, where appropriate, with courses required for the selected occupation), and, as necessary, a list of nearby four-year colleges where the student can complete his preparation. If the local community college did not offer a program leading to the selected occupation, this sequence would be replaced by a display listing nearby institutions that did offer it.

CURR07. The student's continued interest in Draftsman leads to the interaction that follows in the printout. If he had signified no interest

in the program, he would have skipped to CURR35 (in the case of Draftsman) or would have exited from PLANNING if his occupation was served by only one curriculum.

CURR10. (Exhibit III-1f) The student is asked whether he has taken the high school prerequisites for his program. Stress is placed on this matter because counselors at Mercer County Community College had expressed concern about the number of unqualified students that were gaining admission to some courses, creating a serious problem. If the student answers frame CURR10 with a "no" or "not sure," he sees a special display emphasizing the importance of discussing his status with a counselor.

CURR21. The student may request a series of displays outlining the major sources of financial aid, Federal, State, and local.

CURR35. If more than one curriculum may lead to an occupation, the student is invited to see the alternatives. Student 23 accepted the invitation.

CURR4M. For Draftsman, the alternative curriculum is Architectural Technology.

CURR07. Having seen the program for Architectural Technology, the student decides he is not interested in it. He therefore exits from PLANNING.

Behavior as an Initiate

At this point the student becomes an initiate. After completing any system, he is free to go to any other system or to sign off.

Student 23 chose to sign off, returning later. He has completed the novice course in one session--an unusual but not rare event. His time is about one hour and 48 minutes, considerably faster than the mean time of all students, which is almost exactly two hours. From this point on he has complete control of SIGI, both between systems and within any system. He returned after an absence of one week.

PRD IN-PRDOUT. (Exhibit III-1g) Student 23 went back to PREDICTION. Again, his first two choices are inefficient, since Prediction No. 51 is included in Prediction 50. However, he is apparently enlarging his horizons, for he asks for two predictions (Engineering Science and Architecture) that imply professional occupations. It may be remembered that in his first interaction with LOCATE, the student was presented with several professional occupations that met his values and specifications--Mechanical Engineer, Chemical Engineer, Civil Engineer, and Industrial Engineer. He had asked for a printout of the list, and one may speculate that he had been thinking about it off line.

VG IN-VL2OUT. (Exhibit III-1g-h) From PREDICTION the student chooses to return to VALUES. As an initiate, he bypasses the interaction of weighting the values separately. He is given the option of playing the Values Game

again or of bypassing that, too. The student chose to play the game. Independence seems to be an important value to him--it succumbed only to Income in the first game of this series, but was more important than Income in the second. However, Student 23 did not change its weight in his final adjustment (VAL33). He raised Income and Variety one point, and lowered Interest Field two points. The inconsistency message in the first game evidently had a powerful effect on him. Moreover, he seems to be moving away from a commitment exclusively to the technological field. Consequently, he may have decided that Interest Field was not so important to him as he had first thought.

LC IN2-LC OUT. (Exhibit III-1h) The student returns to LOCATE with the same five values as in his first session, but with Income set at $12,000 and Early Entry (i.e., education) set at 4 years. He raises Early Entry, and loses all the occupations except Flight Engineer, and then lowers Early Entry (returning to his original specifications) and, of course, replicates his first list. Again, his behavior suggests a movement toward professional occupations.

CMP IN-CMPOUT. (Exhibit III-1i) The student goes to COMPARE--he is retracing the novice path. This time he includes a professional occupation--Civil Engineer--and compares it with two technician ones. Civil Engineer and Mechanical Engineering Technician had been retrieved when the student was in LOCATE as a novice. Surveyor had never been retrieved in LOCATE, but the student had asked about it earlier in COMPARE.

DES IN-DE OUT. The student continues his interest in Civil Engineer. The tag "INCHAA" indicates that the student ranked these three occupations in the same order as they are ranked by sum.

PRD IN-PRDOUT. (Exhibit III-1i-j) He again checks out his probabilities in the technology curricula. His behavior shows the same inefficiency as before--he asks for Prediction No. 51 twice, even though he had already obtained the prediction when he asked for No. 50.

PLN IN-PLNOUT. He returns to PLANNING, this time with a professional occupation, Civil Engineer. However, he is undecided about pursuing this occupation (CURR07), and he has the disadvantage of lacking some of the high school prerequisites for the Engineering Science curriculum (CURR4S).

STG IN. The student now goes to STRATEGY. This system combines features of DESIRABILITY and PREDICTION in that the Desirability Sum for an occupation is multiplied by the probability of success (earning C or better) in the curriculum prescribed for that occupation. The result is an index that combines desirability and feasibility.

STRA 1. (Exhibit III-1k) The student chooses three occupations. He selected the same occupations he compared in DESIRABILITY.

STRA 2. The student is asked which of the three occupations he would enter at the present moment. Student 23 chose Civil Engineer. He may have made this choice because he had seen the three Desirability Sums a few moments earlier, or because he is continuing his movement toward a professional occupation.

STRA 6-STRA 8. The probability of Student 23's earning a C or better in Engineering Science, the curriculum recommended for Civil Engineer, is .55. (The "1" in the second column after "STRA 6" means that the probability figure in the first column is associated with the first of the three occupations selected.) The Desirability Sum for Civil Engineer (143) times this probability figure yields a product of 78.65. Decimal points are omitted for convenience.

STRA 5. If more than one curriculum can lead to an occupation, as is true of Draftsman, the student names the curriculum he intends to follow. He chose Drafting and Design Technology over Architectural Technology.

STRA 8. Having seen the indexes for the three occupations, the student again names the occupation he would like to enter at the present time. Civil Engineer is a logical choice, since that occupation has the highest Desirability Sum, the highest Index, and a reasonably hopeful probability (.55 as compared to .65 for the two technical occupations).

STRA 1-STGOUT. (Exhibit III-1k-1) The student goes through STRATEGY again, this time with Civil Engineer, Industrial Designer, and Flight Engineer. Again Civil Engineer is his first choice both before and after the interaction, and again it has the highest Index. It may be noted that the tag "STRA 4" opposite Flight Engineer indicates that the associated probability is the student's estimate. Estimates are necessary for curricula for which insufficient data exist at the local college for the calculation of regression equations.

CMP IN-CMPOUT. (Exhibit III-1ℓ) The student returns to COMPARE and continues his explorations. The appearance of Photographer is somewhat surprising. The occupation fits in well with the student's interest in drafting and design, but it had not appeared previously in any interaction. Perhaps Student 23 selected it merely as a third occupation to make up the number required for COMPARE. His main interest still seems to lie between his original choice, Draftsman, and the new possibility, Civil Engineer.

STG IN-STGOUT. (Exhibit III-1ℓ-n) He returns to STRATEGY, first comparing three technician occupations, and then comparing two professional occupations with the technician occupation that got the highest index in the first group. When he sees the Indexes, he switches his choice from Mechanical Engineering Technician to Industrial Engineer.

CMP IN-CMPOUT. (Exhibit III-1n) He returns to COMPARE to inquire about this new occupation of interest. Although Industrial Engineer had appeared on the very first list of occupations retrieved in LOCATE, the student had never explored it before. However, it was included in the list of choice occupations, and the student saw it there every time he entered COMPARE, DESIRABILITY, PLANNING, or STRATEGY. All three occupations now under consideration were retrieved in the first interaction in LOCATE.

PRD IN-PRDOUT. The student goes to PREDICTION to see his probabilities with respect to Engineering Science, the curriculum he would enroll in to prepare to become an Industrial Engineer.

PLN IN-PLNOUT. (Exhibit III-1o) The student is still unwilling to commit himself. He asks about General Studies, a one-year program designed to allow students to sample from several curricula before declaring a major. However, he rejects the program.

PLN IN-PLNOUT. (Exhibit III-1o-p) Now he sees plans for Industrial Engineer. He is not sure about committing himself to the plan, perhaps because he has not taken all the high school prerequisites.

STG IN. (Exhibit III-1p) He returns to STRATEGY, this time selecting Industrial Engineer, Industrial Designer, and Electronics Technician. He is asked whether or not he wants to see his values weights. This option is open to everyone entering STRATEGY, since Desirability Sums depend on the weights and the student may have revised his insights since he was last in VALUES. Student 23 had not exercised this option before. Now he does so, but does not alter his weights. Unfortunately, the last portion of his record was lost owing to errors in transmission in the telephone line to Mercer College. If his record had been complete, it would have shown an Index of 6955 for Industrial Designer and an Index of 8400 for Electronics Technician owing to a high probability of .80. We do not know whether this information would have influenced his final choice of occupation, Industrial Engineer.

Student 23 spent three hours and twelve minutes on SIGI, not counting his last interaction in STRATEGY. This is a little more than the mean of two hours and fifty-eight minutes. Since he went through the system as a

novice faster than the average student, his difference in total time must be due to the amount of interaction he engaged in as an initiate.

Conclusion

In a post-SIGI interview, Student 23 said that he had been most pleased with SIGI. He had changed his mind about his original choice of occupation, Draftsman, and was about to change his major to Engineering Science in order to become an Industrial Engineer. That occupation would provide him with the opportunity to do drafting, an activity that he enjoyed, while it provided a better match with his values, particularly Independence and Variety.

EXHIBIT III-1a

09-FAT-75 12:53:21

023

INT IN	10:56:17							
INTFO	1 STATUS: About to enter	1 AGE: 15-22	1 SEX: Male	2 General idea of his values	2 Knows a few occupations	2 Can predict 1+ program	2 General idea of occupational plans	
INTOUT	11:00:15 Time in INTRODUCTION: 4:06							
VL1IN	11:00:20 Sent to VALUES							
VAL22	2 Selects technological interest field							
VAL26 Weights assigned one at a time	6 Income 7 Interest Field	4 Prestige 4 Leisure	5 Independence 4 Early Entry	3 Helping	3 Security	3 Variety	4 Leadership	
VL1OUT	11:11:54							
VG IN	11:12:35							
END 2	5 Variety> 777	6 Leadership 777	777	777	777	777	777	
END 5 Game 1	5 Variety <	7 Interest Field 777						
INCON2	5 Variety 777	6 Leadership 777	Weighted higher: 777	777	777	777	777	
END 2	1 Prestige > 777	4 Security 777	2 Independence 777	6 Leadership	3 Helping	777	777	
END 5 Game 2	1 Prestige <	6 Leisure 777						
INCON2	1 Prestige 777	2 Independence 777	Weighted higher: 777	777	777	777	777	

EXHIBIT III-1b

```
END 2          2 Independence >  5 Leisure      4 Security     9 Early Entry  777  777  777
               777               777            777
               Game 3
END 5          2 Independence <  8 Income       777

END 2          8 Income >        8 Leisure      1 Prestige     3 Helping      777  777  777
               777               777            777
               Game 4
END 5          8 Income <        2 Independence 777
               Weighted lower:
INCON4         8 Income          2 Independence 777

END 2          2                 777            777            777  777  777  777  777
               777               777            777
               Game 5
END 5          2 Independence <  8 Income       777

VGOUT1         11:25:07  Time in Values Game: 12:32

VL2IN          11:25:07

VAL31 Weights (Adjusted  6 Income          4 Prestige     5 Independence  3 Helping  3 Security  3 Variety  4 Leadership
      before game)       7 Interest Field  4 Leisure      4 Early Entry

VAL33 Weights (adjusted  9 Income          4 Prestige     4 Independence  3 Helping  3 Security  3 Variety  3 Leadership
      to 40 points)      7 Interest Field  4 Leisure      4 Early Entry

VL2OUT         11:32:25  Time in VALUES: 32:05

LC IN          11:32:34  Sent to LOCATE

LC IN2         11:33:38
```

EXHIBIT III-1c

LOC 12A	2 Technological 10 Early Entry	6 Interest Field 3 Average	3 $9000+ 9 Leisure	1 Income	2 Average	3 Independence	2 4 years
LOC 12	INDUSTRIAL DESIGNER MECH. ENGINEERING TECHNICIAN PHYSICAL THERAPIST MECHANICAL ENGINEER		PILOT ELECTRONICS TECHNICIAN CHEMICAL ENGINEER CIVIL ENGINEER		FLIGHT ENGINEER SCIENCE LABORATORY TECHNICIAN ELECTRICAL ENGINEER INDUSTRIAL ENGINEER		
LOC 12A	2 10 Early Entry	6 3	3 9	1	2	3	3 2-3 years
LOC 12	FLIGHT ENGINEER SCIENCE LABORATORY TECHNICIAN		MECH. ENGINEERING TECHNICIAN		ELECTRONICS TECHNICIAN		
LOC 12A	2 10	6 3	4 9	$12000+ 1 Income	2	3	3
LOC 12	FLIGHT ENGINEER						
LOC 12A	2 10	6 3	5 9	$14000+ 1 Income	2	3	3
LOC 12	FLIGHT ENGINEER						
LOC 12A	2 10	6 3	2 9	$7000+ 1 Income	2	3	3
LOC 12	MACHINIST ELECTRONICS TECHNICIAN INHALATION THERAPIST		FLIGHT ENGINEER BUSINESS MACHINE SERVICEMAN		MECH. ENGINEERING TECHNICIAN SCIENCE LABORATORY TECHNICIAN		
LOC 12A	2 10	6 3	3 9	$9000+ 1 Income	2	3	3

EXHIBIT III-1d

LOC*2	FLIGHT ENGINEER SCIENCE LABORATORY TECHNICIAN	MECH. ENGINEERING TECHNICIAN	ELECTRONICS TECHNICIAN
LC OUT	11:44:17 Time in LOCATE: 11:43		
LC OUT	11:44:17		
CMP IN	11:44:25 Sent to COMPARE		
COMP11 Definition	SCIENCE LABORATORY TECHNICIAN	MECH. ENGINEERING TECHNICIAN	FLIGHT ENGINEER
COMP20 Beg. Salary	SCIENCE LABORATORY TECHNICIAN	MECH. ENGINEERING TECHNICIAN	FLIGHT ENGINEER
COMP21 Ave. Income	SCIENCE LABORATORY TECHNICIAN	MECH. ENGINEERING TECHNICIAN	FLIGHT ENGINEER
COMP22 Top Salary	SCIENCE LABORATORY TECHNICIAN	MECH. ENGINEERING TECHNICIAN	FLIGHT ENGINEER
COMP26 Int. Fields	SCIENCE LABORATORY TECHNICIAN	MECH. ENGINEERING TECHNICIAN	FLIGHT ENGINEER
COMP11 Definition	DRAFTSMAN	MECH. ENGINEERING TECHNICIAN	ELECTRONICS TECHNICIAN
COMP11 Definition	DRAFTSMAN	PILOT	AIRCRAFT MECHANIC
COMP20 Beg. Salary	DRAFTSMAN	PILOT	AIRCRAFT MECHANIC
COMP21 Ave. Income	DRAFTSMAN	PILOT	AIRCRAFT MECHANIC
COMP22 Top Salary	DRAFTSMAN	PILOT	AIRCRAFT MECHANIC
COMP26 Int. Fields	DRAFTSMAN	PILOT	AIRCRAFT MECHANIC
COMP18 Pers. Quals.	DRAFTSMAN	PILOT	AIRCRAFT MECHANIC
COMP15 Education	DRAFTSMAN	PILOT	AIRCRAFT MECHANIC
COMP20 Beg. Salary	DRAFTSMAN	AIRCRAFT MECHANIC	SURVEYOR
COMP21 Ave. Income	DRAFTSMAN	AIRCRAFT MECHANIC	SURVEYOR
COMP22 Top Salary	DRAFTSMAN	AIRCRAFT MECHANIC	SURVEYOR
COMP20 Beg. Salary	SURVEYOR	METEOROLOGIST	GEOGRAPHER
COMP15 Education	SURVEYOR	METEOROLOGIST	GEOGRAPHER
CMP OUT	12:06:45 Time in COMPARE: 22:20		
DES IN	12:06:52 Sent to DESIRABILITY		
INCHAC Occupations	METEOROLOGIST	DRAFTSMAN	SURVEYOR
Sums	109	99	98

(Student's first-choice occupation did not receive highest sum.)

DE OUT 12:16:18 Time in DESIRABILITY: 9:26

EXHIBIT III-1e

PRD IN	12:46:42 Sent to PREDICTION	
PREDIC	58 Technology curricula	
PREDIC	52 Drafting & Design Technology	
PREDIC	51 Architectural Tech., Civil Eng. Tech., Electromech. Eng. Tech., Electric Power Tech., Mech. Eng. Tech.	
PREDIC	51 Same as previous	
PREDIC	53 Electric Eng. Tech., Electronics Tech.	
PRDOUT	12:28:56 Time in PREDICTION: 12:17	
PLN IN	12:29:33 Sent to PLANNING	
TERM 82	DRAFTSMAN Occupation selected	1 Willing to undertake education
PRPLTE	DRAFTSMAN	1 Confident of ability to get at least C average
PRPL34	1 Wants to see GPA prediction	
PRPL11	1 Wants to see key course prediction	
EACH24	2 Does not change estimate of ability	
CURR31	DRAFTSMAN Sees programs for this occupation	
CURC4M	1 Selects Drafting & Design Technology curriculum	
CURP37	1 Wishes to pursue this program	

EXHIBIT III-1f

```
CURR13          1 Has taken high school prerequisites

CURR21          1 Wants to see financial aid displays

CURR3?          1 Asks to see alternative curriculum for Draftsman

CURR4M          2 Selects Architectural Technology curriculum


CURR07          2 Does not wish to pursue this program

PLNOUT     12:44:12 Time in PLANNING: 14:39
                    (Student is now released from novice status)
```

EXHIBIT III-1g

16-MAY-73 12:43:55

323

INT IN 12:46:04

PRD IN 12:46:45 Goes to PREDICTION

PREDIC 5: Architectural Tech., Civil Eng. Tech., Electromech. Eng. Tech., Electric Power Tech., Mech. Eng. Tech.

PREDIC 3: Technology curricula

PREDIC 4: Engineering Science, Math., Physics, Chemistry

PREDIC 6: Architecture

PRDOUT 12:52:14 Time in PREDICTION: 5:23

VG IN 12:52:47 Goes to VALUES

END 2		2 Independence >	1 Prestige	3 Helping	4 Security	5 Variety	6 Leadership	7 Interest Fd		
		8 Leisure	9 Early Entry	777						
END 5	Game 1	2 Independence <	0 Income	777						
			Weighted higher:							
INCON2		2 Independence	7 Interest Field	777	777	777	777	777		
		777	777	777						
END 2		0 Income >	1 Prestige	777	777	777	777	777		
		777	777	777						
END 5	Game 2	0 Income <	2 Independence	777						
			Weighted lower:							
INCON4		0 Income	2 Independence	777						

VGOUT1 12:59:22 Time in Values Game: 6:39

EXHIBIT III-1h

VL2IN 12:59:22

VAL31 Weights (before game)	5 Income 7	4 Prestige 4 Interest Field	4 Independence 4 Leisure	3 Helping Early Entry	3 Security	3 Variety	3 Leadership
VAL33 Weights (readjusted)	6 Income 5 Interest Field	4 Prestige 4 Leisure	4 Independence 4 Early Entry	3 Helping	3 Security	4 Variety	3 Leadership

VL2OUT 13:04:38 Time in VALUES: 11:47

LC IN2 13:04:48 Goes to LOCATE

LOC12A	4 $12000+ 10 Early Entry	1 Income 3 Average	2 Technological 9 Leisure	6 Interest Field	2 Average	3 Independence	2 4 years
LOC12	PILOT ELECTRICAL ENGINEER INDUSTRIAL ENGINEER		FLIGHT ENGINEER MECHANICAL ENGINEER		CHEMICAL ENGINEER CIVIL ENGINEER		
LOC12A	4 10 Early Entry	1 3	2 9	6	2	3	3 2 3 years
LOC12	FLIGHT ENGINEER						
LOC12A	4 10 Early Entry	1 3	2 9	6	2	3	2 4 years
LOC12	PILOT ELECTRICAL ENGINEER INDUSTRIAL ENGINEER		FLIGHT ENGINEER MECHANICAL ENGINEER		CHEMICAL ENGINEER CIVIL ENGINEER		

LC OUT 13:08:37 Time in LOCATE: 3:57

EXHIBIT III-11

LC OUT 13:28:37

CMP IN 13:28:52 Goes to COMPARE

COMP23 Beg. Salary	CIVIL ENGINEER	MECH. ENGINEERING TECHNICIAN	SURVEYOR
COMP21 Ave. Income	CIVIL ENGINEER	MECH. ENGINEERING TECHNICIAN	SURVEYOR
COMP21 Ave. Income	CIVIL ENGINEER	MECH. ENGINEERING TECHNICIAN	SURVEYOR
COMP22 Top Salary	CIVIL ENGINEER	MECH. ENGINEERING TECHNICIAN	SURVEYOR
COMP23 Salary vari	CIVIL ENGINEER	MECH. ENGINEERING TECHNICIAN	SURVEYOR
COMP28 Environment	CIVIL ENGINEER	MECH. ENGINEERING TECHNICIAN	SURVEYOR
COMP15 Education	CIVIL ENGINEER	MECH. ENGINEERING TECHNICIAN	SURVEYOR
COMP33 Outlook	CIVIL ENGINEER	MECH. ENGINEERING TECHNICIAN	SURVEYOR
COMP19 Other reqs.	CIVIL ENGINEER	MECH. ENGINEERING TECHNICIAN	SURVEYOR
COMP13 Pers. quals	CIVIL ENGINEER	MECH. ENGINEERING TECHNICIAN	SURVEYOR
COMP34 Where jobs	CIVIL ENGINEER	MECH. ENGINEERING TECHNICIAN	SURVEYOR
COMP14 Where info.	CIVIL ENGINEER	MECH. ENGINEERING TECHNICIAN	SURVEYOR
COMP12 Description	CIVIL ENGINEER	MECH. ENGINEERING TECHNICIAN	SURVEYOR
COMP32 Benefits	CIVIL ENGINEER	MECH. ENGINEERING TECHNICIAN	SURVEYOR
COMP16 Pers. Quals	CIVIL ENGINEER	MECH. ENGINEERING TECHNICIAN	SURVEYOR
COMP16 Occ. train.	CIVIL ENGINEER	MECH. ENGINEERING TECHNICIAN	SURVEYOR
COMP29 Leisure	CIVIL ENGINEER	MECH. ENGINEERING TECHNICIAN	SURVEYOR
COMP12 Description	CIVIL ENGINEER	MECH. ENGINEERING TECHNICIAN	SURVEYOR

CMP OUT 13:28:?? Time in COMPARE: 19:08

DES IN 13:28:?? Goes to DESIRABILITY

INCHAA Occupations	CIVIL ENGINEER	MECH. ENGINEERING TECHNICIAN	DRAFTSMAN
Sums	142	135	94

(Rank order agrees with student's preference.)

DE OUT 13:34:?? Time in DESIRABILITY: 6:10

PRD IN 13:34:48 Goes to PREDICTION

PREDIC 53 Technology curricula

PREDIC 51 Architectural tech., Civil Eng. Tech., Electromech. Eng. Tech., Electric Power Tech., Mech. Eng. Tech.

EXHIBIT III-1j

PREDIC	51 Same as previous	
PRDOUT	13:28:12 Time in PREDICTION: 3:24	
PLN IN	13:28:33 Goes to PLANNING	
BACH32	CIVIL ENGINEER Occupation selected	1 Willing to undertake education
PRPLBA	CIVIL ENGINEER	1 Confident of ability to get at least a C average
PRPL34	1 Wants to see GPA prediction	
PRPL11	1 Wants to see key course prediction	
BACH24	2 Does not change estimate of ability	
CURR01	CIVIL ENGINEER Sees program for this occupation	
CURR45	1 Engineering Science curriculum	
CURF07	3 Uncertain about pursuing this occupation	
CURF13	2 Has not taken all high school prerequisites	
CURF21	1 Wants to see financial aid displays	
PLNOUT	13:50:37 Time in PLANNING: 12:00	
STG IN	13:50:56 Goes to STRATEGY	

EXHIBIT III-1k

STRA 1	Occupations selected	CIVIL ENGINEER	MECH. ENGINEERING TECHNICIAN	DRAFTSMAN	
STRA 2		1 First choice: Civil Engineer			
STRA 3	Desirab. sums	Civ. Eng. 143	Mech. Eng. Tech. 125	Draftsman 94	
STRA 6	Probability	55	1 Civil Engineer		
STRA 7	Index	7865	1 Civil Engineer		
STRA 6	Probability	65	2 Mech. Engineering Technician		
STRA 7	Index	6625	2 Mech. Engineering Technician		
STRA 5	Draft & Design Tech. curric.	1	3 Draftsman		
STRA 6	Probability	65	3 Draftsman		
STRA 7	Index	6413	3 Draftsman		
STRA 8		1 First choice: Civil Engineer			

STRA 1	Occupations selected	CIVIL ENGINEER	INDUSTRIAL DESIGNER	FLIGHT ENGINEER
STRA 2		1 First choice: Civil Engineer		
STRA 3	Desirab. sums	Civ. Eng. 143	Indust. Des. 107	Flt. Eng. 26
STRA 6	Probability	55	1 Civil Engineer	
STRA 7	Index	7865	1 Civil Engineer	

EXHIBIT III-1b

```
STRA 6    Probability 65              2 Industrial Designer

STRA 7    Index       6955           2 Industrial Designer

STRA 4    Estimated   55             3 Flight Engineer
          Probability

STRA 7    Index       6938           3 Flight Engineer


STRA 5                                1 First choice: Civil Engineer

STROUT              13:57:37 Time in STRATEGY: 6:41

CMP IN              13:58:07 Goes to COMPARE

COMP21 Ave. Income  CIVIL ENGINEER      MECH. ENGINEERING TECHNICIAN   DRAFTSMAN
COMP22 Top salary   CIVIL ENGINEER      MECH. ENGINEERING TECHNICIAN   DRAFTSMAN
COMP20 Beg. salary  CIVIL ENGINEER      DRAFTSMAN                      PHOTOGRAPHER
COMP21 Ave. Income  CIVIL ENGINEER      DRAFTSMAN                      PHOTOGRAPHER
COMP22 Top salary   CIVIL ENGINEER      DRAFTSMAN                      PHOTOGRAPHER
COMP23 Salary vari. CIVIL ENGINEER      DRAFTSMAN                      PHOTOGRAPHER
COMP31 Variety      CIVIL ENGINEER      DRAFTSMAN                      PHOTOGRAPHER
COMP30 Independence CIVIL ENGINEER      DRAFTSMAN                      PHOTOGRAPHER
COMP17 Coll. courses CIVIL ENGINEER     DRAFTSMAN                      PHOTOGRAPHER
COMP13 Interaction  CIVIL ENGINEER      DRAFTSMAN                      PHOTOGRAPHER
COMP16 Pers. quals. CIVIL ENGINEER      DRAFTSMAN                      PHOTOGRAPHER
COMP27 Prestige     CIVIL ENGINEER      DRAFTSMAN                      PHOTOGRAPHER
COMP28 Environment  CIVIL ENGINEER      DRAFTSMAN                      PHOTOGRAPHER
COMP36 Advancement  CIVIL ENGINEER      DRAFTSMAN                      PHOTOGRAPHER
COMP33 Outlook      CIVIL ENGINEER      DRAFTSMAN                      PHOTOGRAPHER
COMP19 Other reqs.  CIVIL ENGINEER      DRAFTSMAN                      PHOTOGRAPHER
COMP29 Leisure      CIVIL ENGINEER      DRAFTSMAN                      PHOTOGRAPHER
CMPOUT              14:10:51 Time in COMPARE: 12:44

STG IN              14:11:16 Goes to STRATEGY
```

EXHIBIT III-1m

STRA 1 Occupations selected: DRAFTSMAN | SURVEYOR | MECH. ENGINEERING TECHNICIAN

STRA 2: 1 First choice: Draftsman

STRA 3		Draftsman	Surveyor	Mech. Eng. Tech.
	Desirab. sums	94	99	135
STRA 5	Draft & Design Technology	1	1	Curriculum selected for Draftsman
STRA 6	Probability	65	1	Draftsman
STRA 7	Index	6410	1	Draftsman
STRA 6	Probability	65	2	Surveyor
STRA 7	Index	6435	2	Surveyor
STRA 6	Probability	65	3	Mech. Engineering Technician
STRA 7	Index	6425	3	Mech. Engineering Technician

STRA 8: 3 First choice: Mech. Engineering Technician

STRA 1 Occupations selected: MECH. ENGINEERING TECHNICIAN | INDUSTRIAL DESIGNER | INDUSTRIAL ENGINEER

STRA 2: 1 First choice: Mech. Engineering Technician

STRA 3		Mech. Eng. Tech.	Indust. Des.	Indust. Eng.
	Desirab.	135	107	134
STRA 6	Probability	65	1	Mech. Engineering Technician

EXHIBIT III-1n

```
STRA  7Index          6825          1 Mech. Engineering Technician

STRA  6Probability      65          2 Industrial Designer

STRA  7Index          6955          2 Industrial Designer

STRA  6Probability      55          3 Industrial Engineer

STRA  7Index          7370          3 Industrial Engineer

STRA  6                 3 First choice: Industrial Engineer

STROUT            14:15:42 Time in STRATEGY: 4:26

CMP IN            14:15:52 Goes to COMPARE

COMP20 Beg. salary INDUSTRIAL ENGINEER          MECH. ENGINEERING TECHNICIAN    SCIENCE LABORATORY TECHNICIAN
COMP21 Ave. income INDUSTRIAL ENGINEER          MECH. ENGINEERING TECHNICIAN    SCIENCE LABORATORY TECHNICIAN
COMP22 Top salary  INDUSTRIAL ENGINEER          MECH. ENGINEERING TECHNICIAN    SCIENCE LABORATORY TECHNICIAN
COMP15 Education   INDUSTRIAL ENGINEER          MECH. ENGINEERING TECHNICIAN    SCIENCE LABORATORY TECHNICIAN
COMP12 Description INDUSTRIAL ENGINEER          MECH. ENGINEERING TECHNICIAN    SCIENCE LABORATORY TECHNICIAN
COMP12 Description INDUSTRIAL ENGINEER          MECH. ENGINEERING TECHNICIAN    SCIENCE LABORATORY TECHNICIAN
COMP21 Ave. income INDUSTRIAL ENGINEER          MECH. ENGINEERING TECHNICIAN    SCIENCE LABORATORY TECHNICIAN
CMPOUT            14:21:45 Time in COMPARE: 5:53

PRD IN            14:22:08 Goes to PREDICTION

PREDIC              42 Engineering Science, Math., Physics, Chemistry

PROOUT            14:23:24 Time in PREDICTION: 1:16
```

EXHIBIT III-1o

PLN IN	14:23:44 Goes to PLANNING		
GEN#04	2 Declines to see GPA prediction for General Studies		
GEN#07	1 Wants to see program for General Studies		
CURR01	GENERAL STUDIES Sees program for this curriculum		
CURR4S	1 General Studies curriculum		
CURR07	2 Does not want to pursue this program		
PLNOUT	14:27:01 Time in PLANNING: 3:17		
PLN IN	14:27:23 Goes to PLANNING		
BACH02	INDUSTRIAL ENGINEER Occupation selected	1 Willing to undertake education	
PRPL0A	INDUSTRIAL ENGINEER	1 Confident of ability to get at least C average	
PRPI04	1 Wants to see GPA prediction		
PRPL11	1 Wants to see key course prediction		
BACH24	2 Does not change estimate of ability		
CURR01	INDUSTRIAL ENGINEER Sees program for this occupation		
CURR4S	1 Engineering Science curriculum		
CURR07	3 Uncertain about pursuing this occupation		
CURR13	2 Has not taken all high school prerequisites		

EXHIBIT III-1p

CURR21	2 Does not see financial aid displays								
PLNOUT	14:34:18 Time in PLANNING: 6:47								
STG IN	14:35:09 Goes to STRATEGY								
VAL21	Sees value weightings	6 Income 5 Interest Field	4 Prestige 4 Leisure	4 Independence 4 Early Entry	3 Helping	3 Security	4 Variety	3 Leadership	
VAL23	Same--does not readjust	6 5	4 4	4 4	3	3	4	3	
STRA 1	Occupations selected	INDUSTRIAL ENGINEER		INDUSTRIAL DESIGNER		ELECTRONICS TECHNICIAN			
STRA 2	2 First choice: Industrial Designer								
STRA 3	Desirab. sums.	Indust. Eng. 134	Indust. Des. 107	Electronics Tech. 105					
STRA 6	Probability	55	1 Industrial Engineer						
STRA 7	Index	7370	1 Industrial Engineer						
STRA 6	Probability	65	2 Industrial Designer						
STRA 7	Index								

(Lost synchronization with remote terminal--record incomplete)

CHAPTER IV

VARIABILITY IN STUDENT BEHAVIOR

In the previous chapter, it was noted that the path selected by Student 23 for his journey through SIGI was in many ways unique. Reference was made to the fact that the variability displayed by the students made it difficult to identify a behavior that could be called "typical." By design, SIGI is open to much variability in the way it is used. There are two main ways in which the student can interact in a highly personal manner: first, in the amount of use he makes of any system once he has entered it, and second, in the path he chooses in going from system to system as he collects information as an initiate. Students have apparently taken advantage of both opportunities to be distinctive.

Unfortunately, the size of our sample was too small to allow as much statistical analysis as we would have liked. It would be interesting to know, for instance, whether the students' behaviors cluster in identifiable patterns, to see if significant correlations exist between the amount of student control over the system and the degree of occupational maturity shown by the student, or to discover whether a student's condition at entry with respect to his knowledge of values, occupations, and plans affects the manner in which he uses the system.

But we did not have a large sample. Consequently, many of the conclusions that follow are based on the printouts of individual students, observations at our slave terminal of students' interaction on their terminal at Mercer College, and interviews with students themselves.

System Usage

Table IV-1 shows the mean amount of time spent within each system and the standard deviations under the novice and the novice-plus-initiate conditions. The total time and the novice time are equal for INTRODUCTION and the Initial Weighting of Values, since the student encounters these sections only as a novice. Also, because the student loses his novice status upon

TABLE IV-1

TIME SPENT WITHIN THE SYSTEMS (MINUTES)

System	Novice			Total		
	N*	Mean	S.D.	N*	Mean	S.D.
Introduction	31	4.9	1.3	31	4.9	1.3
Initial Weighting of Values	31	17.4	5.1	31	17.4	5.1
Values Game	31	17.4	6.0	31	18.5	6.8
Adjustment of Weights	31	8.6	3.9	31	10.1	4.7
Locate	30	12.6	7.3	30	18.1	15.7
Compare	28	20.3	13.5	28	31.1	26.1
Desirability	26	11.6	5.7	26	16.8	11.9
Prediction	28	9.4	5.3	27	12.3	8.6
Planning	29	17.4	6.3	28	31.6	20.7
Strategy	—	—	—	29	18.7	13.4
		119.6			179.5	

* When N < 31, data were lost in system breakdowns

completing one pass through PLANNING, he can enter STRATEGY only as an initiate. With respect to the other systems, the difference between the total time and the novice time is equal to the time spent within the system as an initiate. It should be remembered that the path of an initiate through a system is in most instances much shorter than the path of a novice because the initiate bypasses the teaching displays that explain how to use the system.

Table IV-1 shows that the smallest increase from novice to total occurs in the Values Game and in the Adjustment of Weights to 40 points in the Values system. This result is not unexpected. After the original self-assessment that occurs in the Values system, only four students felt so uncertain about their values that they chose to start all over with the Values Game. As a result, the total mean time for the game is only a minute more than the time for the novice. Also, the total mean time for reweighting does not show a large increase. Only nine students returned to the Values system at all as initiates, and some of them merely examined their original weights without changing them. The time to readjust would also be less for the initiate than for the novice since the initiate's sum already equals 40 when he reaches this point, whereas the novice on the average has to reduce his sum by eight points. Finally, twenty students used STRATEGY to reweight their values, and the time spent in this activity is charged to that system.

The Prediction system, like the Values system, shows a relatively small mean increase in usage due to interaction on the part of initiates. Time, however, is a deceptive measure for this system, for the initiate goes directly to his prediction, whereas the novice must go through a long sequence explaining the nature of probability figures and displaying illustrative predictions. The initiate can get a piece of information in a fraction of the time required by the novice.

All of the other systems show considerable increases in total time over time as a novice. Apparently each system is useful to some students when they are given free access to SIGI.

Of particular interest in Table IV-1 are the large standard deviations associated with LOCATE, COMPARE, DESIRABILITY, PREDICTION, PLANNING, and STRATEGY. This phenomenon will be taken up again in a later chapter. Here it is sufficient to observe that such high standard deviations indicate a great amount of variability in student behavior. Two additional points should be made:

1. The standard deviations for the Introduction, Initial Weighting of Values, Values Game, and Adjustment of Weights do not appear to be remarkably high. These sections are straightforward linear sequences. The only source of variability would be the reading speed of the student, the amount of deliberation he put into his responses, and (with respect to the Values Game only) the number of games he chose to play. These systems operate under the conditions of maximum machine control with the student playing the role of respondent, and here we find the least variability.

Control passes more to the student in the remaining systems. He selects the values and specifications in LOCATE, the occupations and questions in COMPARE, and so on, and the computer plays the role of respondent. Here we find the maximum variability.

2. If one examines the standard deviation as a percentage of the mean, one is struck by the fact that the standard deviations are higher for the total times than for the novice times. The sample was too small to make practical a test of significance for this phenomenon. But inspection of Table IV-1 confirms the impression one gets from going through

the students' printouts or observing at the slave terminal: the amount of variability increases when the student achieves the status of initiate. The variability comes about mainly because different students seem to have different styles in decision-making. Some may rely heavily on one system, and others on another.

Time is not the best measure of system interaction. Time will vary with the reading rate of the student. Also, some students seem compelled to read every display, even ones they have seen before, whereas others skip many displays that do not demand a selective response. Moreover, under the conditions of this pilot study, asking for many printouts might disproportionately increase a student's time in a system because an extra delay was required for operation of the line printer at the student's terminal.

Table IV-2 shows system usage in terms of other units than time (ex-

TABLE IV-2

SYSTEM USE

System and Unit	Mean	S.D.
Values Game (no. of values encountered)	24.3	10.3
Values Adjustment (time to reweight)	10.1	4.7
Locate (no. of value/specification combinations)	4.6	4.1
Compare (no. of sets of occupations)	4.0	3.9
Desirability (no. of sets of occupations)	1.7	.9
Prediction (no. called for)	3.3	3.4
Planning (no. of occupations)	3.0	1.9
Strategy (no. of sets of occupations)	3.4	4.0

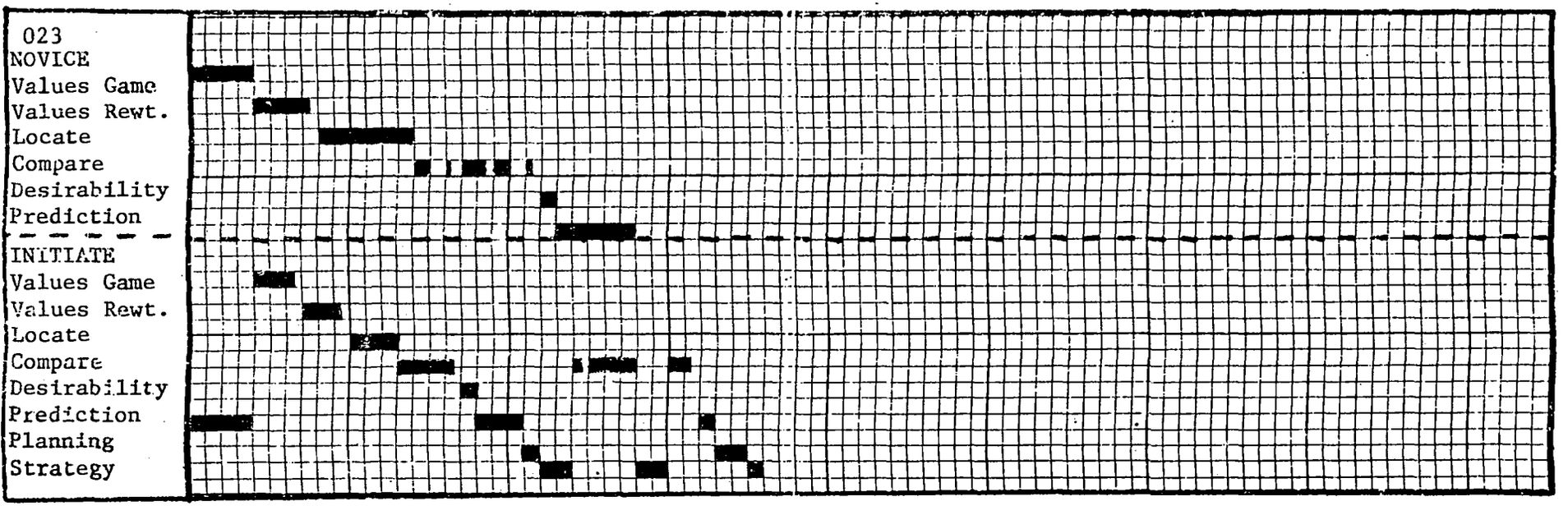
cept for Values Adjustment, where time provides the only possible measure). These will be discussed separately in the next chapter, but they have been brought together here. Once again, the high standard deviations stand out for most systems.

Behavior of Individual Students

Representing a student's interaction graphically is helpful in understanding the different styles that contribute to the variability. Figure IV-1 is such a representation for Student 23, whose printout was discussed in the preceding chapter.

Reading Figure IV-1 from left to right, one can see the order in which the student encountered the various systems in SIGI. For the novice this order is, of course, prescribed. PLANNING and STRATEGY are not shown for the novice, since the former consists of one unit of interaction in all cases, and the latter is not open to him. Although the amount of interaction in one system should not be compared with the interaction in another because the units of measurement are different, the length of the bars does suggest at a glance whether the amount of interaction was great or small. The lower graph (initiate) represents interaction under the conditions of maximum student control: the student controls not only the length of the bars, but the order in which they occur from left to right.

The style of Student 23 is apparent in his graph. He uses all parts of SIGI rather extensively in the decision-making process. Only DESIRABILITY has small usage, being entered once as a novice and once as an



Each division from left to right represents:

Values Game: Five values encountered in the game
Values Reweight: Two minutes in reweighting values
Locate: One set of values/specifications that retrieved
Compare: Five questions; each segment represents one set of occupations
Desirability: One set of occupations
Prediction: One prediction called for
Planning: One occupation
Strategy: One set of occupations

FIGURE IV-1

INTERACTION OF STUDENT 23

initiate. No system is notably favored over any other. The order in which he uses the systems as an initiate is deliberate. He begins in PREDICTION and then chooses to consolidate his understanding of SIGI by going through the novice path again, ending in STRATEGY for two sets of occupations. He then returns to COMPARE, asking two questions about one set of occupations and 15 about another. Next he returns to STRATEGY for two additional sets, and then goes back to COMPARE for seven more questions about a single set, and finishes with a pass through PREDICTION (one call), PLANNING (two occupations), and STRATEGY (at least one set--he was interrupted by a telephone line failure). One may speculate that he used VALUES and LOCATE to generate a list of candidates; then he used COMPARE and PREDICTION to inform himself about the candidates, and STRATEGY and PLANNING to test their feasibility.

Collected at the end of this chapter as exhibits are similar graphs for eight students whose behavior displays a distinctive style.

Like Student 23, Student 16 (Exhibit IV-1) uses COMPARE and STRATEGY extensively in trying to reach a decision. However, the behavior of the two students is quite different. Student 23 used the two systems mostly to explore and evaluate candidate occupations nominated by the other systems or previously held in mind. Student 16, on the other hand, seems to have used them to identify occupations to think about. This use would normally be the function of LOCATE, a system that this student returned to only once as an initiate. She selected 33 different sets of occupations in COMPARE, generally asking only a single question about a set.

Her questions tended to define rather than explore: she asked about salary (although income was not among her five highest weighted values), educational requirements, or definition. Again, in STRATEGY she chose occupations from many different fields: Auto Mechanic, Radio/TV Serviceman, Funeral Director, Radio Announcer, as well as numerous selections from the health and human services fields. She barely used the Planning system at all.

On the surface, Student 16 seems to be employing SIGI in a disorderly way, and it was a surprise to the person who interviewed her to find a cool, mature, and businesslike student who gave the impression of knowing exactly what she was doing. She was putting herself through school by working as a real estate agent. Her long-term goal was to manage a halfway house for women on probation. Feeling already committed, the student saw little need of LOCATE. This intended occupation, however, was not included in SIGI, and much of her apparently erratic behavior is attributable to the fact that she was trying to "construct" it out of related occupations, such as Policeman, Social Worker, and Occupational Therapist. PLANNING could not be of much service to her. We do not know why she sought the index for Automobile Mechanic or Radio/TV Serviceman. Perhaps she wanted a standard she could use for comparison with indexes that were of more interest. It is also possible that she was having fun in a private session at the terminal.

Student 18 (Exhibit IV-1)adopts a style that minimizes the use of LOCATE. Her graph as a novice shows very little student-initiated inter-

action. She became selective as an initiate, however, and turned out to be one of the students about whom we had a feeling of closure: she had entered SIGI believing that she would become an architect, but discovered that she could secure many of the same rewards at much less cost as an architectural technician.

Students 33 and 43 (Exhibits IV-2 and IV-3) show heavy reliance on the Values system. They were well above the mean in their interaction with the Values Game and in the time they spent reweighting their values. Furthermore, both returned to VALUES again as initiates and reweighted a third time in STRATEGY. Student 37 (Exhibit IV-2) shows the opposite behavior. He retrieved only three occupations in his three interactions in LOCATE, but relied mainly on COMPARE, DESIRABILITY, PREDICTION, and PLANNING to reach a tentative decision to become a life insurance salesman. He said that he had eliminated rival candidates mostly on the basis of what he had learned in SIGI.

Student 57 (Exhibit IV-4) seems to illustrate another style. Nearly all of her interaction occurred as a novice. We note the heavy emphasis given to PREDICTION (eight called for) and PLANNING (nine occupations seen, including one as a novice). This student evidently relies heavily on the two systems that provide information most relevant to her immediate circumstances as an enrolled college student. She wants to see the probability figures and programs of study for her college.

Students 52 and 54 (Exhibits IV-3 and IV-4) show yet other styles. The former placed very heavy emphasis on LOCATE (in contrast to Student 18),

using 24 different combinations of values and specifications to retrieve occupations. He did not ignore other systems, but his main support was LOCATE. Student 54, on the other hand, relied very heavily on STRATEGY, using 22 sets of occupations before finally signing off. By contrast, his use of COMPARE was very slight. One would ordinarily expect the student to use COMPARE to shorten his list of candidates and to use STRATEGY to evaluate his list. But this student was apparently using STRATEGY for both purposes.

Concluding Remarks

The behavior of students whose graphs do not appear in this report was also distinctive. There does not emerge a dominant pattern of behavior of the sort one might predict who had only read a description of the structure of SIGI. That is, students do not enter with tabulae rasae with respect to occupational choice, ready to let VALUES and LOCATE propose and the other systems dispose. Rather, they seem to appear each with individual preconceptions and needs, and then formulate a method of attack based on their status and on the resources of SIGI. This behavior is consistent with the underlying philosophy of SIGI: to enhance each student's freedom and competence in career decision-making as he gains mastery of the machine.

EXHIBIT IV-1


016
NOVICE
Values Game
Values Rewt.
Locate
Compare
Desirability
Prediction
INITIATE
Values Game
Values Rewt.
Locate
Compare
Desirability
Prediction
Planning
Strategy

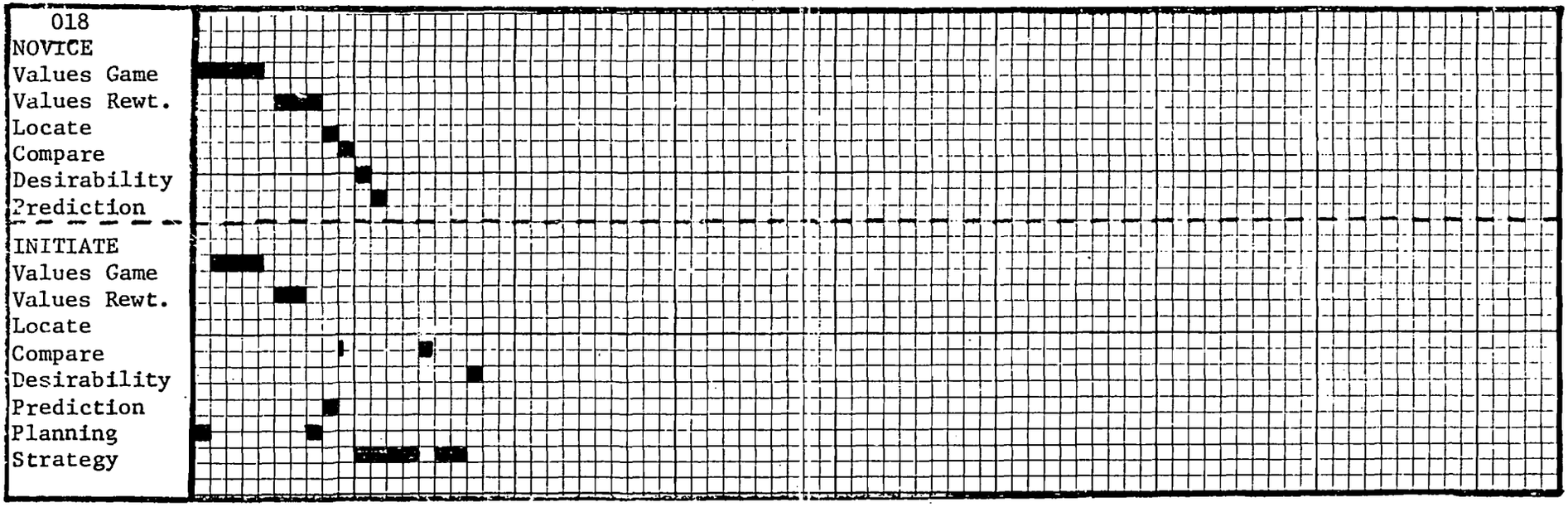
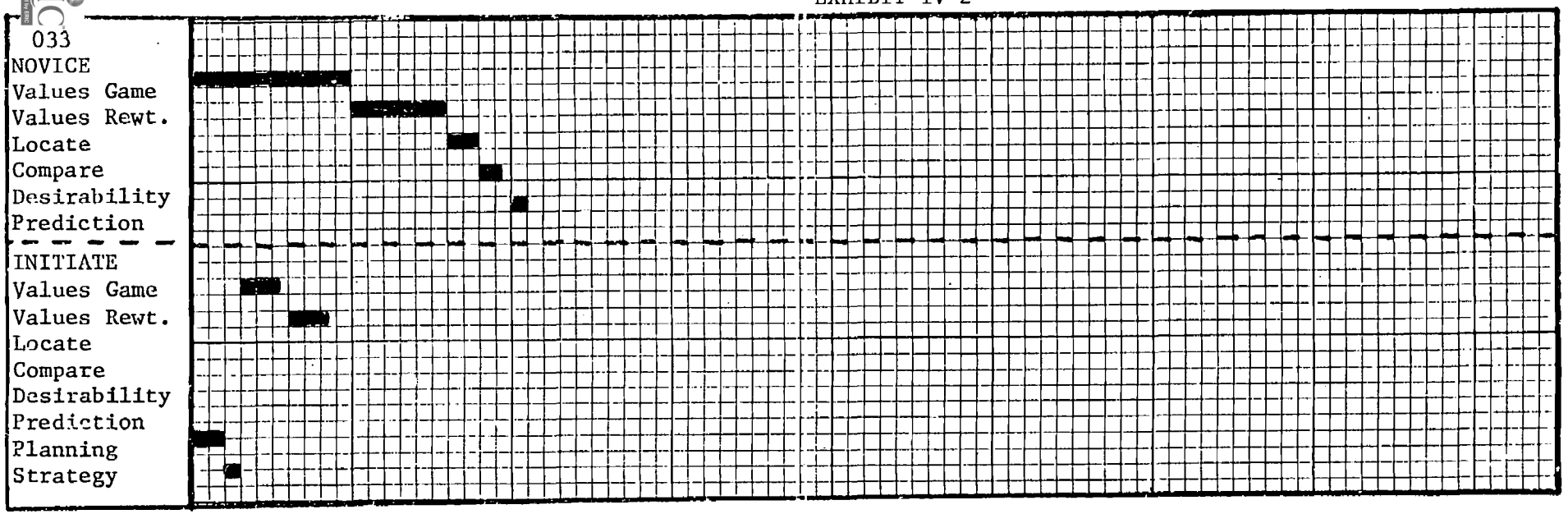

018
NOVICE
Values Game
Values Rewt.
Locate
Compare
Desirability
Prediction
INITIATE
Values Game
Values Rewt.
Locate
Compare
Desirability
Prediction
Planning
Strategy

EXHIBIT IV-2


033
NOVICE
Values Game
Values Rewt.
Locate
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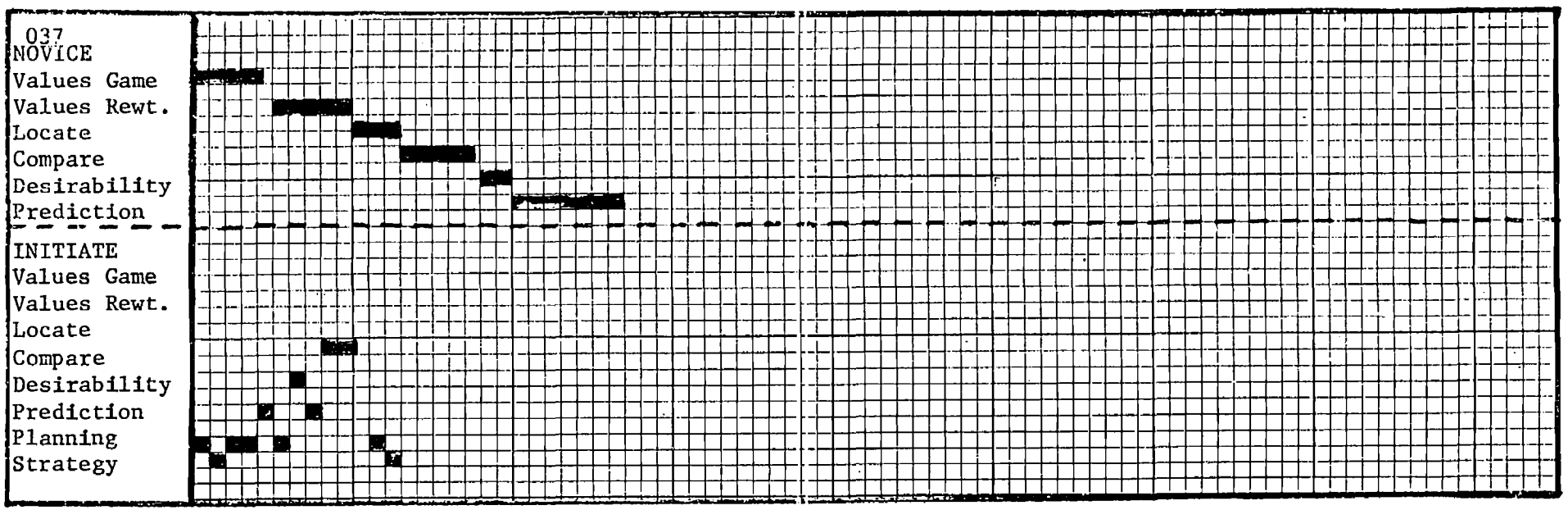
Desirability
Prediction
INITIATE
Values Game
Values Rewt.
Locate
Compare
Desirability
Prediction
Planning
Strategy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NOVICE
Values Game
Values Rewt.
Locate
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Prediction
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Locate
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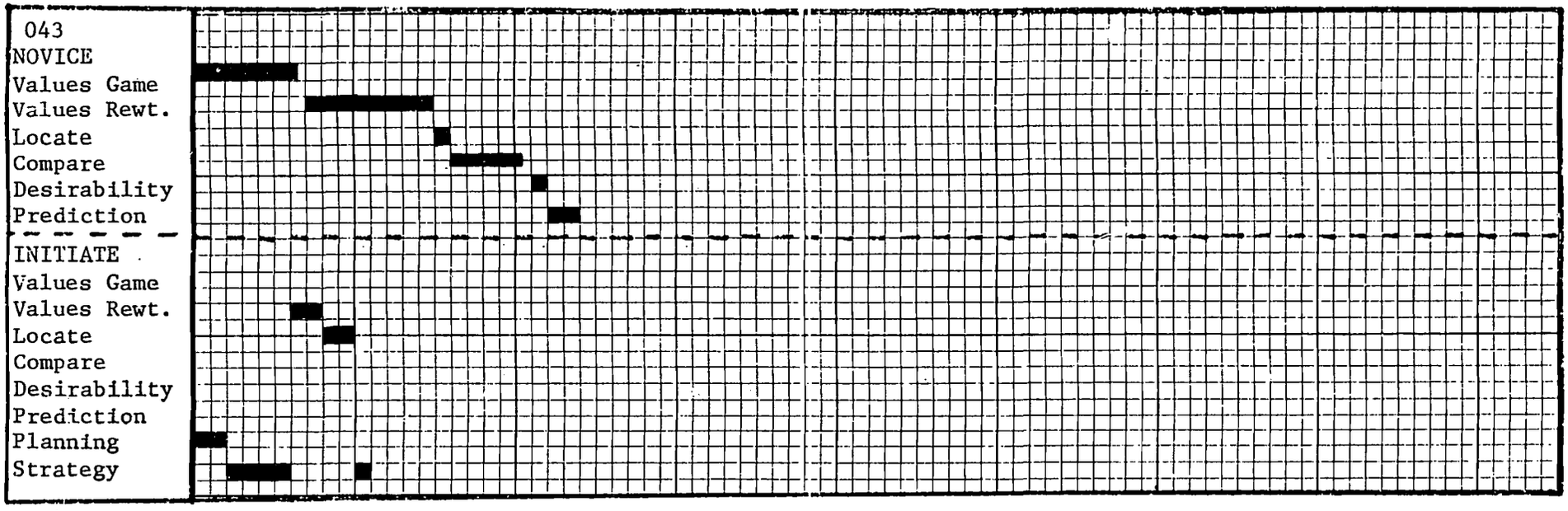
Desirability
Prediction
Planning
Strategy

EXHIBIT IV-3


043
NOVICE
Values Game
Values Rewt.
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INITIATE
Values Game
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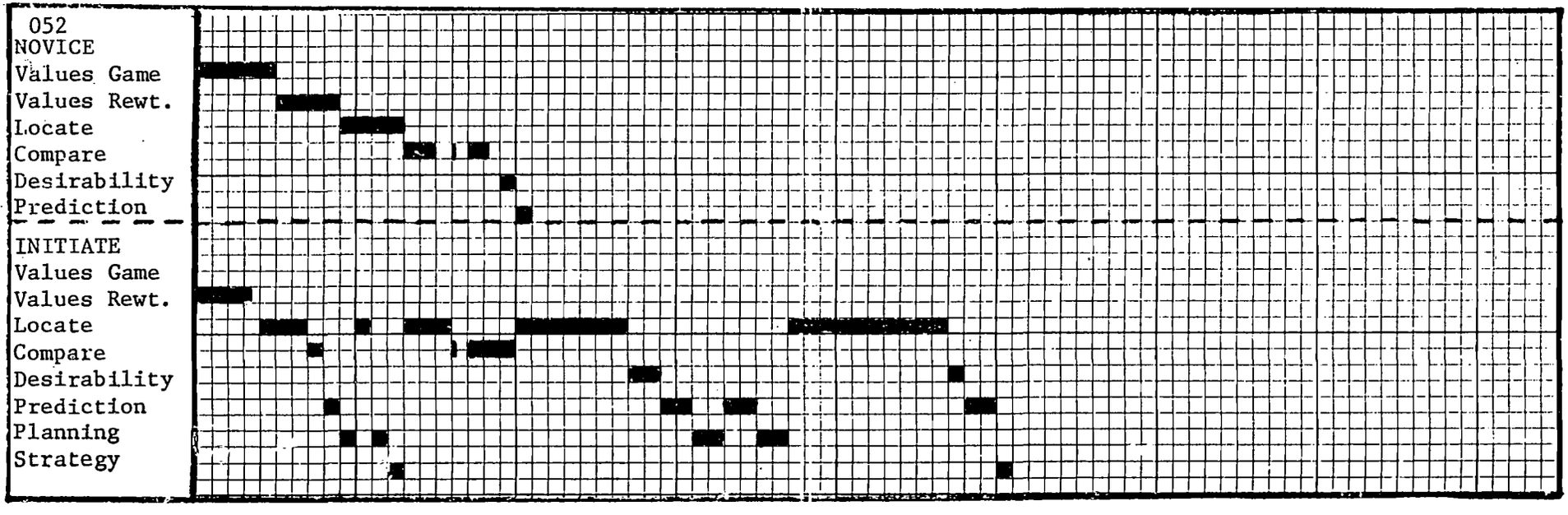
Prediction
Planning
Strategy


052
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Values Game
Values Rewt.
Locate
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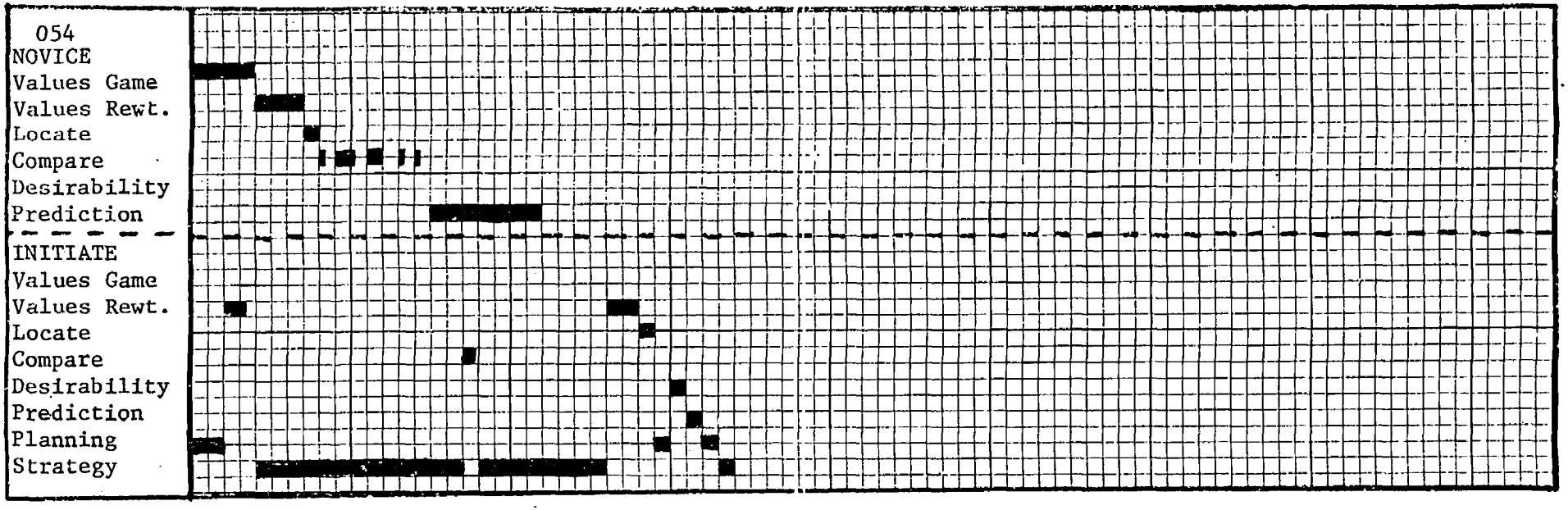
INITIATE
Values Game
Values Rewt.
Locate
Compare
Desirability
Prediction
Planning
Strategy

EXHIBIT IV-4


054
NOVICE
Values Game
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Values Game
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Locate
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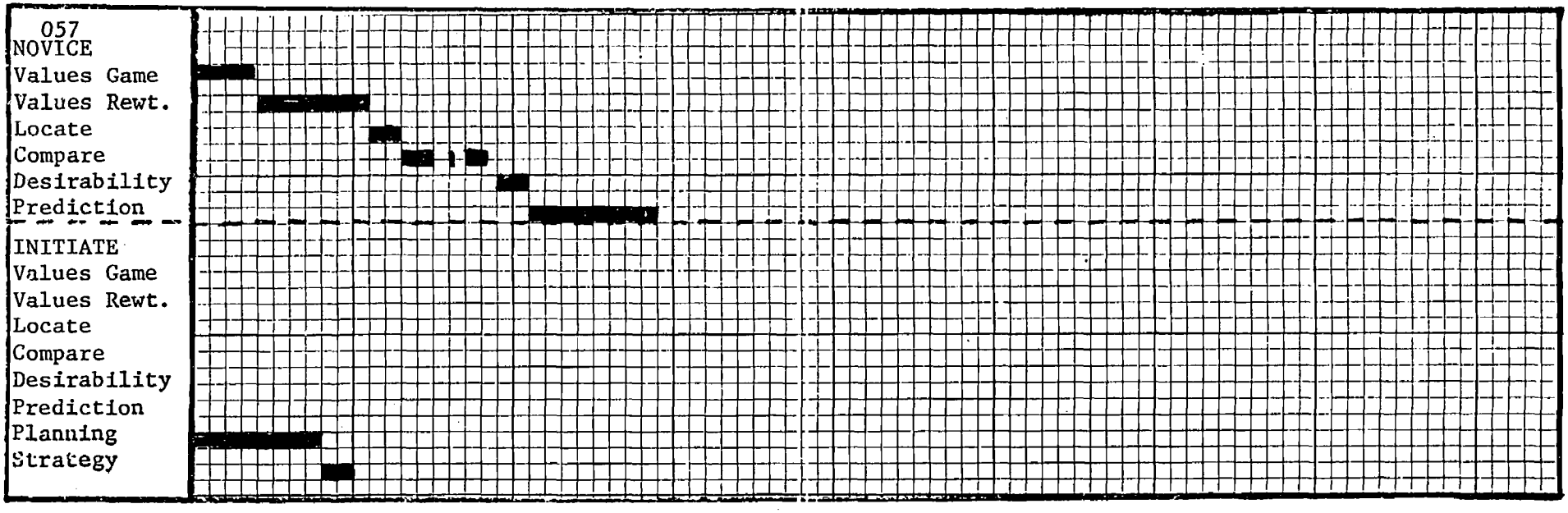
Prediction
Planning
Strategy


057
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Locate
Compare
Desirability
Prediction
Planning
Strategy

CHAPTER V

USE OF THE SYSTEM BY THE EXPERIMENTAL GROUP

This chapter presents descriptive data collected by the computer on the behavior of the 31 experimental students. As Chapter III gave a detailed picture of the use of the system by one student, in depth, this chapter presents summary statistics on the use of the system by all students, in breadth. Some data for some students were lost because of hardware and system failures; consequently, the size of the sample for some statistics is less than 31. However, the N never fell below 26. The subdivisions of this chapter represent the subsections of SIGI.

INTRODUCTION

The computer collected data on the students' enrollment status, age, sex, knowledge of his values, knowledge of occupations, ability to predict his college grades, and the status of his occupational plans. The first three items in this list were discussed earlier in the description of the sample. Table V-1 shows the distribution of answers with respect to the last four items.

As might be expected, few students claimed extensive or exact knowledge about the dimensions explored. Only three said they knew all their occupational values, one believed he had sufficient information about relevant occupations, seven thought they could predict their college grades accurately, and only one believed that his plans were complete and firm for gaining entry into his occupation of choice. On the other hand, a larger

TABLE V-1

DISTRIBUTION OF ANSWERS TO FOUR QUESTIONS ASKED IN INTRODUCTION

Questions	No. of responses
Knowledge of values	
Know importance of all	3
General, unanalyzed knowledge	14
Would know if seen	6
No idea	8
Knowledge of occupations	
Know all relevant occupations	1
Know a few relevant occupations	14
Need much information	16
Ability to predict	
Predict well all programs of interest	7
Predict well 1+ programs of interest	11
General idea of future GPA	12
Cannot predict at all	1
Status of plans	
All future steps planned	1
General idea, need information	21
Need much information	9

number of students were quite open in acknowledging their total ignorance in these matters. Eight admitted that they had no idea at all of their values, sixteen--more than half of the sample--had a need for large amounts of occupational information, and nine were at sea with respect to plans for the future. Only one, however, said that he was completely unable to predict his future grade point average.

The four questions just discussed were designed not so much to collect information as to introduce students to the four major sections of SIGI they would encounter: VALUES, INFORMATION, PREDICTION, and PLANNING. However, their answers give a picture of students in considerable need of vocational counseling.

VALUES

From the Values system, measures were obtained of the importance each student attached to ten occupational values: High Income, Prestige, Independence, Helping Others, Security, Variety, Leadership, Interest Field, Leisure, and Early Entry. Means and standard deviations for these values are in Table V-2. The figures in the "Unrestricted" column are based on the weightings made by the student before he played the Values Game; those in the "Restricted" column are based on weightings made after the game. The latter are subject to the restriction that they sum to forty. This constraint, of course, largely accounts for the smaller means in the second column.

These figures show, first, that all the values were being used; i.e., each of the values was important to some students. Second, there was no serious ceiling or floor effect, since even the highest and lowest weighted values exhibited sizable variation. Third, the values Interest Field, Variety, and Security had the highest means, whereas Early Entry had the

TABLE V-2

MEANS AND STANDARD DEVIATIONS FOR VALUES

	Unrestricted		Restricted	
Values	Mean	S.D.	Mean	S.D.
High Income	4.81	1.91	4.52	1.58
Prestige	4.35	2.04	3.19	0.93
Independence	5.00	1.61	3.94	1.27
Helping Others	4.55	1.70	4.19	1.91
Security	5.45	1.46	4.77	1.62
Variety	5.90	1.47	4.94	1.32
Leadership	4.16	1.39	3.16	1.35
Interest Field	5.87	1.36	5.65	1.71
Leisure	4.06	1.54	3.39	1.60
Early Entry	3.48	1.86	2.26	1.29

lowest mean. The low weight given to Early Entry is understandable, since all of the students in the sample had already made a commitment to some education beyond high school.

In the reweighting task, the value means decreased by varying amounts while retaining quite closely their rank ordering (the mean r was .85 computed using an r to z transformation). This fact suggests that the reweighting seemed to be sharpening rather than grossly changing students' estimates. It should be noted also that the variance is not generally reduced in going from the Unrestricted to the Restricted case.

It must be remembered, of course, that the figures in the Restricted column reflect not only the constraint of distributing a fixed sum but also the immediate effects of the Values Game. These two effects are inextricably confounded--an unavoidable situation since it did not seem ad-

visable to ask the student to make two separate reweightings immediately after the Values Game.

The magnitude of the change in value means before and after the Values Game can be measured against the average reduction required by the reweighting procedure itself. Since the pregame value means summed to 47.6, an average value reduction of about .8 would meet the restriction that they sum to 40. Five values exhibited reductions exceeding this amount (Prestige, Early Entry, Independence, Leadership, Variety); three values fell short of this amount (Interest Field, High Income, Helping Others); two values showed reductions approximately equal to this amount (Security, Leisure). Thus, the differences in value means between the two columns show that the reweighting procedure was not having the effect of merely flattening out student profiles. Indeed, Interest Field, which had one of the highest means, exhibited the smallest reduction.

Table V-3 shows the intercorrelations between the weightings given to the ten SIGI values before the Values Games (Value 1) and after the game subject to the restriction that they be summed to 40 (Value 2). An examination of the table indicates that the value weightings were relatively independent. This outcome agrees with our findings from earlier research on a large sample (not related to SIGI), where we found values to be relatively independent of one another and also independent of abilities and interests (Norris and Katz, 1970).

TABLE V-3

INTERCORRELATIONS BETWEEN VALUES WEIGHTS

	INC1	PRE1	INP1	HELP1	SEC1	VAR1	LEA1	INT1	LEI1	EEN1	INC2	PRE2	INP2	HELP2	SEC2	VAR2	LEA2	INT2	LEI2	EEN2
INC1	1.00																			
PRES1	.43	1.00																		
INP1	.24	.57	1.00																	
HELP1	-.04	.46	-.02	1.00																
SEC1	.37	.58	.29	.28	1.00															
VAR1	-.04	.39	.34	.12	.41	1.00														
LEAD1	.34	.39	.30	.34	.47	.13	1.00													
INT1	-.06	.31	.18	.21	.09	.07	.27	1.00												
LEIS1	-.02	.07	.26	-.38	.00	.22	.13	-.09	1.00											
EENT1	.05	.24	.38	.22	.24	.15	.28	-.24	-.03	1.00										
INC2	.88	.22	.14	-.28	.36	-.13	.20	-.19	.07	-.13	1.00									
PRES2	.15	.49	.00	.38	.13	-.08	.22	.35	.04	-.07	-.09	1.00								
INP2	.02	-.08	.62	-.31	-.18	-.00	-.05	.03	.00	-.01	.05	-.40	1.00							
HELP2	-.40	.08	-.41	.76	-.09	.06	.07	.18	-.42	.01	-.53	.22	-.49	1.00						
SEC2	.27	.26	-.04	.06	.59	-.02	-.16	-.29	-.15	.13	.36	.11	-.18	-.18	1.00					
VAR2	-.07	-.14	-.02	-.17	.02	.65	-.13	-.15	.16	-.13	-.06	-.15	.04	-.11	-.05	1.00				
LEAD2	-.18	-.22	-.25	.06	-.35	-.25	.35	.24	-.01	.03	-.28	.28	-.22	.21	-.50	-.14	1.00			
INT2	-.22	-.05	-.01	-.08	-.12	.06	-.18	.63	-.20	-.51	-.16	-.08	.12	.10	-.38	-.04	-.10	1.00		
LEIS2	-.27	-.38	-.05	-.49	-.32	-.19	-.23	-.39	.67	.11	-.10	-.29	.03	-.38	-.15	-.06	.00	-.30	1.00	
EENT2	-.07	-.10	.23	.01	-.06	-.09	.03	-.40	-.02	.63	-.18	-.36	.19	-.03	-.06	-.37	-.10	-.35	.29	1.00

* The postscript 1 signifies the unrestricted condition.

** The postscript 2 signifies the constraint that the weights must sum to 40.

Nine students returned to the Values system as initiates, one of them twice. Four of these asked to play the Values Game a second time. Moreover, twenty students asked to see their value weights upon their entry into STRATEGY, and four of them changed their value weights there. Seven of these twenty were among the nine who also returned to the Values system in a separate interaction. Thus 22 different students in this sample were sufficiently uncertain about their value weights to seek a review of them, and seven reviewed them twice. When values were reweighted, the changes were usually small. It appears from these figures that the Values system received quite heavy use. The students did not weight their values and simply forget them. Even though they often did not change them at all, students appeared to take their values seriously. They seemed to have grasped the importance of periodic review of values in career decision-making.

LOCATE

In LOCATE, students choose a set of five values, usually those which received the greatest weight, as a screen for retrieving occupations. The student specifies a minimum for each value, and the computer retrieves only those occupations that meet or exceed the minimum on all five of the selected values. If the student's specifications are too strict or too loose, resulting in an empty list or one too large to be useful, he alters his specifications until he finally arrives at a set that retrieves. As a unit for measuring interaction in LOCATE, each set of five values and specifications that retrieves a list of occupations may be considered as one trans-

action. Sets that do not retrieve are not counted, since they must ultimately be modified into sets that do retrieve. Any time a student changes a specification or a value in his set and retrieves occupations, the event is counted as a new transaction.

Table V-4 shows the mean number of occupations retrieved for each of the first five transactions in LOCATE. (Although one student used LOCATE for 19 different transactions, the mean number for all students was 4.6. Carrying the table beyond five transactions did not add any useful information.)

TABLE V-4

OCCUPATIONS RETRIEVED FOR EACH TRANSACTION IN LOCATE

	Value/Specification Combinations				
	First	Second	Third	Fourth	Fifth
Mean	6.25	4.84	3.55	3.13	2.03
S.D.	4.79	4.66	4.72	4.92	3.77

It may be noted that the mean number of occupations retrieved decreased as the number of transactions increased. That is, the students' use of LOCATE did not seem to be merely a haphazard experimentation with different value/specification combinations. After retrieving their first list of occupations, students became progressively more demanding in their combinations, and succeeded in paring the list down. If they were using values

truly important to them, the more demanding they were, the more likely they were to find satisfaction in one of the occupations retrieved.

Not all students, however, followed the same pattern of behavior. The standard deviations in Table V-4 are high, indicating much variability in the way students interact in LOCATE. The whole subject of variability was discussed in the previous chapter. Nevertheless, it may be noted here that LOCATE was the first system the student encountered where he was given maximum control of the interaction. The Introduction and Values systems are essentially linear, although the student could spend as much time in them and play as many Values Games as he wanted. But in LOCATE, the inputs as well as the time are controlled by the student, and wide variability in behavior, manifest in the large standard deviations, began to emerge.

COMPARE

In COMPARE, students select a set of three occupations to ask questions about. Two units are useful for measuring interaction in this system, the number of sets used and the number of questions asked.

Table V-5 shows the mean number of questions asked for each of the first five sets, and the mean number of questions asked across all sets by all students. It is evident that the mean number of questions per set progressively decreased, beginning with 6.94 for the first set and falling off to 1.48 for the fifth. This fact suggests that the students became more and more selective in their search for information. In all cases,

TABLE V-5

NUMBER OF QUESTIONS ASKED PER SET OF OCCUPATIONS IN COMPARE

	Set Number					
	1	2	3	4	5	Total
Mean	6.94	3.74	3.00	1.81	1.48	20.8
S.D.	7.25	5.08	3.79	3.07	3.55	17.2

the first set must consist of occupations retrieved in LOCATE. Subsequent sets might consist of other such occupations or of occupations selected from the total SIGI offerings, or a mixture. Students often included one occupation in several sets. Whatever the composition of the sets was, it seems clear that, after their first flurry of questions, students tended to seek only one or two items of information about additional occupations.

The mean number of questions asked was 20.8. This, of course, included duplicate questions, since students could ask the same question about different occupations.

Table V-5 again displays high standard deviations such as were characteristic of the data in LOCATE. The behavior of the students was quite variable. Observation of the student records showed that some simply went down the list of questions with a single set of occupations. Others, like Student 23, seemed to "discover" a new occupation of interest and then to return to COMPARE either to explore it or to satisfy themselves with respect to a single piece of information.

DESIRABILITY

In the Desirability system, the student selects three occupations that he wants to test to see how well they fit his professed values. The rating for each occupation on each value is multiplied by the weight that shows the importance of that value to the student; the products are then added to produce a Desirability Sum. The higher the sum, the better the fit between the occupation and the values.

The mean number of sets of three occupations for which sums were sought was 1.7, with a standard deviation of 0.9. This small use of DESIRABILITY is not surprising, since the student also sees Desirability Sums in STRATEGY, where they are modified by his probabilities of scholastic success to produce Indexes combining the desirability of occupations with their feasibility in terms of the student's aptitude. The Index probably provides more useful information than does the Desirability Sum for students who have to take their abilities into account in searching for an occupation. Therefore students tend to favor STRATEGY over DESIRABILITY unless they have a special reason to see how the sums are derived. They can get that information only in DESIRABILITY.

Before seeing their Desirability Sums, students rank by preference the three occupations they selected. The computer compares their rank order with the rank order by sums and displays a message appropriate for the outcome. How did the students' preferences compare with the calculated sums? For nine experimentals, the two rank orders agreed. For four students, the

top ranked by preference received the highest sum, but there was disagreement between the second and third places. And for sixteen, the most preferred occupation did not receive the highest sum.

Students are told to ignore small differences in sums. The computer is not programmed to do this, and so its rank order will treat a virtual tie in the same way as a large difference. For this reason, we may discount some of the disagreements. Nevertheless, it appears that the majority of students are not sufficiently sophisticated to know which occupations would be most satisfactory for them in terms of their values. They need help.

PREDICTION

In PREDICTION, the student can ask for figures showing the probability of his getting a grade of A or B, C, or below C in any curriculum at his junior college for which sufficient data have accumulated for the calculation of regression equations. At the time of the pilot study Mercer County Community College offered 31 such curricula; figures were not available for 13 other (recently added) curricula.

To show the student the kind of data provided in the Prediction system, probability statements are first displayed for a set of three preselected curricula. The student can then request predictions for additional curricula. A satisfactory unit for measuring student interaction is the number of requests for such additional predictions made by the student. Using this unit, we found that the mean number of requests in the experimental group was 3.3, with a standard deviation of 3.4 (N=30). Students can call up pre-

dictions for several related curricula with only one request (e.g., by pressing the number 20, the student can call up two predictions, one for Laboratory Technology, and the other for Nursing); such responses were treated as a single interaction in calculating the mean. Also, the three preselected predictions (for Humanities and Social Science, Data Processing, and Accounting or Nursing) displayed as part of his introduction to the Prediction system were not counted in the total of requests.

A mean of 3.3 may not seem large. It is surprising, however, that it is as large as it is. For many students, the three preselected predictions may cover the main curricula of interest. Furthermore, the information the student receives in PREDICTION is not, in that system, directly related to occupations. Predictions appear in a useful context in PLANNING, where they are tied to the curricula that serve the occupation under consideration, and in STRATEGY, where they serve to modify Desirability Sums, which take no account of the student's abilities. Students almost always exercised their option to see their predictions in PLANNING, and they had to see them in STRATEGY. Consequently, there was little reason why they should seek them, unattached to any occupational information, in PREDICTION. Nevertheless, they did seek them. Some were undoubtedly prompted by curiosity. One may also speculate that some students were looking for information about the easiest path into an occupation. Unfortunately, the size of our sample was too small to let us follow up this speculation.

We note once again a large standard deviation (3.4, where the mean is 3.3) associated with the interaction with a system. Some students used PREDICTION much more extensively than others. The range was 0 to 13 requests for additional predictions.

PLANNING

In PLANNING, the student selects an occupation for which he wants to make plans. The plans include the educational prerequisites for entry into the occupation. There is considerable interaction involving the student's willingness to undertake the necessary education and his ability to handle the coursework, culminating in the display of the appropriate program of study at his junior college.

The best unit for measuring interaction in this system is the number of occupations for which plans were sought. The mean number was 3.0, with a standard deviation of 1.9. This includes requests to see General Studies, a program that is treated as an occupation in PLANNING. If the student saw more than one program of study for a single occupation, he was still deemed to have engaged in only one interaction. Also, if he rejected an occupation before he had seen the program for it, it was counted as an interaction.

One would not expect students to ask for plans for a large number of occupations. PLANNING is more for implementation than exploration, and one would expect students to enter it with only a few previously selected occupations. Nevertheless, some students seemed to use PLANNING for exploration, and the range of occupations considered in the system was 1 to 9. Even if

we eliminate the six instances of General Studies from our assessment of interaction in PLANNING, it is apparent that some students used the system as part of the selection process rather than as mere implementation.

STRATEGY

In STRATEGY, the student selects a set of three occupations from the SIGI base. He sees the Desirability Sums for the occupations, the probabilities (GPA of C or better) in the curricula associated with the selected occupations, and Indexes produced by multiplying the Desirability Sum times the probability for each occupation. An Index may be regarded as a combination of desirability and feasibility. When a student's probabilities are markedly different for different curricula, application of the probability figures to Desirability Sums can dramatically change the attractiveness of various occupations. An occupation that is most appealing in terms of its Desirability Sum, without consideration of the student's chances of getting into it, may become least appealing in terms of its Index. Much depends, of course, on the student's proclivity for risk-taking.

The best measure of interaction in STRATEGY is the number of different sets of occupations for which Indexes were generated. The mean number of sets for all 31 experimental students was 3.4, with a standard deviation of 4.0. It may be noted that this mean is exactly double that for DESIRABILITY. Students apparently want to judge candidate occupations on the basis of something more than desirability alone. Also notable is the high standard deviation. Again, we find considerable variability in the way students use SIGI. The range was 1 to 22 different sets of three occupations each.

After selecting his set of three occupations, but before seeing the Desirability Sums, the student indicates the one that he would enter if he had to make the choice at that moment. Then, after seeing the Sums and Indexes, he again designates a first choice. Comparing the pre- and post-interaction choices gives some insight into the effect of STRATEGY on the student. Tables V-6 and V-7 indicate the outcomes.

Table V-6 shows students' choices with respect to the Desirability Sums. The top row, CH 1 = CH 2, represents the condition where the occupation preferred after the interaction was the same as the one preferred before. The second row, CH 1 ≠ CH 2, shows the number of times students changed their minds about their first choice.

TABLE V-6

CONSISTENCY WITH RESPECT TO DESIRABILITY SUM OF OCCUPATION PREFERRED BEFORE AND AFTER INTERACTION IN STRATEGY

	Before and After Choices			
Condition	Max/Max	No/No	Max/No	No/Max
CH 1 = CH 2	22	35	-	-
CH 1 ≠ CH 2	0	0	6	27

Column Max/Max shows the number of times the students' first and second choice occupations had the highest Desirability Sums. The choice remains unchanged after the interaction since there is no logical reason to change as

long as the student is basing his choice on the magnitude of the Desirability Sums. This logical behavior occurred 22 times.

Column No/No shows the number of times the students held occupational preferences that did not have the highest sum. In other words, the Desirability Sums offered a reason to change, but the students did not do so. This pattern occurred 35 times. This behavior is not considered irrational, since no pressure is put on students to accept the numerical outcomes. There are many reasons why a student might not want to abandon an occupation solely on the basis of its Desirability Sum, particularly since students had been advised that small differences between sums were not significant. Column Max/No indicates very rare behavior: the first choice is confirmed by the highest Desirability Sum, but the student nevertheless changes his preference. This behavior took place 6 times.

The final column No/Max shows the number of times students changed from an occupation that did not have the highest Desirability Sum to an occupation that did. This outcome happened 27 times, and the behavior is considered logical.

The analogous table, Table V-7, shows students' choices with respect to the Indexes. On 21 occasions, the preferred occupation had the highest Index and CH 2 remained the same. However, on 36 occasions when the student did not change preferences, the choice was not the one with the highest Index. It is possible once again to see what seems to be irrational behavior occurring four times, when students abandoned their initially pre-

TABLE V-7

CONSISTENCY WITH RESPECT TO INDEX OF OCCUPATION PREFERRED BEFORE AND AFTER INTERACTION IN STRATEGY

	Before and After Choices			
Condition	Max/Max	No/No	Max/No	No/Max
Ch 1 = CH 2	21	36	-	-
Ch 1 ≠ CH 2	0	0	4	29

ferred occupation even though it got the highest Index. Students moved 29 times from an occupation with a lower Index to the one with the highest Index.

Closer examination of the irrational behavior enumerated in column Max/No of both tables shows that the behavior is not irrational when individual circumstances are considered. For two students in Max/No for Desirability, the first choice occupations had highest Desirability Sums but not the highest Indexes. These two students chose the occupations with the highest Index for CH 2. Their behavior is recorded in the Max/No column for Desirability, but in the No/Max column of the Index table.

Another student is singlehandedly responsible for six instances, 3 in each table, of moving from a compatible to an incompatible position. Interview data from the student made the behavior understandable. She was putting herself through college by working as a real estate agent. That was her short-term career goal. Her long term goal was to manage a half-way house for young women on probation. During STRATEGY, whenever Real Estate

Agent was one of the selected set, it was always CH 2 regardless of Sums or Indexes. This was certainly her current career choice. The remaining instances of "irrational" behavior resulted from the fact that the Sums for the before and after occupations were very close. The student wished to be an Architect, but experimented briefly with Urban Planner, which had a slightly higher Sum and Index. Nevertheless, Architect ultimately won out.

Therefore, in all the cases where a student chose the career with poorer Desirability Sum or Index over the one with the maximum, no one did so out of caprice, ignorance, or obstinacy.

CHAPTER VI

INTEGRITY OF THE SYSTEM

Previous chapters have dealt with the responsiveness of SIGI to the needs and purposes of students. This chapter reverses the emphasis and considers the responsiveness of students to SIGI--that is, the degree to which the intent of SIGI was realized under field conditions. We will ask such questions as the following: Do the students use their top weighted values in LOCATE, or is their selection random? Are all the questions used that are offered to the students in COMPARE? Are there any occupations that are not used? Considered as groups, did the experimentals differ from the controls after the SIGI treatment?

Values Selected for Use in LOCATE

Students select five of the ten occupational values as a screen for retrieving occupations in LOCATE. Although students are invited to experiment by selecting different sets of five, the expectation is that students would favor use of their top weighted values to assure themselves of retrieving the most compatible occupations. What values did the experimentals actually select?

Table VI-1 shows on the left the ten values ranked by mean weight (under the restriction that the weights sum to 40) assigned in the Values system, and on the right ranked by the number of students who selected the value for inclusion in a set of five in LOCATE. It should be noted that the values on the right do not include instances where a student used the same value more

TABLE VI-1

RANK ORDER OF VALUES BY WEIGHT IN VALUES SYSTEM AND BY NUMBER OF STUDENTS SELECTING THE VALUE IN LOCATE

	Values System		LOCATE	
Rank	Value	Mean Weight	Value	No. of Students Selecting
1.	Interest Field	5.65	Interest Field	27
2.	Variety	4.94	Security	26
3.	Security	4.77	High Income	25
4.	High Income	4.52	Independence	22
5.	Helping Others	4.19	Variety	22
6.	Independence	3.94	Helping Others	18
7.	Leisure	3.36	Leisure	13
8.	Prestige	3.19	Prestige	11
9.	Leadership	3.16	Leadership	10
10.	Early Entry	2.26	Early Entry	10

than once; that is, the numbers represent students, not usage--so the maximum number for any value is 31. The table demonstrates that the students are using their most important values in their search for occupations. Helping Others is the only value among the top five by weight, where it is ranked fifth, that is not among the top five by usage, where it is ranked sixth. Leisure, Prestige, Leadership, and Early Entry are at the bottom of both lists. Even the lowest ranked value was important to at least ten students.

If one compares the rank order the first time students used LOCATE with the rank order the second and third times, one finds small changes in position, but almost no change in the values assigned to the top five positions. Table

TABLE VI-2

RANK ORDER OF VALUES USED IN LOCATE IN EACH OF THE FIRST THREE TRANSACTIONS

	First Transaction		Second Transaction		Third Transaction	
Rank	Value	Number of times selected	Value	Number of times Selected	Value	Number of times Selected
1.	Security	26	Interest	23	Interest	19
2.	Interest	25	Security	21	Variety	15
3.	Income	24	Income	20	Security	14
4.	Variety	19	Variety	16	Income	14
5.	Helping	17	Independ.	15	Independ.	12
6.	Independ.	16	Helping	11	Helping	9
7.	Leisure	12	Leisure	11	Leisure	9
8.	Prestige	8	Leadership	7	Leadership	6
9.	Leadership	5	Prestige	6	Early Entry	5
10.	Early Entry	3	Early Entry	5	Prestige	2

VI-2 shows this ranking. Duplicates are, of course, included across transactions. Since the number of students who use LOCATE more than three times is less than half the sample (N=13 for the fourth time), the table is not carried out any farther. The first time in LOCATE, the top five values used are the five weighted highest in VALUES. The second and third sets contain four of the top five, with Independence replacing Helping Others as the fifth. In two sets, Interest Field, the highest weighted value, is most frequently used by these students in searching for compatible occupations, and in the third set it is the second most frequently used.

One would expect students to use their five top-weighted values the first time in LOCATE because these values are presented in an early display and it would be natural to use them. Table VI-2 shows, moreover, that when students substitute other values, they tend to use a highly ranked value as the replacement.

Occupations Used in the Information System

What occupations do students retrieve with these values? Table VI-3 lists the occupations produced by the first five sets of values/specifications that retrieved a list of occupations, and the frequency with which each occupation appeared in each set. Table VI-4 shows the frequency with which each occupation was retrieved across all sets of values/specifications, not counting duplication for any one student. That is, the frequency column indicates the number of different people for whom the occupation came up.

Of the 104 occupations in the system during the study, 80 appear in Table VI-4. This number is 77% of the total. The mean number of different occupations retrieved for each student was 11.4. If one considers the small size of the sample and the short duration of the study, this result suggests that the occupations selected for inclusion in SIGI have a wide appeal for this population.

Analogous tables were drawn up for COMPARE. Table VI-5 lists the occupations selected for inquiry through the first five sets, each set consisting of three occupations. Table VI-6 shows the total number of occupations asked

TABLE VI-3

OCCUPATIONS RETRIEVED PER SET OF VALUES/SPECIFICATIONS
IN LOCATE (FIRST FIVE SETS ONLY)

Occupations Named in LOCATE	Frequency Counts				
	Set 1	Set 2	Set 3	Set 4	Set 5
1. Accountant	0	1	0	0	0
2. Actor/Actress	0	0	0	1	0
3. Actuary	1	1	1	1	1
4. Advt. Copywriter	0	0	0	0	0
5. Aircraft Mech.	0	1	0	0	0
6. Airline Pilot	1	0	0	0	1
7. Appliance Serv.	0	0	0	0	0
8. Architect	2	2	1	2	1
9. Automobile Mech.	0	0	0	0	0
10. Auto Salesman	0	0	0	0	0
11. Bank Officer	2	3	0	0	0
12. Bank Teller	0	0	0	0	0
13. Beautician	0	0	0	0	1
14. Biol. Scientist	4	2	2	3	1
15. Bookkeeper	0	0	0	0	0
16. Broadcast Tech.	1	0	0	0	0
17. Bus. Mach. Serv.	1	0	0	1	1
18. Chem. Engineer	8	5	2	4	2
19. Chemist	2	1	0	0	1
20. Civil Engineer	12	10	6	5	4
21. Cloth. Designer	0	0	0	0	0
22. Commer. Artist	0	0	0	0	0
23. Computer Prog.	0	1	0	0	0
24. Counselor, Sch.	7	3	4	2	3
25. Dental Asst.	0	0	0	0	0
26. Dent. Hygienist	0	0	0	0	0
27. Dentist	5	3	3	1	1
28. Diesel Mechanic	0	1	0	0	0
29. Dietitian	2	1	0	0	1
30. Draftsman	0	0	1	1	1
31. Electrical Eng.	3	3	1	3	2
32. Electronics Tech.	3	3	1	1	1
33. Fine Artist	1	3	2	2	0
34. Flight Engineer	1	1	1	2	1
35. Forester	2	0	1	0	0
36. Funeral Director	3	1	3	2	0
37. Geographer	3	1	1	0	0
38. Home Economist	1	2	2	3	2
39. Hotel/Motel Mgr.	0	2	0	1	0
40. Indust. Designer	5	5	2	3	1

TABLE VI-3 (continued)

Occupations Named in LOCATE	Frequency Counts Set 1	Set 2	Set 3	Set 4	Set 5
41. Indust. Eng.	11	11	6	5	3
42. Ind. Traffic Mgr.	0	2	0	1	0
43. Inhal. Therapist	1	0	0	2	1
44 Instru. Repair.	0	0	0	0	0
45. Insur. Salesman	0	1	1	1	0
46. Inter. Decorator	2	1	2	2	1
47. Labor Rel. Spec.	2	1	1	1	1
48. Lawyer	7	6	3	2	2
49. Librarian	3	3	1	1	0
50. Libr. Technician	0	0	0	0	0
51. Machinist	0	0	0	0	1
52. Mfgr. Salesman	0	0	1	0	0
53. Market Researcher	0	0	1	1	1
54. Mathematician	4	2	2	3	1
55. Mech. Engineer	7	5	2	4	2
56. Engr. Tech.	3	3	1	1	1
57. Medical Rec. Lib.	0	0	0	0	0
58. Medical Tech.	0	1	0	0	0
59. Meteorologist	5	2	2	2	1
60. Model	0	0	0	0	0
61. Musician	0	1	0	2	0
62. News. Reporter	0	0	0	0	0
63. Occup. Therapist	2	2	2	2	2
64. Oceanographer	0	0	1	2	0
65. Optician	0	1	1	1	0
66. Pers. Interviewer	5	3	3	3	1
67. Pharmacist	1	0	0	0	0
68. Photographer	0	1	0	1	0
69. Phys. Therapist	8	4	4	2	3
70. Physician	10	7	5	2	2
71. Physicist	0	0	0	0	0
72. Policeman	3	1	3	1	0
73. Practical Nurse	0	0	0	0	0
74. Production Mgr.	1	2	3	3	1
75. Psychologist	9	6	4	2	2
76. Pub. Health Off.	3	1	2	0	1
77. Purch. Agent	0	1	0	0	0
78. Radio/TV Anncr.	0	0	0	0	0
79. Radio/TV Serv. Tech.	0	0	0	0	0
80. Real Estate Sales.	0	0	1	0	0
81. Receptionist	0	0	0	0	0
82. Recreat. Worker	1	1	2	0	1
83. Reg. Nurse	0	1	0	0	0
84. Ret. Store Mgr.	0	1	2	2	0
85. Sci. Labor. Tech.	3	3	1	1	1

TABLE VI-3(continued)

Occupations Named in Locate	Frequency Counts				
	Set 1	Set 2	Set 3	Set 4	Set 5
86. Secretary	0	0	0	0	0
87. Secur. Salesman	1	2	1	1	1
88. Sing. & Sing. Teach.	0	0	2	0	0
89. Social Worker	3	1	2	1	1
90. Soil Conser.	3	1	2	1	1
91. Statistician	1	1	1	1	1
92. Stewardess	0	0	0	0	0
93. Surveyor	0	1	0	0	0
94. Systems Analyst	1	2	0	0	0
95. Teacher Aide	0	0	0	0	0
96. Teacher, Ele. Sch.	6	2	4	2	3
97. Teacher, Sec. Sch.	7	3	5	2	3
98. Tech. Writer	0	0	0	0	0
99. Telephone Crafts.	0	1	0	0	0
100. Tool & Die Maker	0	0	0	0	0
101. Typist	0	0	0	0	0
102. Urban Planner	6	4	1	2	2
103. Veterinarian	4	2	1	0	0
104. X-Ray Tech.	0	0	0	1	0

TABLE V I-4

TOTAL FREQUENCY COUNTS (EXCLUDING DUPLICATES)
FOR OCCUPATIONS RETRIEVED IN LOCATE

Occupation Number	Occupation Name	Frequency	Occupation Number	Occupation Name	Frequency
1.	Accountant	1	51.	Machinist	2
2.	Actor/Actress	1	52.	Mfgr. Salesman	1
3.	Actuary	1	53.	Market Research	2
5.	Aircraft Mech.	3	54.	Mathematician	6
6.	Airline Pilot	3	55.	Mech. Engineer	9
8.	Architect	4	56.	Engr. Tech.	5
11.	Bank Officer	4	58.	Medical Tech.	2
12.	Bank Teller	1	59.	Meteorologist	6
13.	Beautician	1	61.	Musician	2
14.	Biol. Scientist	6	63.	Occup. Therapist	5
16.	Broadcast Tech.	2	64.	Oceanographer	2
17.	Bus. Mach. Serv.	4	65.	Optician	2
18.	Chem. Engineer	10	66.	Pers. Interviewer	9
19.	Chemist	3	67.	Pharmacist	1
20.	Civil Engineer	16	68.	Photographer	1
23.	Computer Prog.	2	69.	Phys. Therapist	13
24.	Counselor, Sch.	10	70.	Physician	11
26.	Dent. Hygienist	1	72.	Policeman	5
27.	Dentist	7	74.	Production Mgr.	5
28.	Diesel Mechanic	2	75.	Psychologist	10
29.	Dietitian	4	76.	Pub. Health Off.	4
30.	Draftsman	2	77.	Purch. Agent	2
31.	Electrical Eng.	8	80.	Real Estate Sales.	1
32.	Elect. Tech.	5	82.	Recreat. Worker	3
33.	Fine Artist	4	83.	Reg. Nurse	2
34.	Flight Engineer	3	84.	Ret. Store Mgr.	3
35.	Forester	3	85.	Sci. Labor.Tech.	5
36.	Funeral Director	6	87.	Secur. Salesman	2
37.	Geographer	3	88.	Sing.& Sing.Teach.	2
38.	Home Economist	4	89.	Social Worker	4
39.	Hotel/Motel Mgr.	4	90.	Soil Conser.	4
40.	Indust. Designer	10	91.	Statistician	1
41.	Indust. Eng.	15	93.	Surveyor	2
42.	Ind. Traffic Mgr.	3	94.	Systems Analyst	3
43.	Inhal. Therapist	4	96.	Teacher, Ele.Sch.	9
45.	Insur. Salesman	1	97.	Teacher, Sec.Sch.	10
46.	Inter. Decorator	4	99.	Telephone Crafts.	3
47.	Labor Rel. Spec.	4	102.	Urban Planner	9
48.	Lawyer	8	103.	Veterinarian	4
49.	Librarian	6	104.	X-Ray Tech.	1

TABLE VI-5

OCCUPATIONS INCLUDED IN FIRST FIVE SETS IN COMPARE

Occupation Number	Occupation Name	Sets 1	2	3	4	5
1.	Accountant	0	1	1	1	2
2.	Actor/Actress	1	0	0	0	1
3.	Actuary	0	0	0	0	1
4.	Advt. Copywriter	0	0	0	0	1
5.	Aircraft Mech.	0	0	1	1	0
6.	Airline Pilot	0	0	1	0	0
7.	Appliance Serv.	0	0	0	0	0
8.	Architect	1	2	0	0	0
9.	Automobile Mech.	0	0	0	0	0
10.	Auto Salesman	0	0	1	0	0
11.	Bank Officer	1	1	0	0	1
12.	Bank Teller	0	0	0	0	0
13.	Beautician	0	0	0	0	0
14.	Biol. Scientist	0	0	0	0	0
15.	Bookkeeper	0	0	0	1	1
16.	Broadcast Tech.	1	2	2	1	1
17.	Bus. Mach. Serv.	0	0	0	0	0
18.	Chem. Engineer	1	0	0	0	0
19.	Chemist	0	0	0	0	0
20.	Civil Engineer	5	2	2	0	0
21.	Cloth. Designer	0	0	0	0	0
22.	Commer. Artist	0	1	0	0	0
23.	Computer Prog.	2	1	1	1	1
24.	Counselor, Sch.	5	1	0	0	0
25.	Dental Asst.	0	0	0	1	1
26.	Dent. Hygienist	0	0	0	0	0
27.	Dentist	2	1	1	0	0
28.	Diesel Mechanic	0	0	0	0	0
29.	Dietitian	0	0	0	0	1
30.	Draftsman	1	1	1	2	0
31.	Electrical Eng.	4	1	2	0	1
32.	Elect. Tech.	2	3	1	1	0
33.	Fine Artist	2	2	1	0	0
34.	Flight Engineer	2	0	1	0	1
35.	Forester	1	1	1	1	1
36.	Funeral Director	0	0	0	1	0
37.	Geographer	0	0	0	0	1
38.	Home Economist	0	0	0	0	0
39.	Hotel/Motel Mgr.	0	1	0	2	2
40.	Indust. Designer	4	0	0	2	1

TABLE VI-5 (continued)

Occupation Number	Occupation Name	Sets 1	2	3	4	5
41.	Indust. Eng.	6	0	0	0	0
42.	Ind. Traffic Mgr.	0	1	0	0	0
43.	Inhal. Therapist	1	1	0	0	1
44.	Instru. Repair.	0	0	0	0	0
45.	Insur. Salesman	0	1	0	0	0
46.	Inter. Decorator	1	3	2	1	1
47.	Labor Rel. Spec.	0	0	0	1	0
48.	Lawyer	3	3	3	2	2
49.	Librarian	1	0	0	0	0
50.	Libr. Technician	0	0	0	0	0
51.	Machinist	1	0	0	0	0
52.	Mfgr. Salesman	0	0	0	0	0
53.	Market Researcher	0	1	0	0	0
54.	Mathematician	2	1	1	2	0
55.	Mech. Engineer	1	0	0	1	0
56.	Engr. Tech.	2	1	0	0	0
57.	Medical Rec. Lib.	0	0	0	0	0
58.	Medical Tech.	0	0	0	0	0
59.	Meteorologist	1	0	0	0	1
60.	Model	0	1	0	0	0
61.	Musician	0	2	1	0	0
62.	News. Reporter	0	0	1	0	1
63.	Occup. Therapist	1	1	0	0	0
64.	Oceanographer	0	1	1	1	1
65.	Optician	0	0	0	0	0
66.	Pers. Interviewer	3	1	1	0	0
67.	Pharmacist	1	1	0	1	0
68.	Photographer	0	5	3	1	0
69.	Phys. Therapist	1	2	2	1	0
70.	Physician	4	1	0	0	0
71.	Physicist	0	0	0	0	0
72.	Policeman	2	0	1	0	1
73.	Practical Nurse	0	0	0	0	0
74.	Production Mgr.	1	0	0	0	0
75.	Psychologist	5	1	2	0	0
76.	Pub. Health Off.	2	2	2	2	1
77.	Purch. Agent	0	1	0	0	1
78.	Radio/TV Anncr.	0	0	0	0	0
79.	Radio/TV Serv. Tech.	0	0	0	1	0
80.	Real Estate Sales.	0	0	0	1	0

TABLE VI-5 (continued)

Occupation Number	Occupation Name	Sets 1	2	3	4	5
81.	Receptionist	0	0	0	0	0
82.	Recreat. Worker	0	0	1	1	0
83.	Reg. Nurse	0	0	0	0	0
84.	Ret. Store Mgr.	0	1	1	1	1
85.	Sci. Labor. Tech.	2	1	0	0	0
86.	Secretary	0	0	2	1	0
87.	Secur. Salesman	1	0	0	0	0
88.	Sing. & Sing. Teach.	2	1	1	0	1
89.	Social Worker	1	0	1	1	0
90.	Soil Conser.	0	1	0	0	1
91.	Statistician	0	1	0	0	0
92.	Stewardess	0	0	2	1	0
93.	Surveyor	0	1	1	1	1
94.	Systems Analyst	1	0	1	1	0
95.	Teacher Aide	0	0	0	0	0
96.	Teacher, Ele. Sch.	2	0	0	0	0
97.	Teacher, Sec. Sch.	5	4	4	0	1
98.	Tech. Writer	0	1	1	0	0
99.	Telephone Crafts.	0	0	0	0	0
100.	Tool & Die Maker	0	0	0	0	0
101.	Typist	0	1	0	0	0
102.	Urban Planner	4	0	2	1	0
103.	Veterinarian	1	2	0	0	0
104.	X-Ray Tech.	0	0	0	1	0

TABLE V I-6

TOTAL FREQUENCY (EXLUDING DUPLICATES) WITH WHICH EACH OCCUPATION WAS USED IN COMPARE

Occupation Number	Occupation Name	Frequency	Occupation Number	Occupation Name	Frequency
1.	Accountant	4	55.	Mech. Engineer	4
2.	Actor/Actress	2	56.	Engr. Tech.	2
3.	Actuary	2	58.	Medical Tech.	1
4.	Advt. Copywriter	1	59.	Meteorologist	3
5.	Aircraft Mech.	1	60.	Model	1
6.	Airline Pilot	1	61.	Musician	2
8.	Architect	3	62.	News. Reporter	2
9.	Automobile Mech.	1	63.	Occ. Therapist	1
10.	Auto Salesman	2	64.	Oceanographer	3
11.	Bank Officer	2	65.	Optician	1
13.	Beautician	1	66.	Pers. Interviewer	4
15.	Bookkeeper	1	67.	Pharmacist	3
16.	Broadcast Tech.	5	68.	Photographer	9
18.	Chem. Engineer	2	69.	Phys. Therapist	4
20.	Civil Engineer	9	70.	Physician	4
22.	Commer. Artist	2	71.	Physicist	1
23.	Computer Prog.	4	72.	Policeman	4
24.	Counselor, Sch.	6	74.	Production Mgr.	2
25.	Dental Asst.	2	75.	Psychologist	7
27.	Dentist	2	76.	Pub. Health Off.	3
29.	Dietitian	1	77.	Purch. Agent	3
30.	Draftsman	3	79.	Radio/TV Serv.Tech	1
31.	Electrical Eng.	4	80.	Real Estate Sales	1
32.	Elect. Tech.	5	82.	Recreat. Worker	3
33.	Fine Artist	3	84.	Ret. Store Mgr.	2
34.	Flight Engineer	5	85.	Sci. Labor. Tech.	2
35.	Forester	6	86.	Secretary	2
36.	Funeral Director	1	87.	Secur. Salesman	1
37.	Geographer	2	88.	Sing.& Sing.Teach.	3
38.	Home Economist	1	89.	Social Worker	3
39.	Hotel/Motel Mgr.	3	90.	Soil Conser.	3
40.	Indust. Designer	6	91.	Statistician	1
41.	Indust. Eng.	8	92.	Stewardess	4
42.	Ind. Traffic Mgr.	1	93.	Surveyor	4
43.	Inhal. Therapist	3	94.	Systems Analyst	4
45.	Insur. Salesman	1	95.	Teacher Aide	1
46.	Inter. Decorator	5	96.	Teacher, Ele.Sch.	2
47.	Labor Rel.Spec.	1	97.	Teacher, Sec.Sch.	8
48.	Lawyer	8	98.	Tech. Writer	1
49.	Librarian	2	100.	Tool & Die Maker	1
51.	Machinist	1	101.	Typist	1
53.	Market Researcher	1	102.	Urban Planner	7
54.	Mathematician	5	103.	Veterinarian	4
			104.	X-Ray Tech.	1

about across all sets, and the frequency with which each was used, not counting duplication for any one student. As in Table VI-4, the frequency indicates the number of different people for whom the occupation was selected for query. This represents interest in 87 (84%) of the 104 occupations then in SIGI. The mean number of different occupations asked about by each student was 8.2. Again, the result suggests that the selection of occupations is useful to the junior college population.

Table VI-7 lists the occupations that were not used in the two systems.

TABLE VI-7

OCCUPATIONS THAT DID NOT COME UP IN LOCATE AND COMPARE

LOCATE	COMPARE	LOCATE and COMPARE
Advt. Copywriter	Appliance Serv.	Appliance Serv.
Appliance Serv.	Bank Teller	Cloth. Designer
Automobile Mech.	Biol. Scientist	Instru. Repair.
Auto Salesman	Bus. Mach. Serv.	Libr. Technician
Bookkeeper	Chemist	Medical Rec. Lib.
Cloth. Designer	Cloth. Designer	Practical Nurse
Commer. Artist	Dent. Hygienist	Radio/TV Anncr.
Dental Asst.	Diesel Mechanic	Receptionist
Instru. Repair.	Instru. Repair	
Libr. Technician	Libr. Technician	
Medical Rec. Lib.	Mfgr. Salesman	
Model	Medical Rec. Lib.	
News. Reporter	Practical Nurse	
Physicist	Radio/TV Anncr.	
Practical Nurse	Receptionist	
Radio/TV Anncr.	Reg. Nurse	
Radio/TV Serv. Tech.	Telephone Crafts.	
Receptionist		
Secretary		
Stewardess		
Teacher Aide		
Tech. Writer		
Tool & Die Maker		
Typist		

The first column is the set of 24 that were not retrieved in LOCATE. The middle column is the set of 17 that were not selected for inquiry in COMPARE. The third column is the intersection of the two sets. Only eight occupations are contained in the third column. One of these--Radio/TV Announcer--was selected in both STRATEGY and PLANNING. Therefore it appears that 97 of the 104 occupations then available in SIGI were of interest to one or another of the 31 experimental students at some point in SIGI.

An examination of the occupations that are of no interest shows that they are below the mean with respect to their value ratings. The mean rating (excluding Interest Field) for the eight occupations in column three is 2.1, whereas the mean for all 104 occupations is 2.6. Apparently, the students are aware of which occupations are least likely to satisfy their values, and they seem to avoid them.

Follow-up of the Most Popular Occupations

It is interesting to see what happens to the most frequently retrieved occupations in LOCATE. Do the students select them for inquiry in COMPARE? Table VI-8 lists in the "Locate" column the nine occupations that were retrieved with the greatest frequency as listed in Table VI-4. The "Compare" column lists the ten occupations most frequently selected for inquiry in COMPARE as listed in Table VI-6.

TABLE VI-8

MOST FREQUENTLY USED OCCUPATIONS IN LOCATE AND COMPARE

Locate	Freq.	Compare	Freq.
Civil Engineer	16	Civil Engineer	9
Industrial Engineer	15	Photographer	9
Physical Therapist	13	Industrial Engineer	8
Physician	11	Lawyer	8
Sec. School Teacher	10	Sec. School Teacher	8
Psychologist	10	Psychologist	7
Chemical Engineer	10	Urban Planner	7
School Counselor	10	School Counselor	6
Industrial Designer	10	Industrial Designer	6
		Forester	6

The arrows between the columns indicate that six of the nine most frequently retrieved occupations are among the ten occupations most frequently selected in COMPARE. Apparently the students consider seriously the candidates nominated by LOCATE. The three occupations that did not make the "top ten" in COMPARE were nonetheless not neglected. Of the 13 students who retrieved Physical Therapist, four selected it in COMPARE. Four out of the 11 who saw Physician followed it up, and two out of 10 followed through with Chemical Engineer.

If we trace the source of occupations that appear in the "Compare" column, we find that eight students retrieved Lawyer in LOCATE, and nine students retrieved Urban Planner. (This does not necessarily mean that all of the students selecting these occupations in COMPARE had retrieved them in LOCATE,

but one can assume that that was the case in many instances.) On the other hand, Photographer came up only once in LOCATE, and Forester came up three times. In the main, however, it appears that the occupations asked about most frequently in COMPARE were nominated in LOCATE.

One cannot follow these "most frequent" occupations farther with much confidence because the selection process involved in occupational choice drastically reduces the numbers. For example, the most popular occupation used in PLANNING, Secondary School Teacher, was chosen by only five students in that system. Nevertheless, one can assert tentatively that the "top ten" occupations in LOCATE and COMPARE are also the most frequently selected in PLANNING.

Table VI-9 lists the occupations selected twice or more in PLANNING.

TABLE VI-9

MOST POPULAR OCCUPATIONS ACROSS LOCATE, COMPARE, AND PLANNING

No. of Times Selected for Planning	Occupation	Appeared Among "Top Ten" in: LOCATE	COMPARE
5	Secondary School Teacher	x	x
4	Architect		
4	Civil Engineer	x	x
3	Broadcast Technician		
3	Draftsman		
3	Industrial Designer	x	x
3	Lawyer		x
3	Psychologist	x	x
2	School Counselor	x	x
2	Forester		x
2	Industrial Engineer	x	x
2	Physician	x	
2	Radio/TV Announcer		
2	Recreation Worker		
2	Urban Planner		x

An X in the "Locate" or "Compare" columns indicates that the occupation is included in the "top ten" list of Table VI-8. Of the 15 occupations listed, only six were not among the most frequently encountered in LOCATE and COMPARE. Of these six, only one--Radio/TV Announcer--was not retrieved in LOCATE nor made subject of inquiry in COMPARE.

To pursue this matter further, one can examine Table VI-10, which shows the frequency with which students selected for PLANNING an occupation that appeared in the other systems. Table VI-10 may imply an assumption that is not wholly true, namely that an occupation selected for PLANNING represents the end point of the decision-making process. Actually, as we saw in Chapter IV, some students seem to use PLANNING in the same way they use LOCATE and COMPARE rather than as the culmination of a search that began in those systems. Nevertheless, it is reasonable to believe that students who have explored in other systems the occupations they select for PLANNING are better off than those who select an occupation they have not explicitly studied in SIGI.

The names of the occupations identified by number in Table VI-10 can be found in Table VI-3 above. A "1" opposite the name of a system in Table VI-10 indicates that the occupation planned for appeared in that system for that student. An examination of the table shows that students only rarely pick an occupation out of the air when they get to PLANNING. In only three instances (4 per cent of the total) did students select an occupation that did not appear in other systems: Students 18, 47, and 57.

TABLE VI-10

APPEARANCE IN OTHER SYSTEMS OF OCCUPATIONS SELECTED FOR PLANNING

Student Number	Planned Occupation Number	Other systems than Planning			
		LOCATE	COMPARE	DESIRABILITY	STRATEGY
12	20	1	1	1	1
	34	0	1	0	0
	16	0	1	0	0
	18	1	0	0	0
	93	0	1	0	1
13	16	0	1	1	1
	78	0	0	0	1
15	11	1	1	1	1
16	89	0	1	1	1
17	39	0	1	1	1
	84	0	1	1	1
18	8	1	1	1	1
	102	1	1	1	1
	30	0	0	0	0
20	20	1	1	0	1
	30	0	0	1	1
	74	1	1	0	1
21	86	0	1	1	1
22	24	1	0	1	1
	75	1	0	1	1
23	30	0	1	1	1
	20	1	1	1	1
	41	1	1	0	1
24	20	1	1	1	0
	41	1	1	1	1
	51	0	1	1	1

TABLE VI-10 (continued)

Student Number	Planned Occupation Number	Other systems than Planning			
		LOCATE	COMPARE	DESIRA-BILITY	STRATEGY
25	27	1	1	1	1
	8	1	0	0	1
26	35	1	1	1	1
29	66	1	1	1	1
30	97	1	1	1	1
33	102	1	1	1	1
	88	0	1	1	1
34	33	1	1	1	1
	40	1	1	1	0
	8	1	0	1	0
35	6	0	0	1	1
37	45	0	1	0	1
	70	1	1	1	0
38	8	0	1	1	1
	85	1	1	1	1
	32	1	1	0	1
	104	1	0	0	1
39	97	0	1	1	1
40	97	1	0	0	0
	4[illegible]	0	1	1	0
43	48	1	1	1	1
	75	1	1	1	1
	70	1	1	1	1
47	40	1	1	1	0
	78	0	0	0	0
49	54	0	1	0	1
	97	1	1	1	1
51	1	0	1	1	1

TABLE VI-10 (continued)

Student Number	Planned Occupation Number	Other systems than Planning			
		LOCATE	COMPARE	DESIRABILITY	STRATEGY
52	16	1	1	1	1
	31	1	1	1	1
54	35	0	1	1	1
	82	0	0	0	1
	48	0	0	1	1
56	40	1	1	1	0
57	48	1	1	1	1
	96	0	1	1	1
	75	1	1	0	1
	82	0	1	1	1
	24	1	1	1	1
	92	0	1	1	0
	103	0	1	0	0
	83	0	0	0	0
	69	1	0	0	0
58	97	1	1	1	1

And in each of those instances the occupation was not the only one selected by the student for planning. In 69 per cent of the cases, the selected occupation appeared in three or more other systems. An inference from these observations is that most students seem to be using SIGI as a whole rather than piecemeal.

Use of Questions in COMPARE

Twenty-seven questions are available to students as the basis for inquiry in COMPARE. How are they asked?

Table V -5 showed that the mean number of questions asked by the 31 experimental students was 20.8. Table VI-11 reverses the point of view and shows the total number of students asking each question, without duplication. That is, the last column counts the number of students asking a question, not the frequency with which the question was asked.

TABLE VI-11

FREQUENCY (EXCLUDING DUPLICATES) OF QUESTIONS USED IN COMPARE

Question No.	Content of Question	No. of Students Using
11	Definition of occupation	20
12	Description of work activities	22
13	Level of skill in interaction	12
14	Where to get more information	9
15	Formal education beyond high school	21
16	Specific occupational training	8
17	Related college courses	17
18	Personal qualifications	20
19	Other requirements	10
20	Beginning salary	19
21	Average income	16
22	Top salary possibilities	12
23	How salaries vary	9
24	Opportunities to help others	7
25	Opportunities for leadership	2
26	What fields of interest	17
27	Prestige level	4
28	Physical surroundings	11
29	Leisure (hours)	19
30	Independence on the job	13
31	Variety	13
32	Fringe benefits	7
33	Employment outlook	19
34	Where are the jobs	23
35	Job security	14
36	Advancement	12
37	How many women	12

The most popular questions for this group of students appear to be pragmatic and concrete--location, description, educational requirements, definition, personal qualifications, salary, outlook, leisure, interest fields, and college courses. The least popular questions tend mostly toward more abstract concepts--leadership, prestige level, opportunities for helping others, although fringe benefits and occupational training are of the "nuts and bolts" type.

Approximately the same results emerge from an examination of the frequency with which each question is selected for each of the first five sets of occupations. This information is contained in Table VI-12. The table does not extend further because very few students used more than five sets of occupations. For the first three sets, education was the most popular single subject of inquiry, unless four questions about salary are taken as one question. Location of work opportunities does not appear as the first concern of students, being replaced by outlook. Otherwise, the top five questions for the first set are the same as the top five in Table VI-11. Once again, prestige, fringe benefits, and opportunities for leadership are areas of least concern.

Tables VI-11 and VI-12 suggest that every question in COMPARE was of interest to someone in this small sample. They also show that students tend to zero in on occupations by seeking concrete information: How much education is required for entry? What income is produced? Where is the work located? How is the occupation defined? What work activities are required? Students seem less interested in the more abstract [illegible] dimen-

TABLE VI-12

FREQUENCY COUNTS OF QUESTIONS ASKED FOR THE FIRST FIVE SETS OF OCCUPATIONS SELECTED IN COMPARE

Question Number	Content of Question	Sets 1st	2nd	3rd	4th	5th
11	Definition	8	5	5	4	1
12	Description	8	7	5	4	5
13	People, Data, Things	6	1	1	0	0
14	Where to Get Information	2	3	0	1	2
15	Education	11	9	6	4	2
16	Occupational Training	3	1	1	0	1
17	College Courses	7	3	3	2	2
18	Personal Qualifications	8	8	3	1	2
19	Other Requirements	2	2	2	1	1
20	Beginning Salary	7	7	6	5	4
21	Average Income	4	5	3	3	3
22	Top Salary	3	2	3	2	1
23	How Salary Varies	3	1	0	0	1
24	Helping Others	3	2	0	0	0
25	Leadership	1	1	0	0	0
26	Interest Fields	4	5	3	2	1
27	Prestige	0	1	0	0	0
28	Surroundings	2	3	1	1	1
29	Leisure	3	6	3	2	3
30	Independence	3	3	2	2	0
31	Variety	3	4	2	1	0
32	Fringe Benefits	0	0	1	1	1
33	Outlook	8	4	3	3	3
34	Location	7	6	0	2	3
35	Security	5	1	1	3	0
36	Advancement	2	2	0	1	0
37	Men/Women	3	1	2	1	1

sions of the occupation than one would expect, considering that entry into COMPARE initially follows LOCATE, where the importance of values in occupational choice is stressed. For instance, Interest Field was the top-weighted value, but as a subject for inquiry in COMPARE it ranked 9th among the 27 questions. Helping Others, ranked fifth by weight, was ranked 24th in COMPARE.

One should not press these comparisons too far. A value dimension of an occupation may be apparent on its face; moreover, the student will already know something about the occupations he got from LOCATE. For example, he may have specified an interest field or a minimum for helping others. In either case, there would be no reason to ask about the known quantities in COMPARE. Nevertheless, if one were to judge only from the students' behavior in COMPARE, he would have to conclude that the primary questions students ask are not about satisfactions an occupation may offer. They are about its operational parameters: What is it? What does it pay? How much education does it require? In a revised version of SIGI it may be desirable to point their inquiry in COMPARE more toward the values that they have weighted high.

Range and Use of Desirability Sums

Desirability Sums represent the interaction between the satisfactions a student desires (the weight given each value) and the opportunities an occupation offers to satisfy those desires (the ratings of each occupation on each value).

Desirability Sums of all SIGI occupations were calculated for each student. The rating of each occupation on each value is multiplied by the weight the student assigned to that value; the ten products are then added to obtain the student's Desirability Sum for that occupation. Students were given a printout of the Sums, arranged in rank order, for all 104 occupations then in SIGI. This rank order was unique for each student in the pilot study, being a function of a student's own values.

Nevertheless, it is of interest to compute the mean Desirability Sums for the 104 occupations across all 31 students. This appears in Exhibit VI-1. The means range from a low of 61.65 for Model to a high of 136.19 for Physician. (The lowest possible sum would be 40, and the maximum 168.) Note that the standard deviations show considerable variation across students in the desirability of each occupation.

A question of some importance is whether the occupations are distinct from one another in terms of the values dimensions used in SIGI. To provide data on this issue, 100 of the SIGI occupations (the maximum number that could be handled by the program) were subjected to a hierarchical cluster analysis (Gruvaeus & Wainer, 1972). The input for the analysis was a distance matrix based on nine value ratings for each occupation (Interest Field was omitted, since distribution of ratings across six interest fields was bound to reduce any tendency toward clustering except within each interest field.) The results from this analysis failed to show any meaningful clustering of the occupations. The within group distances were, in general, greater than the between group distances. The groups formed were not readily identifiable.

Asterisks to the left of the occupational titles in Exhibit VI-1 indicate careers requiring at least four years of college. Not surprisingly, many of the occupations that offer the greatest possibility of satisfying most of the SIGI values are those that require a college degree. For example, Physician has the highest possible rating on all values except Leisure and Early Entry. Consequently, a rather high sum for that occupation is virtually inevitable.

The list of Desirability Sums sent to students included the asterisks to indicate occupations requiring a college degree. At the terminal the student had been previously informed of the range and significance of the Desirability Sums. An example of the use made of this listing is seen in the behavior of one young woman. She circled the occupations that had high Desirability Sums, interested her, and were tolerable in the amount of preparation required. She brought the table with her for her next session in order to investigate the circled occupations further.

Desirability Sums of occupations selected in DESIRABILITY. For each student, the rank order was determined for the three occupations used in going through the Desirability section of SIGI for the first time. The mean rank of these occupations for the total experimental group is 11.9 for the first occupation, 23.6 for the second, and 53.4 for the third. In other words, the student's first-choice occupation on the average was the twelfth one in his list of all occupations in rank order of desirability. The mean rank of the three occupations together is 30.3.

It can be concluded from these means that in the Desirability section (1) students are using occupations with relatively high rankings, and (2) there is a good spread in Desirability Sums among the three occupations.

Correlation Between Reading Ability and System Times

Some visitors to SIGI, familiar with the range of abilities found in the junior college population, have asked whether the reading load of the system might not be too demanding for some students. We have no evidence that these concerns are justified. Both the syntax and the vocabulary of displays have been kept as simple as is consonant with fidelity to the idea being expressed. The groundwork is carefully laid for difficult concepts like specification and probability, and the terms are defined operationally, in context, and are amply illustrated. No student either in the preliminary trial in 1972 or the pilot study which is the subject of this report has mentioned difficulty with the reading load.

Nevertheless, we took advantage of the pilot study to see if significant correlations exist between reading ability and behavior at the terminal. Time within a system was taken as the only available measure of behavior at the terminal relevant to reading, even though, as mentioned earlier, it is not the best indicator of what the student is getting out of SIGI. The student's score on the reading section of the Comparative Guidance and Placement (CGP) battery was taken as the measure of reading ability. The correlations are shown in Table VI-13.

TABLE VI-13

CORRELATION BETWEEN CGP READING AND SYSTEM TIMES

System	r
Introduction	-.67**
Values	-.56**
Values Game	-.04
Values Reweight	-.04
Locate	-.46**
Compare	-.14
Desirability	.04
Strategy	-.29
Planning	.15
Prediction	-.37

** Significant at .01 level

The table indicates that significant negative correlations exist with respect to INTRODUCTION, VALUES, and LOCATE. The first two are understandable, since in these systems all students encounter pretty nearly the same amount of reading material. The correlation in LOCATE is harder to understand; the amount of reading is light and the student's role is very active. One may speculate that the novelty of making and altering his specifications slows down the response time of the less able reader. None of the correlations for other systems is significant.

Table VI-13 indicates, then, that the less able reader is slowed down in parts of SIGI. In an attempt to see whether he is at any other disadvantage, we used the median CGP reading score to divide the experimental

students into two groups, those above and those below the median. The groups were then compared with respect to the "grade" (A, B, C, etc.) students assigned to SIGI on three items in their post-SIGI evaluation sheet: (1) "Grade SIGI on how interesting it was." (2) "How clear were SIGI's directions?" (3) "Overall, how helpful was SIGI?" These items were selected because we felt that a student's evaluation of them might be affected by the level of his reading comprehension. There was no difference between the two groups with respect to any of the three items. This result confirms the statements of participants in the preliminary study, all of whom denied having encountered any problems in understanding the displays.

There is, therefore, no evidence at the present time that low reading ability has any effect on a student's interaction with SIGI except to make him take longer. One of the principal arguments for individualized education is that it allows the slow reader to take his time. This principle holds for SIGI, which places no time restrictions on the student. He can stay at the terminal without pressure as long as something useful is happening.

Effect of Sex Differences

The 31 experimental students were divided into groups by sex, and the scores on all appropriate measures of interaction with the system were compared. There were no differences by sex on any measure.

Effect of Previous Knowledge of Occupational Information

The experimental students were divided into two groups on the basis of their putative knowledge of occupations as indicated by their responses in INTRODUCTION. (See Table V-1, Chapter V.) Fifteen students had reported that they knew all or a few occupations relevant to their values, and 16 reported that they needed much information. The scores on all measures of interaction with the system of these two groups were compared to see whether or not the students' belief that they already had considerable occupational information would affect their interaction with SIGI. There were no differences between the groups on any measure. Apparently, students who feel considerable need for career information interact with SIGI to the same degree as students who perceive themselves as better off.

Experimental and Control Group Comparisons

In addition to an examination of student behavior at the terminal, our evaluation of the system included comparisons between the SIGI group (experimentals) and a control group on responses to a structured interview. The assumption behind this comparison was that students who go through SIGI would be more aware of the elements that contribute to a rational decision-making process than would students who had not been through SIGI.

The interview schedule was designed to evaluate three criteria regarded as important elements in rational decision-making: (1) the number of occupational constructs (e.g., value concepts) that the student could volunteer in an appropriate context (Part 1 of the interview); (2) the extent

and nature of the student's planning (Part 2 of the interview); and (3) the amount of information about a preferred occupation. A separate score was derived for each of these criteria. The interview schedule is described in Chapter II, pp. 37-38 of this report.

Interview score means and standard deviations for the experimental and control groups are presented in Table VI-14. The table shows that the means for the experimental group exceed those of the control group on all

TABLE VI-14

INTERVIEW SCORES FOR THE EXPERIMENTAL AND CONTROL GROUPS

Interview Measures	Mean		S.D.		t
	Exp.	Cont.	Exp.	Cont.	
Constructs	9.19	8.03	3.08	3.50	1.34
Planning	7.36	5.43	1.68	2.16	3.79**
Information Test	12.81	11.82	2.92	3.76	1.13

** Significant of .01 level

measures. Of the three measures, however, only the difference between the means on Planning reaches significance ($p < .01$). That is, the two groups are significantly different with respect to the final element (planning) of the decision-making process, but the difference does not reach significance with respect to the acquisition of information and the formulation of occupational constructs.

This outcome is consistent with the findings, discussed more fully in Chapter IV, that students seem to use SIGI in accordance with their idiosyncratic style or needs or, perhaps, both. SIGI was designed to encourage experimentation and to accommodate a great variety of behaviors. Our expectation was, however, that, regardless of how distinctive a student might be in his approach, he would learn all the elements of a logical decision-making sequence by going through it. The steps in this sequence are defined by the path prescribed for the novice: (1) the determination of his values, (2) the location of opportunities for realizing those values, (3) the collection of information about those opportunities, and (4) the formulation of plans that combine an acceptable risk with an acceptable reward. Although students successfully fabricate a logical decision-making procedure at the terminal, where all the elements of such a procedure are in full view, they do not transfer the procedure to the context of the interview, where the elements are no longer visible.

It seems probable that the tendency of many students to select one of the systems for heavy use, subordinating the others, accounts for their failure to transfer all elements of the decision-making process. It is conjectured that the heavy users of VALUES and LOCATE account for the difference in mean between the experimentals and controls with respect to Constructs, and the heavy users of INFORMATION account for the difference in the Information Test. Other users would show no difference. The number of such heavy users in any one system, however, is too small to cause a significant difference between the groups as a whole.

Some support for the hypothesis of differential use is found in an examination of the intercorrelations of the three interview scores and the Reading test scores in the experimental and the control group. (See Table VI-15.) The table shows that the three separately scored parts of

TABLE VI-15

INTERCORRELATIONS OF INTERVIEW AND READING SCORES FOR EXPERIMENTAL AND CONTROL GROUPS

	Experimental (N=31)			
	Information	Constructs	Planning	Reading
Information	1.00			
Constructs	.05	1.00		
Planning	.08	.27	1.00	
Reading	.29	.07	.06	1.00

	Control (N=30)			
	Information	Constructs	Planning	Reading
Information	1.00			
Constructs	.54	1.00		
Planning	.36	.19	1.00	
Reading	.19	.65	.30	1.00

the test and the Reading score are all independent of one another in the experimental group.

In the control group, however, there are substantial correlations between Constructs and Information and between Constructs and Reading. Thus, the pattern of intercorrelations suggests less differentiation on the various measures in

the control group than in the experimental group. One effect of SIGI, therefore, appears to be differential change on the three criterion measures, independent of reading ability, from a relatively undifferentiated pretreatment status which is tied in with reading ability. Finally, it should also be noted that the interview scores for Student 23 (the subject of Chapter III), who used all subsystems about equally, were above the mean of the experimental group on all four measures, though only slightly on Constructs. His scores were Constructs, 10; Planning, 9; and Information, 17.

It is also possible that the method of scoring the interview deprived it of sensitivity for measuring the depth of an experimental student's value constructs. Each different construct mentioned by the student was counted only once, regardless of the number of times or ways in which it was mentioned. Consequently, a student who, for example, referred to many different aspects of Helping Others received the same score on that construct as a student who referred to it only once. The purpose of scoring this way was to avoid penalizing inarticulate students. That aim was apparently accomplished, for the correlation between constructs and CGP reading is only .07 in the experimental group, whereas it was .65 in the control group. Unfortunately, this outcome seems to have been achieved at the sacrifice of measuring the richness of the student's constructs.

Student Evaluation of SIGI

At the conclusion of their interview, the experimental students were asked to evaluate their SIGI experience by responding to a written questionnaire. The first part of this instrument asked them to assign a letter grade to various aspects of the system, and the second part to answer 16 questions about their attitudes and suggestions for improvement.

Grades assigned to SIGI. Table VI-16 shows the mean grade that these students gave to SIGI on a scale from A (4 points, highly favorable) to F (0 points, highly unfavorable). In general, the grades were high. SIGI's GPA would be better than B. Students found SIGI interesting (3.8), the directions clear (3.8), and the system helpful (2.8). They also found the various components of SIGI worthy of B grades (in the range of 3.0 to 3.4). It is interesting to note that the mean grade on SIGI's overall helpfulness (2.8) is lower than the mean grades on the helpfulness of any of the individual sections of SIGI. This expression of feeling with respect to usefulness agrees with our observation of student behavior at the terminal: many of them seem to favor one system at the expense of the whole. It also agrees with the assessment of interview scores, discussed earlier, which showed that the experimental students were not significantly different from the controls with regard to two of the three elements of decision-making that were measured by the interview. It seems probable that the tendency to use one system more heavily than others causes the students to perceive that system as more helpful than the whole. Again, the large standard deviations reflect the different points of view entertained by individual students concerning SIGI as a whole and each of its subsections.

TABLE VI-16

EVALUATION OF SIGI BY EXPERIMENTAL GROUP

Questionnaire Item	Grade Mean*	S.D.
1. Grade SIGI on how interesting it was:	3.8	.8
2. How clear were SIGI's directions?	3.8	.5
3. Overall, how helpful was SIGI--give it a grade--	2.8	.8
4. Give SIGI a grade showing how useful it was in each of the following:		
a. Helping you become more aware of your values?	3.1	.8
b. Helping you understand that values are related to career decisions?	3.2	.9
c. Helping you find out which occupations might fit your values?	3.0	.9
d. Helping you get information about occupations?	3.4	.9
e. Helping you understand that predictions of GPA are expressed in probabilities?	3.0	.8
f. Helping you estimate probabilities of success in one or more programs?	3.1	.9
g. Giving information about programs of study at MCCC?	3.4	.8
h. Helping you plan a program appropriate for an occupation you are considering?	3.3	.8
i. Helping you learn how to make career decisions?	3.1	.7

* The scale ran from F (0) to A (4)

Attitudes and suggestions. A summary of the students' responses to the remaining 16 questions of the evaluation of SIGI appears in Table VI-17. The responses speak for themselves. Two items, however, deserve comment:

1. About one-quarter of the students (7 out of 31) expressed a need to get advice from a counselor. This direct expression of sentiment confirms our opinion, based on our observation of students at the terminal, that there should be articulation between SIGI and the regular counseling services. The SIGI Counselor's Handbook, which is an appendix to this report, was prepared for that purpose. It was not available at the time of the pilot study, but it would be distributed as part of counselor training in a future field test.

2. In general, the three-hours' experience at the terminal does not result in the immediate selection of an occupation. It is doubtful if so drastic an effect would be desirable. Rather, SIGI seems to provide direction or encouragement to the students and to make them feel more comfortable about their choices. Only 7 of the 31 students said that they were still uncertain about their occupation, whereas 24 received some feeling of progress toward closure.

By way of illustration, it is interesting to see what four students who felt they had profited from SIGI said in their interview. Student 12 mentioned the impact of his predictions; he also succeeded in narrowing down his choice from the general field of mathematics to the occupation of

TABLE VI-17

STUDENT'S EVALUATION OF SIGI

Do you feel as if you need to get advice from a counselor now? (other than approving your program) Yes 7 No 24

If yes, what kind?

1	occupational choice		personal life
2	curriculum choice	1	financial aid
2	course selection	2	special question

When you first came to SIGI, how well did you know what occupation and program you wanted?

12 I came to SIGI not knowing what I wanted to do.
10 I came to SIGI having several alternatives.
9 I came to SIGI knowing for sure what I wanted to do.

Now, how well do you know what occupation and program you want?

7 I'm still uncertain.
9 I have a much better idea now.
2 SIGI helped me to choose one.
9 SIGI helped confirm the choice I had already made.
4 SIGI suggested other things which I am considering.

What was the most useful section of SIGI for you?

10 Values 15 Information 5 Prediction 7 Planning 2 Strategy

Is there anything SIGI didn't cover that you would like it to cover?
What: Most said no

Is there any area you would like to have covered more fully?

Most said no

Did you have any trouble locating an occupation you were interested in (in LOCATE)? Most said no

Were there any occupations missing from SIGI that you were interested in?
See Table V-18

Name of Occupations

Do you expect to return to MCCC next fall? 25 Yes 1 No 3 Don't know 1 Spring '74

If so, would you want to use SIGI again? 15 Yes 9 No 6 Maybe

How often do you think you would use it? Which sections would you use most?

4 Values 15 Information 7 Prediction 11 Planning 3 Strategy

Is there anything else you would like to tell us that would help us improve SIGI? Most said no

Have you told any of your friends at MCCC about SIGI? If so, how many? Most said yes

Would you advise friends in your class at MCCC to use SIGI?
29 Yes 1 No 1 Maybe
Would you be willing to answer a few questions about your occupational and educational plans a year from now? 31 Yes 0 No

Secondary School Teacher of Mathematics. Student 18 entered SIGI with the idea of becoming an architect. She was allowed to see our writeup of Architectural Technician, an occupation not yet entered in the system. She learned that that occupation required less education but still kept the door open to her original choice. She made up her mind to enroll in Architectural Technology. Student 38 had likewise considered becoming an architect, but his SIGI experience, especially his predictions, has given him alternatives in the technology fields. Student 37 had started out with no idea of what career to follow; when he signed off, he was fairly confident that Life Insurance Salesman was a career that he might enjoy. He had rejected Physician and Forester along the way, the former because it required too much education and the latter because his predictions in biology were too gloomy. Student 43 was leaning toward a career as a psychologist because of unexpectedly hopeful predictions and information she had learned in SIGI.

Occupations not in SIGI. Question #24 asked the students to name occupations that they would have liked to find in SIGI. Table VI-18 lists the occupations named in the responses. Some of the occupations listed are among those that have been added since the completion of the pilot study: Architectural Technician, Medical Laboratory Technician, and Speech Pathologist.

The SIGI occupational base will be expanded to about 200 occupations as soon as possible. Plans for expansion beyond that point are uncertain at present (September, 1973).

TABLE VI-18

OCCUPATIONS THAT STUDENTS WANTED TO SEE IN SIGI

College Teacher
Architectural Technician
Astronomer
Paramedical Occupations
Disc Jockey
Museum Curator
Florist
Jeweler
Food Preparation and Service
Radio, TV, & Film Occupations: Editor, Cameraman, Station or Program Manager, Producer

Development Work on Simulated Occupational Choice

The pilot study at Mercer College afforded an opportunity to try out the version of Simulated Occupational Choice (SOC) described in Chapter II, pp. 38-39. SOC is being developed as a possible criterion measure of ability in decision-making.

SOC was administered to the experimental and control groups after their interviews. Then intercorrelations were calculated for the various SOC scores that were discussed earlier in the report. Correlations were also calculated for the SOC scores and the interview scores, and for the SOC scores and usage measures of each SIGI system.

Examination of these data have led to extensive modifications in both the instrument and the method of scoring it. The development work is con-

tinuing under a grant from the National Institute for Education, with a preliminary test of a modified version scheduled for the fall of 1973 on a target population of ninth- and twelfth-grade students.

Self-Sufficiency in Operation

SIGI was designed to permit the student to interact without human assistance or preliminary instruction. When he first seats himself at the terminal, the student sees displayed a SIGI logogram and the words, "Press NEXT." Thereafter, each display contains instructions for proceeding to the next. The computer has been programmed to ignore any responses except those legal in the display on the screen. Therefore the student should not have to appeal to human help unless he fails to understand what he reads or the system malfunctions. The purpose behind this design for self-sufficiency was to increase the student's sense of privacy and to conserve human resources.

The pilot study gave us an opportunity to see whether or not the system was truly self-sufficient. A bright red telephone was installed at the terminal at Mercer College with a direct line to the Educational Testing Service telephone switchboard. A card taped to the terminal listed the number of the ETS computer room and instructed the student to call if he needed help.

Nearly all calls that came over this line were occasioned by system failures--occasional "bugs" in the program, hardware malfunctions due to humidity or low line voltage, errors in the transmission of data over the

telephone line from which the system could not recover. Two students called because they did not realize that the names of the "jobs" in the Values Game were fictitious. Only one student reached a complete impasse because he did not understand the directions; he did not realize that a certain frame in the Prediction system requires two inputs before the student can proceed.

It appears, therefore, that students can interact successfully with a minimum of human assistance. This conclusion implies that a single clerk could monitor several terminals in a counseling center and still be free to schedule student visits and handle their printouts and requests for appointments with counselors. On the basis of our experience in the pilot study, it seems unlikely that extensive training would be necessary. The monitor should be able to turn the equipment on and off, to change the ribbons and paper supply in whatever printer is selected for the final hardware configuration, and to recognize hardware malfunctions when they occur.

Concluding Remarks

The data in this chapter present a picture of SIGI showing that it was used very much in the way it was designed to be used. Each of the values in the Values system and each of the questions available in COMPARE are important to some students. Even though our sample was small, a large proportion of the total number of occupations was used in one system or another. The standard deviations of mean Desirability Sums show considerable variation across students. A cluster analysis indicates that the

occupations are distinct from one another in terms of value ratings. Furthermore, the fact that students select in one system occupations that they discovered in another suggests that SIGI as a whole has integrity. It is not simply a set of separate operations that fail to hang together.

On the other hand, the fact that differences between the experimental and control groups reached significance only with respect to their scores on the Planning section of the interview and the fact that in COMPARE students asked few questions about the value dimensions of occupations suggest that the depth of the interaction with the various systems is not uniform. Even though students use SIGI as a whole, in working toward a decision about occupational choice they seem to identify one system or another as most helpful.

This observation is borne out when one examines the printouts showing the behavior of individual students and when one looks at the statistics showing how variable was the usage of the SIGI systems. Variability in student behavior was the subject of Chapter IV.

EXHIBIT VI-1

DESIRABILITY SUMS

DESIRABILITY RANKINGS

RANK		MEAN	S.D.
1	*PHYSICIAN	136.19	13.60
2	*CIVIL ENGINEER	135.45	10.33
3	*PSYCHOLOGIST	135.23	11.31
4	*LAWYER	134.45	11.39
5	*TEACHER,SEC,SCH	130.81	8.51
6	*BANK OFFICER	129.94	7.93
7	*SPEECH PATH	129.94	8.16
8	*TEACHER,ELE,SCH	129.45	7.69
9	*COUNSELOR,SCH.	129.23	8.28
10	*REHAB COUNSELOR	128.03	8.71
11	*CLERGYMAN	125.55	10.37
12	*PHYS.THERAPIST	122.29	8.00
13	*INDUST. ENG.	122.03	11.40
14	*PUB.HEALTH OFF.	121.97	8.12
15	*URBAN PLANNER	121.74	8.62
16	*DENTIST	121.61	13.52
17	*VETERINARIAN	120.00	11.87
18	*POLITICAL SCIENTIST	119.45	11.52
19	*SOCIAL WORKER	119.26	9.24
20	*GEOGRAPHER	119.06	12.95
21	*SOIL CONSER.	117.71	9.11
22	*OCCUP.THERAPIST	115.32	7.87
23	*BIOL.SCIENTIST	115.13	12.75
24	*FORESTER	113.52	9.00
25	*LIBRARIAN	112.74	7.17
26	FUNERAL DIRECTOR	112.23	9.27
27	PERS.INTERVIEWER	111.77	7.40
28	*AIRLINE PILOT	111.71	10.65
29	*ARCHITECT	111.23	9.60
30	*MATHEMATICIAN	111.00	12.05
31	*DIETITIAN	110.97	7.40
32	POLICEMAN	109.65	8.47
33	*MECH. ENGINEER	109.58	13.22
34	PROD. MGR.	108.87	9.38
35	*LABOR REL.SPEC.	108.77	10.68
36	*METEOROLOGIST	108.55	11.40
37	*ELECTRICAL ENG.	107.97	12.76
38	*CHEM. ENGINEER	107.13	11.92
39	*OCEANOGRAPHER	106.23	10.60
40	FLIGHT ENGINEER	106.19	11.34
41	INHAL.THERAPIST	106.00	6.78
42	HOTEL/MOTEL MGR	105.71	7.05
43	NURSERYMAN	105.71	7.10
44	*HOME ECONOMIST	105.58	6.50
45	BROADCAST TECH.	105.52	11.19
46	*STATISTICIAN	105.26	11.66
47	SYSTEMS ANALYST	104.26	10.37

EXHIBIT VI-1 (continued)

48	*MARKET RESEARCH	104.03	11.18
49	*CHEMIST	103.32	10.91
50	*ECONOMIST	102.39	11.67
51	*PHYSICIST	102.03	11.31
52	*INDUST.DESIGNER	101.45	8.79
53	RET.STORE MGR	101.29	9.53
54	RECREAT. WORK.	101.10	8.47
55	REG. NURSE	100.26	8.57
56	FINE ARTIST	99.84	12.74
57	*ACTUARY	98.94	12.13
58	INTER. DECORATOR	97.61	8.90
59	DENT.HYGIENTIST	97.29	8.29
60	*PHARMACIST	94.74	10.22
61	IND.TRAFFIC MGR	94.42	7.07
62	*MEDICAL TECH.	94.06	9.31
63	X-RAY TECH.	92.90	7.14
64	BUS.MACH.SERV.	92.35	8.75
65	CLOTH DESIGNER	92.16	9.34
66	MFGR. SALESMAN	91.58	9.42
67	INSUR.SALESMAN	91.26	8.91
68	NEWS.REPORTER	90.87	6.95
69	SURVEYOR	90.55	9.03
70	SCI.LABOR TECH	90.10	11.12
71	SECUR.SALESMAN	90.00	7.53
72	ELECT. TECH.	89.94	9.86
73	AIR COND,REFRG,MECH	89.52	8.56
74	PURCH. AGENT	89.42	6.94
75	SOCIAL SERV AIDE	89.19	10.26
76	PHOTOGRAPHER	88.35	10.93
77	ADVT. COPYWRITER	87.39	8.85
78	MACHINIST	87.39	9.52
79	RADIO/TV ANN.	87.06	7.50
80	*MEDICAL REC, LIB	86.97	6.80
81	ENGR TECH	86.71	9.86
82	MUSICIAN	85.97	11.30
83	TEACHER AIDE	85.74	9.82
84	MECH LAB TECH	85.61	7.93
85	DIESEL MECHANIC	85.26	10.00
86	TELE.CRAFTSMAN	84.68	8.21
87	COMPUTER PROG.	83.71	9.78
88	BEAUTICIAN	83.52	7.31
89	SING&SING TEACH	83.39	10.68
90	ACTOR/ACTRESS	83.25	10.26
91	DENTAL ASST.	83.26	7.31
92	OPTICIAN	82.74	8.08
93	*PUB RELATIONS WORK	82.74	8.14
94	ARCH TECH	82.52	9.41
95	SECRETARY	82.39	7.80
96	REAL ESTATE SALE	82.35	7.41
97	STEWARDESS	82.10	7.62
98	INSTRU. REPAIR	81.97	9.54

EXHIBIT VI-1 (continued)

99	AVIONICS	81.48	9.63
100	RADIO/TV TECH.	80.68	8.18
101	TECH. WRITER	80.48	10.46
102	APPLIANCE SERV.	80.10	7.96
103	PRACTICAL NURSE	79.97	8.86
104	TOOL& DIE MAKER	79.19	8.50
105	ACCOUNTANT	78.48	6.91
106	DRAFTSMAN	78.29	8.41
107	BANK TELLER	77.48	9.26
108	AUTOMOBILE MECH	76.74	7.86
109	AIRCRAFT MECH.	76.45	8.23
110	COMPUTER OPERATOR	75.42	7.83
111	WASTEWATER	75.06	7.08
112	DANCER	74.68	10.50
113	COMMER. ARTIST	73.29	8.93
114	BOOKKEEPER	72.97	8.35
115	RECEPTIONIST	70.84	7.23
116	AUTO SALESMAN	67.39	7.70
117	TYPIST	66.42	8.72
118	LIBR.TECHNICIAN	64.58	8.47
119	MODEL	61.65	9.84

CHAPTER VII

EVALUATIVE HIGHLIGHTS

Students' Evaluation of SIGI

How students "graded" SIGI. The students who had been through SIGI reacted favorably to the experience. "Grading" the system on a five-point scale on which F (0) represented maximum dissatisfaction and A (4) maximum satisfaction, they gave SIGI mean grades between 3 and 4 on each of the following characteristics and accomplishments: interest level; clarity of directions; helpfulness in achieving increased awareness of values, understanding relation of values to career decisions, identifying occupations that fit values, getting information about occupations, understanding predictions expressed as probabilities, getting information about programs of study, planning an appropriate program, and learning how to make career decisions.

Understanding of the system. Students said that they understood the purpose and the function of each of the SIGI subsystems. They had become more aware of their values and had learned how values are related to career decisions.

Adequacy of the system. The students found SIGI fully adequate for their needs. Most students felt that the areas covered by SIGI had been covered in sufficient depth. While naming a few occupations they would have liked to find in SIGI, they did not think that any area of interest to them had been left uncovered. They would advise their friends to use SIGI,

and three-fifths of those who expected to return to their college the following year would like to use SIGI again. Each section of SIGI was named by some student as being most helpful to him.

Extent of monitoring required. The high marks that students gave SIGI on the clarity of its directions were borne out by their ability to follow those directions without outside assistance. A single monitor with a minimum of training could probably handle a multiterminal center.

Utility of the System Under Field Conditions

Adequacy of values selected for SIGI. Each of the ten values was sufficiently important to some student to be selected for use in the search for compatible occupations. Moreover, intercorrelations between the value weights assigned by the students showed that the values are relatively independent of one another. Finally, the values dimensions incorporated in SIGI appeared adequate to mediate successfully between individual preferences and occupations.

Selection of occupational information. Each of the categories of occupational information available to the students is important to someone. All of the 27 questions in COMPARE were used. In their interviews, most students said that the array of questions satisfied their needs, and they were unable to suggest additional questions.

Use of predictions. All available predictions were called for.

Stability of value weights. The value weights assigned in the students' first interaction with SIGI tend to remain stable throughout the rest of the interaction. Although two-thirds of the students chose to review their weights at some point, most did not change them or, if they did change them, changed them very little.

Recognition of the role of values. Students seemed to respect the role of values in occupational choice. They used their top-weighted values in LOCATE, and they tended to follow up occupations most frequently retrieved there. Also, their first-choice occupations in DESIRABILITY tended to have higher Desirability Sums than their second or third choices. When students changed their designation of a first-choice occupation, they followed a logical pattern of behavior: they tended to pick an occupation with either a higher Desirability Sum or a higher prediction. However, in COMPARE they tended to seek concrete information rather than to explore the more abstract value dimensions of occupations they were considering.

Selection of occupations. Students were willing to explore a wide variety of occupations. They inquired about 84 percent of the 104 occupations in SIGI at the time of the study. Ninety-seven of the 104 appeared in one system or another.

Distribution of Desirability Sums. The combination of weights given by students to each value and the ratings assigned to the occupations on each value dimension produced a rank order of Desirability Sums for the 104

occupations that was unique for each student. The standard deviations show considerable variation across students in the "desirability" of each occupation. A hierarchical cluster analysis showed that the occupations do not tend to cluster on the value ratings. That is, the occupations are distinct from one another in terms of the dimensions of values used in SIGI.

Variability in student behavior. Each student seemed to display an individual style in his interaction. Individual differences were apparent both in the amount of interaction students undertook within a subsystem and in the order in which they went from one subsystem to another as initiates. Many students seemed to identify a subsystem as being most useful to them and to use that subsystem extensively.

Accommodation to individual differences. SIGI was flexible enough to permit students to use it in an individualistic way. Students remained as long in any system as they wished and, as initiates, blazed their own unique trails through SIGI. No student reported frustration due to system design. Some students, however, suggested that a "back frame" feature be added.

Duration of the interaction. The mean total time at the terminal was almost exactly three hours. The mean time as a novice was almost exactly two hours. It seems likely, therefore, that the basic needs of most students for interaction with SIGI could be met in four 50-minute sessions; the needs of many students would be met in only three sessions; additional time would be required by some students.

Group differences. The experimental group scored higher than the control group on all three parts of the interview criterion measure--Information, Constructs, and Planning. The difference reached statistical significance only on Planning ($p < .01$). Apparently, students successfully utilize a rational decision-making procedure in a context where all the elements of such a procedure are in full view. But more research is needed on the extent to which the capability of constructing such a procedure transfers from the context of interaction with SIGI to the context of an interview in which the prompts so visible on the terminal are absent.

Intercorrelations among the three criterion scores and reading ability show independence of these four measures in the experimental group and substantial relationship in the control group. This finding suggests that one effect of SIGI appears to be differential change on the three criterion measures, independent of reading ability, from a relatively undifferentiated pretreatment status that is tied in with reading ability.

Effects of sex, reading ability, and previous knowledge. No differences were evident in the usefulness or effect of SIGI by sex or by the amount of occupational knowledge that the student claimed for himself before interaction with SIGI. With respect to reading ability, students who scored below the median of the study group on a reading test took longer in some subsystems than did the group as a whole, but no other differences were detected either in reports by students or in other observations.

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APPENDIX

SIGI COUNSELOR'S HANDBOOK

by

Warren Chapman

INTRODUCTION

The computer-based System of Interactive Guidance and Information (SIGI) is designed for use in junior and community college counseling services. It is based on the theory of guidance developed by Dr. Martin Katz of Educational Testing Service. In brief, the main purpose of SIGI is to enhance the student's freedom of choice, to develop his understanding of elements involved in choice, and to increase his competence in the process of making informed and rational career decisions.

To make decisions wisely, a student begins by determining and expressing what he wants--what his values are. Then he gathers information to see which of his possible choices of action offer him good opportunities to get what he wants. Third, he assesses the risks associated with the options available to him. Ultimately, he elects an option that provides an acceptable opportunity at an acceptable risk.

This model of guidance as applied in SIGI invites the student to show how much importance he attaches to each of ten occupational values. He then locates occupations that offer the best chance of satisfying those values. He collects information about them, assesses the probability of completing the requisite education, and, finally, learns what steps he should take to enter an occupation of choice.

Although SIGI may prove to be self-sufficient for a certain portion of the counselor's students, our limited experience shows that for many others it opens up new avenues of thought, new insights, new speculations that cannot be resolved by an unaided computer program no matter how ingenious it is. The hope is that SIGI will cause students in this category to appear in the counselor's office with their problems more or less explicitly defined. Then the counselor will not have to sacrifice his precious time getting the student started in the process of career decision-making. Ideally, the SIGI-counseled student will have more specific concerns; he may want to discuss some conflicts or dilemmas involving competing values; he may want local information about a few occupations that the computer says fit his values; he may want to talk about his educationl outlook in light of predictions that SIGI has given him; or he may seek help in assessing the risks of shooting for a highly desirable occupation as opposed to a less desirable one easier to enter.

But not all students are ideal, and some will need help in understanding what SIGI is trying to do for them before they can take full advantage of what it offers. This handbook will aid the counselor in identifying and taking care of their needs. The alert counselor may also be able to identify more readily a number of ways in which he can use SIGI to make his counseling more effective--for example, when to refer to SIGI a student who has not yet used the system.

The SIGI Counselor's Handbook is divided into seven chapters, one for each subsystem. The first six are presented in the order in which the student encounters the system as a novice learning how to use SIGI. These chapters are Values, Locate, Compare, Desirability, Prediction, and Planning. The seventh chapter is devoted to Strategy, a subsystem available to the student when he has been released from the novice status and can move freely to any subsystem.

The chapters all follow the same pattern: a brief description of what the student does at the terminal, a list of printouts available to the student that may be of help during the counseling session, a discussion of specific points the counselor should look for, a short discussion of problems that student may encounter in the general area covered by the subsystem (his values, his search for suitable occupations, etc.), and suggestions of ways in which counselors can help students to solve these problems.

Material for the third item on this list--specific points the counselor should look for--came from our study of the behavior of actual students at the terminal. Since the counselor has no way of knowing what the student did and since the student may not be aware that his understanding is less than complete, the counselor may have to probe to discover whether any of the listed problems exist. The probing should be worth the counselor's effort, for understanding any part of SIGI increases the understanding of the whole, and also increases understanding of career decision-making. Although the subsystems can be used independently for limited objectives (say to find a specific piece of information or see a particular prediction), they are also very much interdependent. The value of SIGI as a tool for the counselor will increase greatly with the student's understanding of the system, so that the counselor can with confidence send the student to the terminal for the sort of help that SIGI can provide.

The last section of each chapter ("Counselor Help with Student Problems") shows how the counselor and SIGI may supplement each other in assisting the student. Here are discussed areas of concern that SIGI, lacking human judgment or comprehensive knowledge of the student, is ill equipped to cope with. On the other hand, the busy counselor will find that some part of his career guidance functions can be transferred to SIGI. Working together, the counselor and SIGI should be able to arrive at outcomes that neither of them could achieve alone.

VALUES

What the Student Does

The student sees an operational definition of each of ten occupational values. He indicates its importance to him by assigning it a weight on a scale ranging from 0 (no importance) to 8 (maximum importance). The ten values are

High Income	Variety
Prestige	Leadership
Independence	Work in Main Field of Interest
Helping Others	Leisure
Security	Early Entry into Occupation

The definitions are attached. (Figure 1)

After weighting all ten values independently, the student plays a game in which he chooses an imaginary job. As he "works" at the job, he is required to make choices between pairs of competing values. The student receives feedback pointing out inconsistencies between his choices and the weights he previously assigned to the values.

When the student has played as many games as he wishes, he reweights his values, this time with the restriction that the sum of all the ten weights must equal 40. This resulting value profile is important, as it is used later for retrieving occupations that may satisfy the student's specifications and for ranking occupations with respect to their desirability.

Printouts That the Student May Get

The student may bring with him for discussion a printout of his value profile. It will show in graphic form the ten values and the weight assigned to each under the restriction that the sum equals 40. Figure 2 illustrates the printout.

Things for the Counselor to Look for

1. Some students are concerned to discover that their behavior in the Value Game is occasionally inconsistent with the weights they assigned to their values. The Value Game forces a choice between two competing values. If the choice is inconsistent with the student's original weightings, he gets feedback pointing out the inconsistency. Some students report that the inconsistency message has a powerful effect, and they may want to discuss the matter.

   The counselor may be able to help them clarify their feelings about inconsistencies. He may want to point out that the choice between two competing values in any round of the Game

is only one sample of all the possible circumstances in which this pair of values might compete. The Game is meant to challenge the student to think in specific terms about his values, but an occasional inconsistency should not disturb him.

2. Some students apparently become negligent when reweighting their values to sum to 40. In their anxiety to make the sum come out right, they may forget that the weight assigned to each value is supposed to represent its importance. For example, one student reduced his initially highest weighted value to insignificance, and another ended up with a flat profile with each value weighted at 4.

   The counselor can help these students understand that the final profile should reflect the relative importance of the values. It may be necessary to "hand crank" the student through the weighting process using pencil and paper (with the definitions in Figure 1). The counselor can then advise the student to reweight his values at the terminal--he will have the opportunity to do so after he has been through the system once as a novice.

3. The student may also be uncertain about whether he selected the right interest field. Students often give the value "Interest Field" a strong weight. The weight is supposed to indicate the importance of working at an occupation in the selected field instead of some other field. The six fields from which selection is made are scientific, technological, administrative, personal contact, verbal, and aesthetic. Definitions of these are also attached (Figure 3). The student may not be sure whether or not his preference is scientific or technological. He may also have some specific occupation in mind, but not know which field it fits into. Some occupations may fit more than one field of interest, and this fact, added to the student's naivete about occupations in general, may mean that a counselor's help at this point is needed.

   The student should be told that he can change his Interest Field when he reweights his values, and he should be encouraged to try more than the interest field in other parts of the system (e.g., LOCATE).

4. The student should also understand that the computer will give him misleading information if his value profile or interest field does not describe his true preferences. The places where he may encounter difficulties are LOCATE, where the computer retrieves occupations that fit the values specified by the student; and DESIRABILITY and STRATEGY, where the computer rates occupations in accordance with their ability to satisfy the value weights recorded for the student.

Counselor Help With Student Problems

Most students signing on SIGI for the first time state that they have only a vague idea of their values. The process of weighting even the limited array of values used by SIGI therefore opens up a new world to them. They may feel the need to discuss not only the ten occupational values in SIGI but also the whole subject of values. For example, many students may be stimulated to discuss their educational values. It might be an enlightening exercise for them to list, define, and weight values in a number of different domains. They may not understand that their daily behavior is an expression of their values, especially since they may not be aware of what those values are. Or they may expect their values to remain more stable than is ordinarily the case.

Finally, getting back to occupational values, they may not understand that occupations differ in capacity to provide certain satisfactions and that finding occupations with the best chance of meeting their values can therefore contribute to their happiness.

HIGH INCOME: Some minimum income (enough for survival) is essential for everyone. But beyond that, how important to you are the extras? People have different ideas about how much income is "high." Therefore, HIGH INCOME is not defined here as a specific amount. It means more than enough to live on. It means money to use as you wish after you have paid your basic living expenses. You can buy luxuries and travel first class.

PRESTIGE: If people respect you, look up to you, listen to your opinions, or seek your help in community affairs, you are a person with PRESTIGE. Of course, PRESTIGE can be gained in several ways. But in present-day America, occupation is usually the key to PRESTIGE. Rightly or wrongly, we respect some occupations more than others.

INDEPENDENCE: Some occupations give you more freedom than others to make your own decisions, to work without supervision or direction from others. At one extreme might be talented free-lance artists or writers who may work without supervision. At the other extreme might be military service or some big business organizations with chains of command which severely limit the decisions that each person can make.

HELPING OTHERS: Most people are willing to help others, and show it every day outside of their work. They put themselves out to do favors, make gifts, donate to charities, and so on. THIS DOES NOT COUNT HERE. The question here is, Do you want HELPING OTHERS to be a main part of your occupation? To what extent do you want to devote your life work directly to helping people improve their health, education, or welfare?

SECURITY: In the most SECURE occupations, you will be free from fear of losing your job and income. You will have tenure--that is, you cannot be fired very easily. Employment will tend to remain high in spite of recessions, and there will be no seasonal ups and downs. Your income will generally remain stable and predictable; it will not vanish with hard times. Your occupation is not likely to be wiped out by automation or other technological changes.

VARIETY: Occupations with the greatest VARIETY offer many different kinds of activities and problems, frequent changes in location, new people to meet. VARIETY is the opposite of routine, predictability, or repetition. If you value VARIETY high, you probably like novelty and surprise, and enjoy facing new problems, events, places, and people.

LEADERSHIP: Do you want to guide others, tell them what to do, be responsible for their performance? People who weight LEADERSHIP high usually want power to control events. They want to influence people to work together effectively. If they are mature, they know that RESPONSIBILITY goes with LEADERSHIP. They are willing to accept the blame when things go wrong, even though they were not at fault.

FIGURE 1

DEFINITIONS OF THE TEN OCCUPATIONAL VALUES

WORK IN YOUR MAIN FIELD OF INTEREST: Some people have only one main field of interest (Scientific, Technological, Administrative, Personal Contact, Verbal, or Aesthetic); others are interested in two or more of these fields. Some insist that their occupation must be in one of their major fields of interest. Others are willing to work in a field that is less interesting; they feel they can satisfy their main interest in their spare time.

LEISURE: How important is the amount of time your occupation will allow you to spend away from work? LEISURE may include short hours, long vacations, or the chance to choose your own time off. To give a high weight to LEISURE is like saying, "The satisfactions I get off the job are so important to me that work must not interfere with them."

EARLY ENTRY: You can enter some occupations with very little education or training. Other occupations require years of expensive education. (The cost includes loss of income from a job you might have if you were not in school.) Think about the time (and money) you are willing to spend on education. Also think about your attitude toward school: Is education a satisfying experience? Or does it seem like a drag?

FIGURE 1 (continued)

VALUES		WEIGHT (IMPORTANCE) None	Slight		Medium		Strong	Highest
(1) High Income	6	*	*	*	*	*	*	
(2) Prestige	3	*	*	*				
(3) Independence	5	*	*	*	*	*		
(4) Helping Others	2	*	*					
(5) Security	6	*	*	*	*	*	*	
(6) Variety	4	*	*	*	*			
(7) Leadership	4	*	*	*	*			
(8) Interest Field	5	*	*	*	*	*		
(9) Leisure	3	*	*					
(Ø) Early Entry	2	*	*					
Sum	4Ø							

To change the weight for another Value, press the number BEFORE that Value (1,2,3,4,5,6,7,8,9,Ø).

When the sum equals 4Ø and you are satisfied with the weights just as they appear on the screen, press PRINT (to get a copy) or NEXT.

FIGURE 2
VALUES SYSTEM: PRINTOUT AVAILABLE TO THE STUDENT
SHOWING HIS VALUE WEIGHTS SUMMED TO 4Ø

SCIENTIFIC--data, knowledge, observations, analysis, mathematics. Examples: physicist, chemist, engineer.

TECHNOLOGICAL--things, machines, manipulative and mechanical skills. Examples: toolmaker, mechanic, technician.

ADMINISTRATIVE--business, finance, records, systems. Examples: Accountant, secretary, bank teller.

PERSONAL CONTACT--people, selling, supervising, persuading. Examples: salesman, social worker, stewardess.

VERBAL--words, reading, writing, talking, listening. Examples: journalist, teacher, advertising copywriter.

AESTHETIC--painting, sculpture, design, music. Examples: artist, interior designer, musician.

FIGURE 3
DEFINITIONS OF THE SIX INTEREST FIELDS

LOCATE

What the Student Does

The computer retrieves occupations that meet the student's specifications with respect to five of the ten occupational values. Usually the five are the ones that the student weighted highest in the VALUES System, but he can use any set of five. He specifies the minimum that he will settle for on each value (or, for Interest Field, the field that he prefers). The occupations retrieved then equal or exceed this minimum for all five specifications. If the student's specifications are so demanding that no occupation fits them, or if they are so loose as to generate an unwieldy list, the student is forced to juggle his specifications until a useful list is finally retrieved. He may repeat the process indefinitely with different sets of values and specifications.

Printouts the Student May Get

The student may have printouts of each set of values and specifications, together with the list of occupations retrieved with that combination. (See Figure 4.)

Things for the Counselor to Look for

1. The student may want to know why a particular occupation was not retrieved. The first step, of course, is to see whether it is included in the list of occupations in the SIGI information system. A copy of the list is at the terminal, but the student may not think of looking at it. Beyond that, it is not possible to give an exact answer to this question, short of going into the SIGI data base. But the counselor can look for certain combinations of values and specifications. The following list describes conditions which may exclude an occupation:

   a) Specification for income too high.
   b) Specification for education too low.

   (For example, occupations requiring graduate training will not appear unless the student specifies a willingness to accept five or more years of post-high school education.)

   c) Specification for security too high. If the specification is "more than average" or "a great amount," many occupations, especially those in the arts, will be excluded.

d) Specification for leisure too high. It seems to be a fact of life that not many occupations are differentiated at the high end of the leisure scale, as defined in SIGI. There is more differentiation at the low end. For leisure, a specification of "average" rates 3 on a scale from 1 to 4; for most other occupations, a rating of 3 signifies "more than average." A student who specifies "average" for leisure may be excluding more occupations than he realizes.

e) A specification of an interest field that the desired occupation does not fit. Although many occupations are classified in more than one field, an occupation in the arts (for example) will ordinarily be excluded by a specification of the scientific or technological fields, and so on.

2. The student may want to know why no occupations are retrieved with certain combinations of values and specifications. Again, it is not possible to give an exact answer, but the counselor can look for combinations likely to result in empty lists.

a) A specification of high income and low education.
b) A specification of high prestige and low education.
c) A specification of the aesthetic interest field and more than average security. Many of the occupations in the aesthetic field do not offer much job security.
d) A specification of high income and high leisure.

3. The student may not realize that reducing a specification on a value to the smallest amount is, in effect, discounting the value entirely; since all occupations will meet or exceed the specification, the value is not screening at all. A student may wish to reduce a specification to its minimum to see what happens to his list, but he should not otherwise wipe it out without substituting another value.

4. If a student experiments with many different sets of values, he may eventually be retrieving occupations that match his lowest weighted values without realizing he is doing so. In DESIRABILITY and STRATEGY he can compare occupations to see how well they fit his profile of values.

5. Some students become irritated because LOCATE retrieves occupations that they think do not interest them. The counselor can help these students. If the student has selected values of real importance to him, then all occupations retrieved in LOCATE are worth thinking about, and the student should be urged to open his mind to them. On the other hand, he may scorn these occupations because they fail to satisfy some value that he is not aware of cherishing. For instance, most students give prestige a low weighting, but at the same time they may unconsciously reject occupations because they lack prestige. If this is the case, the counselor can help the student reweight his values to reflect his true feelings.

Counselor Help With Student Problems

The student may be troubled when LOCATE retrieves for him a disaproportionate number of "high-level" occupations that may seem beyond his reach. This phenomenon is apparently a fact of our world of work: in our society, the highest level occupations are more often the ones with the best opportunities for prestige, independence, high income, security, variety, and leadership. The counselor can help the student realize that the retrieval of high-level occupations is not a bias in LOCATE but an indication of the value structure of the work world. As long as LOCATE searches on some combination of these values only, taking no account of other values or of abilities, it is bound to retrieve mainly "high-level" occupations. The student's problem is to find an occupation that offers the best opportunities for satisfaction, given his abilities and his willingness to accept the risks of preparing for it. The STRATEGY System of SIGI will help him combine values and abilities. Meanwhile, he can cut out most of the high-level occupations in LOCATE by including Early Entry as one of his five values. Each of the six different interest fields, except the Verbal field, includes occupations at various "levels," and the values helping others and leisure are relatively independent of "level."

Values for locating occupations:	These occupations meet your specifications:
Income More than $12,ØØØ	Broadcast Technician Chemical Engineer Civil Engineer Industrial Engineer Electrical Engineer
Security An average amount	Meteorologist Mechanical Engineer
Independence A more than average amount	
Interest Field Technological	
Variety A more than average amount	

For a copy of this information, press PRINT; otherwise press NEXT.

FIGURE 4
LOCATE: VALUES, SPECIFICATIONS, AND OCCUPATIONS RETRIEVED

COMPARE

What the Student Does

The student selects three occupations from among those retrieved in LOCATE. He can then select from a list of twenty-seven questions the one he wants answered about these three occupations. He may ask as many questions as he wishes or, after any question, he may use a different set of three occupations as the subject of inquiry. Figure 5 shows the list of questions. Figure 6 shows the format of answer.

Printouts That the Student May Get

The student may get a printout of all answers. It shows the question asked, the occupations selected, and the answer to the question for each occupation. (Figure 6).

Things for the Counselor to Look For

1. Since the data in COMPARE are compiled from national sources, the answers may not always apply to local conditions. The counselor should use his local knowledge if the student is considering a local job.

2. The student may not realize that the information in SIGI applies to an occupation as a whole rather than to a particular job within an occupation. Data from job to job may vary widely, and the occupational information in SIGI may not fit a particular job the student knows about or has in mind. The counselor can encourage the student to set up his own information system about such jobs.

3. Sometimes students fail to ask about matters that have strongly interested them. For example, in the VALUES System, they may have given security a high weighting, but have failed to ask about security in COMPARE. If the counselor knows which values are important to the student, he can encourage him to ask about them with respect to particular occupations.

4. Questions are asked about three occupations at a time. After each answer the student has the opportunity to substitute one, two, or three occupations in place of those in the previous set. Many students substitute only one occupation and then again ask a question that they had asked before. This is wasteful if it is inadvertent, since the student has already seen the answer for two of the occupations. If the student is doing "comparative shopping," his behavior is logical. But if he is trying to collect information about a wide variety of occupations, he should be encouraged to replace all three occupations with new ones.

Counselor Help With Student Problems

Nearly all students just coming on line admit that they have little information about occupations. If these same students spend only a few moments in COMPARE, they will depart as unenlightened as they entered. The counselor can help them by pointing out the wealth of information offered in COMPARE. This subsystem is almost entirely independent of the other systems, and once the student is freed from following the learner's path, he can enter COMPARE and use it like an encyclopedia of occupational information. Students should be encouraged to take advantage of such an easy way of informing themselves. They should be particularly encouraged to seek information about the value dimensions that they have weighted most highly. The counselor can help them see that if security (for example) is important to them, they should ask about that aspect of occupations they are considering.

Now you can get information about the three occupations.
Press the number for the question you would like to have answered.
(After you get the answer, you can keep coming back to this list to ask more questions.)

DEFINITION AND DESCRIPTION
(11) Definition of occupation?
(12) Description of work activities?
(13) Level of skill in interacting with data, people, things?
(14) Where to get more information?

EDUCATION, TRAINING, OTHER REQUIREMENTS
(15) Formal education beyond high school?
(16) Specific occupational training?
(17) Related college courses?
(18) Personal qualifications?
(19) Other requirements?

INCOME
(20) Beginning salary?
(21) Average income of all people in this occupation?
(22) Top salary possibilites?
(23) How salaries vary?

PERSONAL SATISFACTIONS
(24) Opportunities to help others?
(25) Opportunities for leadership?
(26) What fields of interest?
(27) Prestige level?

CONDITIONS OF WORK
(28) Physical surroundings?
(29) Leisure (hours)?
(30) Independence on the job?
(31) Variety?
(32) Fringe benefits?

OPPORTUNITIES AND OUTLOOK
(33) Employment outlook?
(34) Where are the jobs?
(35) Job security?
(36) Advancement?
(37) How many women?

FIGURE 5
COMPARE: DISPLAY SHOWING THE QUESTIONS
THAT THE STUDENT CAN ASK

Job security?

Electrical Engineer
An average amount: good in many positions, but jobs created by government contracts may end with the contract.

Computer Programmer
A more than average amount: excellent security for those with background in systems analysis. Very good for regular programmers, although security may be affected by technological advances such as "automatic programming," which may eliminate the more routine programming jobs. There have been layoffs of programmers in certain geographical areas.

Systems Analyst
A more than average amount: good job security because of great demand for qualified analysts.

For a copy of this information, press PRINT; otherwise press NEXT.

FIGURE 6
COMPARE: PRINTOUT AVAILABLE TO THE STUDENT IN RESPONSE TO QUESTION NO. 35. THIS PRINTOUT WOULD ALSO BE AVAILABLE IN DESIRABILITY

DESIRABILITY

What the Student Does

The student selects three occupations from those retrieved in LOCATE or asked about in COMPARE. He ranks these by preference. The computer then generates a table showing the three selected occupations on the horizontal axis and the ten occupational values, with the student's most recent weighting of each value, on the vertical axis. Then, for one value at a time, the computer displays the rating of each occupation on each value. (See Figure 7). (The rating is an indication of an occupation's capacity to satisfy the given value.) The student can ask to see the basis for any rating. For instance, he may want to know why Secondary School Teacher has a rating of 4 on security, whereas Purchasing Agent has a rating of only 2. The table is temporarily erased and the information about security appears in the same format as the answers to questions in COMPARE. (Figure 6).

When all ratings have been filled in, the computer multiplies the student's weighting by the rating for each value for each selected occupation, and totals the products. (Figure 8). The occupation with the largest sum is the one most likely to satisfy the student, provided that his value weights are really indicative of the satisfactions he is looking for. The student also sees a display pointing out discrepancies or agreements between his ranking of the three occupations and the ranking on the basis of the Desirability Sums.

The student may repeat this entire process with as many sets of three occupations as he wants. After his first passage through DESIRABILITY, he may select any of the occupations in SIGI.

Printouts That the Student May Get

The student may bring with him printouts showing his Desirability Sums and their calculation (Figure 8). He may also obtain printouts of the basis for the ratings of the three occupations on each of the ten values. (Figure 6).

Things for the Counselor to Look For

1. Students may not understand the distinction between their weighting of a value and the rating of an occupation on that value. In simplest terms, the weighting is an expression of what the student wants, whereas a rating is an expression of what an occupation offers.

   An analogy may make this easier for the student to understand. You may want a lot of vitamin C in your diet. You show this desire by weighting vitamin C at the top of the scale, 8. Now some foods, such as oranges, provide more vitamin C than do others; therefore, oranges have a high rating on vitamin C (say a rating of 4), whereas sugar has

a rating on vitamin C of only 1. In an analogous manner, some occupations offer a better chance than do others to satisfy some such value as security or variety, and they are therefore rated higher on these values, just as various foods are rated higher or lower on vitamin C.

2. The student may not understand why multiplying his value weights by the occupational ratings should produce useful information, the Desirability Sums. The counselor may help the student see that for him the combination of high weight and high rating is a good thing, for it brings together the maximum of opportunity (high rating) with the maximum of desire (high weight). When all ten values are taken together, several such combinations of high weight and high rating will result in large Desirability Sums. On the other hand, the combination of low weight and low rating is not bad, since the student is not losing out on anything that he wants very much. The low weight on one value will be balanced by a high weight on another. The largest Desirability Sums occur when the high weights match high ratings and the low weights match low ratings.

3. The student may be concerned because the occupations with the highest sums may seem out of reach for him. The counselor should stress that the Desirability System takes no account of abilities; that comes later in STRATEGY. (In the next revision of SIGI, DESIRABILITY and STRATEGY will be combined in a single system.) The counselor should make sure that the student goes through STRATEGY with all occupations of interest to him. He should make clear that DESIRABILITY does not identify occupations that the student ought to enter, but only provides information about how they compare with respect to his values. It is a fact of the world of work that the higher level occupations, especially the professional ones, tend to have the highest ratings on most of the values. An obvious exception is Early Entry. Unless the student has placed a heavy weight on Early Entry--and having made a commitment to post-high school education, few students do this--the higher level occupations will tend to produce higher Desirability Sums with almost any combination of value weights. One of the student's aims in choosing an occupation is to combine an acceptable Desirability Sum with an acceptable probability of gaining entry.

4. The student may place too much emphasis on small differences in the Desirability Sums. The computer ranks the three occupations in accordance with their sums disregarding the magnitude of the difference between sums. Then it tells the student whether or not its ranking agrees with his own ranking by preference. A message of disagreement may have a strong effect,

even though it results from trivial differences in the sums. The counselor can reinforce a caveat presented in one of the displays: a difference of less than ten points is probably insignificant, and the student should ignore it. On the other hand, the student should not arbitrarily reject large differences simply because he is unwilling to open his mind to a new option. The counselor can go over the printout of the sums (Figure 8) and point out which combinations of weights and ratings contributed most to the difference in sums. He can be encouraged to return to COMPARE and get more information about unfamiliar occupations.

5. The student may not agree with the ratings of particular values in particular occupations. When the table reproduced in Figure 8 is being built up, the student has the option to ask for occupational information showing why the ratings are as they are. The counselor can ask the student if he took advantage of the option. It is also possible that the student knows about some local conditions--say the local salary range of an occupation--that disagree with the information in SIGI, which is based on national averages. In this case, the counselor can help the student change the questioned rating and see how it affects the Desirability Sums.

Counselor Help With Student Problems

The whole idea of representing desirability by using numbers may be foreign to a student, and he may wonder how much to rely on the sums. Once he understands the relationship between his value weights and the sums, he may be put in an experimental frame of mind to see what happens with different weights and different occupations. The student may be led to the insight that Desirability Sums represent an interaction between his values and the outside world. If he finds himself rejecting occupations with high sums as unsuitable, he should question his value weights. Even when an occupation is beyond his power to enter, its Desirability Sum can tell him something about himself.

VALUE	WT.	OCCUPATION		
		MecEng	CivEng	ElcTec
(1) Income	6	5	5	3
(2) Prestige	3			
(3) Independence	5			
(4) Help Others	2			
(5) Security	6			
(6) Variety	4			
(7) Leadership	4			
(8) Interest Field	5			
(9) Leisure	3			
(Ø) Early Entry	2			

A rating of 5 = average salary over $14,ØØØ per year; 1 = $7,ØØØ or less.

Which of the following do you want to do?

If you want to see the ratings for Prestige, press NEXT.
If you want more detailed information about Income, press the number 1.

FIGURE 7
DESIRABILITY: VALUE WEIGHTS AND OCCUPATIONAL
RATINGS OF INCOME FOR THREE OCCUPATIONS

VALUE	WT.	OCCUPATION		
		MecEng	CivEng	ElcTec
(1) Income	6	5 3Ø	5 3Ø	3 18
(2) Prestige	3	3 Ø9	4 12	3 Ø9
(3) Independence	5	3 15	4 2Ø	2 1Ø
(4) Help Others	2	1 Ø2	3 Ø6	1 Ø2
(5) Security	6	3 18	3 18	3 18
(6) Variety	4	3 12	4 16	2 Ø8
(7) Leadership	4	2 Ø8	4 16	1 Ø4
(8) Interest Field	5	4 2Ø	3 15	4 2Ø
(9) Leisure	3	3 Ø9	3 Ø9	3 Ø9
(Ø) Early Entry	2	2 Ø4	2 Ø4	3 Ø6
		---	---	---
		Sum = 127	146	1Ø4

Your weight for Income (6) X the rating of MecEng on Income (5) = 3Ø, etc.

The sum of the products appears at the bottom of each column.
The occupation with the highest sum is probably the one that would fit your values best. The highest possible sum is 168; the lowest is 4Ø.
In general, a difference of 1Ø points or more between sums is significant.

You will want a copy of this chart. Press PRINT.

FIGURE 8
DESIRABILITY: PRINTOUT AVAILABLE TO THE STUDENT SHOWING MULTIPLICATION OF VALUE WEIGHTS BY OCCUPATIONAL RATINGS TO OBTAIN DESIRABILITY SUMS

PREDICTION

What the Student Does

The student going through SIGI for the first time as a novice sees a display of his CGP test scores and high school rank. If he confirms them, he goes through a short sequence explaining that "predictions" are really statements about the experience of previous students with abilities like his. He sees a table showing the per cent of such students who received a grade of A or B, C, and below C in the Humanities and Social Science curriculum. The accompanying explanation emphasizes that the figures show the probability that he will get a given grade point average (GPA) in this program. The student also sees the probability figures for Data Processing and Accounting (male students) or Nursing (females). Then the student can ask for the probability figures for any curriculum for which sufficient data have been obtained to formulate the necessary probability statements. (See Figure 9).

The student released from the novice status who enters PREDICTION goes directly to the display of curricula (Figure 9).

Students who have completed one or more semesters at the college receive a display telling them that their present GPA is the best predictor of their future GPA. They are told that the probabilities in the table are those they would have seen as entering students.

The probability figures for GPA in each program are based upon a combination of optimally weighted CGP test scores and high school rank. The calculation of key course probabilities does not use high school rank in order to avoid too much overlap with the GPA probabilities. The two exceptions are MA 111 and PH 101, for which it was necessary to include high school rank to obtain a minimum acceptable multiple correlation of .40 or greater between the predictor composite and the criterion.

Printouts That the Student May Get

The student may bring with him a printout of all predictions called for at the time he pressed the PRINT button. It will show the probabilities for Humanities and Social Sciences, Data Processing, and Accounting/Nursing, with the addition of any other curricula requested. (See Figure 10).

Things for the Counselor to Look For

1. Nothwithstanding cautionary messages in the script, some students may misinterpret the probability statements. The counselor should re-emphasize that the probability statements do not say what will happen to the student but what did happen to students who were similar to him with respect to test score and high school rank. This is the best information that any prediction system can provide. Such information is useful in helping the student assess the risks in embarking on various programs. But he must judge whether a given risk is acceptable or not.

2. Some students do not ask for predictions in the PREDICTION System, although they do so in PLANNING, where the prediction is definitely associated with a particular occupation. The counselor can probe to find out why the student passed this opportunity by. If the reason is that the curriculum of interest was among the three used for illustrating PREDICTION (Humanities and Social Science, Data Processing, and Accounting or Nursing), the student may see no reason to look at predictions for other curricula. But if the student does not understand what the predictions tell him or how he can put them to use, or if he does not want to confront them because they seem threatening, the counselor can help him. The counselor can explain that the predictions are useful in selecting programs that offer the best chance of success, or at least in assessing the risks associated with contemplated programs. By comparing predictions for Engineering Science, Physics, or Chemistry with those for some of the technician fields, the student can get useful information for deciding about undertaking a four-year program as opposed to a two-year one. Although predictions should not be sole indicators of what career to follow, the counselor can show how they can add to the store of information that goes into career decision making.

3. The student may strongly disagree with the predictions and consequently lose some faith in SIGI. The predictions for all students are calculated the same way, and considering the variability of the junior college population, an individual student may have good reason to think his predictions misrepresent his abilities. The counselor should look for cases like the following:

   a) If the student has been out of school for a long time, his high school rank--one of the factors in the regression equations for GPA--may come from a population different from that on which the predictions are based. His predictions therefore may not reflect the true probabilities of achievement in his case.

   b) The student may have come from a select high school or private school. In this case, the factor of high school rank may lower the student's predictions from what they would have been if he had come from a less select school where he would presumably have ranked higher in class. His predictions will be too low.

   c) The student may be more mature than the average of the population on which the predictions are based. Maturity is not a factor in the prediction regression equations.

d) If the student has attended his junior college for more than one semester, his GPA may be different from the grade with the highest probability. Even if his probability of getting an A or B is only 5%, he may be one of the five out of every hundred with similar test scores and high school rank who got an A or B. At various points in the program, SIGI tells students who have completed one or more semesters that their present GPA is the best predictor of future GPA, and that they should regard their predictions accordingly. (Present GPA is not a factor in the regression equations.) Nevertheless, some students become resentful because their predictions apparently underestimate their performance. The counselor can stress again that their present GPA is the best predictor and should be used for predicting appropriate curricula; nevertheless, the SIGI predictions are still useful for making judgments about curricula which did not contribute to the student's GPA.

The counselor can use his judgment and experience to help students in these four categories adjust their predictions in some reasonable way. He can reassure the student that there is nothing sacred about the SIGI predictions. The systems in SIGI where predictions make their most important contribution are PLANNING and STRATEGY. In PLANNING the student can call for both GPA and key course predictions to help him assess his chances of success in the curriculum required for the occupation being considered. Since key course predictions do not use high school rank as a factor in their calculation, the counselor can advise the student to use them rather than GPA if the student's high school rank is out of date or otherwise suspect. In STRATEGY, GPA predictions (C or better) are multiplied by Desirability Sums to arrive at an Index showing the combined desirability-feasibility of occupations. If the student has a high probability of success in a curriculum for one occupation with a low desirability sum and a low probability in the curriculum for another with a high Desirability Sum, the occupation with the highest Desirability Sum may have the lower Index. Therefore it is important for the counselor to see that the student is not misled by the Indexes he will get in STRATEGY. In those cases where it is evident that the SIGI predictions are off, the counselor can help the student arrive at adjusted figures to use in STRATEGY.

e) Some students are unrealistically optimistic about their probability of success in difficult curricula. In interviews, they state that their motivation and effort will cause them to perform better than the predictions estimate. When there is no reason to distrust the SIGI predictions, the counselor can caution these students about rejecting them out of hand. Such students should be reminded that many of their predecessors who ended up with low GPA's had had similar faith in their motivation and effort. The predictions may be particularly useful in suggesting that one curriculum may be easier than another with a lower prediction.

Counselor Help With Student Problems

Predictions, like grades, may be perceived as threatening. The counselor can help the student put predictions in their proper context. The probability statements represent reality. They reflect the actual distribution of GPA's obtained by previous students whose abilities were similar.

Unlike grades, they do not stand alone as a final stamp of approval or disapproval. Rather, they must be used in conjunction with other information. The places of use are the PLANNING System, where they are added to information about courses of study to help the student decide whether or not a particular curriculum contains courses that he wants AND thinks he can master; and in STRATEGY, where they are conjoined to the Desirability Sums to help him decide whether or not an occupation is likely to be satisfactory in terms of his values AND feasible in terms of his abilities. Seen this way, as just one piece of information among the various pieces that go into decision making, the predictions need not be so threatening. They give realistic information about "the odds." The student himself must decide whether "the odds" look good or bad to him.

Press the number of the program for which you want a prediction. If you want predictions for all the programs in a group, press the number (ending in Ø) for that group. (Example: press 11 to get accounting. Or press 1Ø to get all six programs listed under business.)

(1Ø) Business
11 Accounting
12 Business Administr.
13 Marketing
14 General Business
15 Secretarial Science
16 Data Processing

(2Ø) Health & Human Serv.
21 Laboratory Technology
22 Nursing
*23 Dental Assisting
*24 Library Tech. Asst.
*25 Community Serv. Asst.
*26 Education Assistant

(3Ø) Developmental
31 General Studies

(4Ø) Liberal Arts and Science
41 Humanities & Social Sci.
42 Engineering Sci., Mathematics, Physics, Chemistry
43 Biology

(5Ø) Technology
51 Architectural Tech., Civil Eng. Technology, Electro-Mech. Eng. Tech, Electric Power Tech., Mechanical Eng. Tech.
52 Drafting & Design Tech.
53 Electric Eng. Tech., Electronics Tech.

(6Ø) Fine/Applied Arts
61 Architecture
62 Fine Arts, Advertising Design
63 Communications Media

(7Ø) Agriculture
71 Ornamental Horticulture

*(8Ø) New Programs
*81 Aviation Instr.
*82 Aviation Electronics
*83 Flight Technology
*84 Industrial Supervsn.
*85 Law Enforcement
*86 Government Aide

*NO PREDICTION AVAILABLE

FIGURE 9
PREDICTION: DISPLAY SHOWING MCCC CURRICULA. GPA PREDICTIONS ARE AVAILABLE FOR ANY CURRICULUM NOT PRECEDED BY AN ASTERISK

MAJOR FIELD PROGRAM	Chances in 1ØØ for GPA of: 4.Ø-3.Ø A-B	2.9-2.Ø C	Below 2 Below C
Hum.& Soc.Sc.	5	35	6Ø
Data Proc.	1Ø	5Ø	4Ø
Accounting	25	5Ø	25
Arch Tech,etc	15	4Ø	45
Dft.& Des.Tec	5	3Ø	65
EE Tech.,etc	2Ø	45	35

When you have finished, you can get a copy of this chart.

For a copy, press PRINT. Otherwise, press NEXT.

FIGURE 10
PREDICTION: PRINTOUT AVAILABLE TO THE STUDENT SHOWING GPA PROBABILITIES

PLANNING

What the Student Does

The student selects the occupation for which he wants to plan. He then must signify his willingness to spend the time necessary to prepare for it, and, after looking at a list of associated college courses, he states whether or not he thinks he has the ability successfully to complete the required study. He can call for his GPA and key course predictions to help him decide. If he says he is both willing and able, he then sees an overview of the steps he should take to enter the occupation, the high school prerequisites for the appropriate curriculum, the curriculum itself, and (when needed) a list of four-year colleges or graduate schools where he can continue his preparation. If the student is still interested in the occupation, he next is asked whether he has taken the high school prerequisites and is invited to see a digest of sources of financial aid. Finally, he is told to take the printout of his program to his college adviser or admissions officer.

Unless the student is a novice going through the system for the first time, he may switch to a different occupation at any point in PLANNING. Also, if more than one curriculum can serve as a route to the occupation, the student selects the curriculum of most interest to him.

Printouts That the Student May Get

The student may ask for a printout of steps he should take to enter his occupation (Figure 11). He is forced to get a printout of the sequence displaying high school prerequisites, the curriculum, and the list (if any) of follow-on institutions he can transfer to (Figure 12a, b, c). For all occupations, such as Fashion Designer or Auto Mechanic, for which the local community college does not offer an appropriate curriculum, this sequence is replaced by displays showing the nearby institutions that do offer it (Figure 13) and the student gets a printout of that. If the student has completed one or more semesters at his community college, he may ask for a printout of a frame showing him how to reconcile his present program with the new one required for his selected occupation (Figure 14). He may also get a printout of his GPA prediction for the curriculum under consideration. Finally, he may get a printout of any or all of the five displays giving information about sources of financial aid (Figure 15).

Things for the Counselor to Look For

1. Students often go through the PLANNING system several times, collecting programs for occupations that they are not sure about. They may seek the counselor's advice in making a choice or in arriving at a set of plans that will preserve

the greatest possible number of options. The counselor can help them by making sure that they have taken full advantage of the resources available in SIGI. Which occupations were retrieved in LOCATE through a satisfactory set of values and specifications? Which have the highest Desirability Sums and the highest index (STRATEGY)? Has the student used COMPARE to gather information about the occupations? The counselor may be able to conserve much of his time for counseling by suggesting that some students go back to SIGI to get more information.

2. Students may wish help in interpreting the overview (Figure 11) outlining the steps to take in preparing for their occupations. This is particularly true if the steps involve transferring to a four-year college or enrolling in a special school.

3. SIGI has taken considerable pains to emphasize the importance of high school prerequisites. The display illustrated by Figure 12a points out ways that students can make up missing prerequisites, and they may want to discuss the alternatives (summer school, additional time to graduate, an extra load during the semester). After seeing the curriculum for their occupations, students are asked whether they are interested in following it. If they show interest, they are asked whether they have the necessary prerequisites. Any answer except yes generates a special display warning the student to discuss the matter with his counselor. The counselor, therefore, should be prepared for the matter to come up.

4. Students may want to discuss the program of study suggested by SIGI (Figure 12b). The programs are copied directly from the college catalog and should meet the requirements for graduation. Whenever research indicated that a particular course should be taken to prepare for an occupation, that course was placed in one of the elective slots; otherwise, electives were left up to the student. In cases involving a transfer to a four-year college, the program presented by SIGI is necessarily a compromise among the local requirements for graduation, the requirements for admission into the upper division of representative local four-year colleges (usually the closest State colleges were used as models), and the requirements of the occupation. The counselor, with his knowledge of transfer institutions, may want to adapt the programs to the policies of a particular college the student is contemplating. The program may have to be changed for other reasons as well, such as missing prerequisites.

5. Some students may want help in selecting a four-year college for transfer. Where appropriate, students get a display (Figure 12c) showing institutions offering curricula appropriate for the selected occupation. The information is very restricted owing to limitations of space. For most occupations, only institutions in the Philadelphia, New York City, and New Jersey area are listed, although for some occupations it has been necessary to go farther afield. Sectarian and non-coeducational institutions are not identified as such, nor are selective private institutions. In short, the list is presented only as a starting point for collecting information. The counselor can help the student narrow the field and steer him to sources of information about four-year institutions.

6. If the local junior college does not offer a curriculum appropriate for the selected occupation, the student is given a special display telling him where to go to find such a curriculum (Figure 13). If that is another public community college, the counselor may have to explain the New Jersey "chargeback" program and help the student enroll. Some occupations, such as Fashion Designer require transfer after only one year of community college experience if the student is not to lose time and credit. The counselor will have to be on the alert for these special displays for each one requires different action and involves a situation in which the student will need assistance.

7. If a student has completed more than one semester at his community college, he sees a display (Figure 14) showing him how to reconcile his old and new programs. Consequently, a student considering a new occupation may come to the counselor with a printout of a new program with some subjects crossed out and with question marks beside others as explained in Figure 14. The counselor should be prepared to advise the student with respect to the new program and to help him enroll in it with the minimum loss of time and credit.

8. Students may see a sequence of five displays outlining the major sources of financial aid (Figure 15). The last display tells him to seek help from the Coordinator of Financial Aid, but the student may bring the matter up to his counselor. The information in the display is necessarily very sketchy, and the student who pursues it will need help. The Coordinator of Financial Aid may be asked about sources of aid specific to a particular occupation as listed in the next to last frame of Figure 15. Students may also need to be told about cooperative education programs.

Counselor Help With Student Problems

The PLANNING System cannot function successfully independently of the counselor. Its aim is to relieve the counselor of many of the tedious details associated with selecting a suitable curriculum. The hope is that the student coming to the counselor from PLANNING will bring with him only the problems of enrolling in a selected curriculum, rather than the problems of selecting it. Ideally, the student's problems will be quite definite: how to enroll in a new curriculum without losing credit, how to assure himself that he has the necessary prerequisites, how to select a transfer college, and so on. Nevertheless, there is no guarantee that students will have defined their problems so conveniently. When students have selected a curriculum that the counselor thinks is severely inappropriate, he can advise the student to return to STRATEGY and see how his predictions affect the desirability of the occupation he selected. The student can also be advised to go to LOCATE and to use Early Entry as one of the values for retrieving occupations. If the specification for Early Entry is set at a level that reduces risks for the student with low predictions--say at 2 or 3 years--higher level and professional occupations will not be retrieved. Of course, any occupations retrieved should be pursued in COMPARE to collect information and in STRATEGY to see how they fit the student's values and abilities.

CAREER PLAN FOR PUBLIC HEALTH OFFICER

1. Enroll in biology program in junior college.

2. Check catalogs of 4-year schools offering a bachelor's degree in (preferably) environmental health or in biology. Include in junior college program courses they require for transfer.

3. Complete the Associate degree; transfer to a 4-year college; complete the bachelor's degree in environmental health or in biology.

4. While in college check with your state Department of Health or Department of Environmental Protection to find out about summer job opportunities related to public health.

5. Find out about registration or licensing laws in the state where you want to work. Fulfill registration or license requirements.

6. Graduate training may be required for high level positions in public health.

For a copy press PRINT; otherwise press NEXT.

FIGURE 11
PLANNING: PRINTOUT AVAILABLE TO THE STUDENT: OVERVIEW OF STEPS TO TAKE TO ENTER A SELECTED OCCUPATION

Public Health Officer

HIGH SCHOOL PREREQUISITES FOR THIS PROGRAM

High school diploma or equivalent
One year of science (biology, chemistry, or physics)
Recommended: two years of academic (not shop) math

If you have not completed the prerequisites, you may not be allowed to take some of the courses in your program of study. You will have to take lower level courses first, and this will put you behind schedule. You can:

1. Get back on schedule by making up work in summer school.
2. Take longer to graduate.
3. Get back on schedule by taking extra courses during a semester.

Each case is different. SEE YOUR COLLEGE COUNSELOR OR COLLEGE ADVISER.

You will want a copy of this information. Press PRINT.

FIGURE 12A
PLANNING: PRINTOUT FORCED ON THE STUDENT OF THE DISPLAY SHOWING THE HIGH SCHOOL PREREQUISITES FOR ENTERING THE CURRICULUM ASSOCIATED WITH A SELECTED OCCUPATION

A suggested BIOLOGY program for a PUBLIC HEALTH OFFICER includes:

FIRST SEMESTER	SECOND SEMESTER
EG 1Ø1 Language & Lit. I	EG 1Ø2 Language & Lit. II
CH 1Ø1 Gen. Chemistry	CH 1Ø2 Gen. Chem. & Qualitative Analysis
PY 1Ø1 Intro. Psychology	BY 1Ø2 Gen. Biology II
BY 1Ø1 General Biology I	AD 127 Freehand Drawing
MA 1Ø3 College Math I*	MA 1Ø4 College Math II*
THIRD SEMESTER	FOURTH SEMESTER
PE 11Ø Phys. Ed.	BY 214 Biology Seminar
Foreign Language	Foreign Language
BY 2Ø1 Microbiology	PH 1Ø2 College Physics II
PH 1Ø1 College Physics I	CH 2Ø1 Organic Chemistry I
Soc. Sci. Elect.	Humanities or Soc. Sci. Elect.

*Take MA 111 and MA 112 (Math Analysis I & II) if you qualify.

You will want a copy of this information. Press PRINT.

FIGURE 12B
PLANNING: PRINTOUT FORCED ON THE STUDENT OF THE DISPLAY SHOWING THE LOCAL CURRICULUM ASSOCIATED WITH A SELECTED OCCUPATION

Nearly all 4-year colleges offer a bachelor's degree in biology. Check college catalogs and choose a school which has courses in bacteriology, medical entomology, and public health.

Most schools which offer a bachelor's in environmental biology or public health are located far from your area. The closest ones are:

VERMONT	MASSACHUSETTS
Goddard College	Univ. of Massachusetts
Royalton College	

The schools nearest you which offer graduate degrees in public health or environmental health engineering include:

NEW YORK	MASSACHUSETTS	MARYLAND	PENNSYLVANIA
Columbia Univ.	Harvard Univ.	The Johns Hopkins U.	U. of Pittsburgh
Cornell Univ.	U. of Massachusetts		

WARNING: List not necessarily complete. Check catalogs in your college library or counselor's office.

You will want a copy of this information. Press PRINT.

FIGURE 12C

PLANNING: PRINTOUT FORCED ON THE STUDENT OF THE DISPLAY SHOWING THE TRANSFER COLLEGES OFFERING A CURRICULUM ASSOCIATED WITH A SELECTED OCCUPATION

There is no Dental Hygiene Technology curriculum at Mercer County Community College. Such programs are offered at the following New Jersey public junior colleges:

Camden County College, Blackwood
Bergen Community College, Paramus
Middlesex County College, Edison
Union County Technical Institute, Scotch Plains

NOTE: Fairleigh Dickinson Univ., Teaneck, offers a 4-year program in dental hygience.

Check the catalogs of these schools, located in your college library or counselor's office. See what high school courses are required for these programs.

TALK TO YOUR COLLEGE ADVISER. He can tell you how to enroll in one of these schools at no extra cost. He can also tell you how to make up for courses which you may not have taken in high school.

You will want a copy of this information. Press PRINT.

FIGURE 13
PLANNING: PRINTOUT FORCED ON THE STUDENT OF A DISPLAY FOR AN OCCUPATION FOR WHICH THE LOCAL JUNIOR COLLEGE DOES NOT OFFER AN APPROPRIATE CURRICULUM

Will you lose some credits if you switch to this new program? To find out, follow these steps:

1. After you have signed off, compare your new program with the courses you have already taken.

2. Cross off the new program any courses you have already taken.

3. Can you SUBSTITUTE a math course you have already taken for a math course in the new program? If you think you can, place a question mark (?) beside the math course in the new program.

4. Follow step 3 for courses in social science, science, and English.

5. Does your new program have any free electives? If so, courses you have already taken may fit in there. Place two question marks (??) beside such courses in the new program.

6. Now take your new program to your counselor. He will know what the question marks mean. He will help you get into the new program with the least loss of credit.

You will want a copy of this display. Press PRINT.

FIGURE 14

PLANNING: PRINTOUT AVAILABLE TO STUDENTS WHO HAVE COMPLETED ONE OR MORE SEMESTERS SHOWING THEM HOW TO ENROLL IN A NEW CURRICULUM

LOANS

National Defense Student Loans	Borrow up to $1ØØØ/yr. Part of loan may be forgiven. Low interest. For college students in need of financial aid.
Federal Guaranteed Student Loan	Borrow up to $25ØØ/yr. from bank, U.S. guarantees repayment. Need not a factor, but you must be accepted in a college.
Guaranteed Student Loan	Borrow up to $15ØØ/yr. from bank, N.J. guarantees repayment. You must be a N.J. resident enrolled in college.
Loan Program for Cuban Students	U.S. loans for Cuban nationals not holding a Permanent Resident visa.
Nursing Loan Programs	Up to $15ØØ/yr. from U.S. for students enrolled in 2- or 4-year nursing programs.

Some banks, lending institutions, & colleges also have low-interest loans for college students.

WORK-STUDY PROGRAM

College Work-Study	U.S. & your college will pay hourly wages for up to 15 hrs./week; you must be enrolled in college & need financial aid.

(Continued in next display)
For a printed copy of this information, press PRINT; otherwise, press NEXT.

GRANTS AND SCHOLARSHIPS

Educational Opportunity Grant	$2ØØ-1ØØØ/yr. from U.S. for person in EXCEPTIONAL financial need accepted by a college.
Educational Opportunity Fund Grant	$25Ø-1ØØØ/yr. for N.J. resident with low income and a disadvantaged educational background.
N.J. State Scholarship	Pays tuition up to $5ØØ for N.J. resident with scholastic ability and need of financial aid.
Educational Incentive Grant	If you have a N.J. State Scholarship & attend a college with tuition more than $45Ø, you may get $1ØØ-5ØØ additional.
Tuition Aid Grant	$2ØØ-1ØØØ for resident of N.J. with financial need enrolled in a college with tuition more than $45Ø.
Rehabilitation Education Grant	Grants for N.J. resident with disability for work and a career goal that requires a college education.
GI Bill	$22Ø/month or more for honorably discharged veterans with at least 181 days' service after Jan. 31, 1955.

(Continued in next display)
For a printed copy of this information, press PRINT; otherwise, press NEXT.

FIGURE 15
PLANNING: DISPLAYS SHOWING SOURCES OF FINANCIAL AID.
PRINTOUTS ARE AVAILABLE TO THE STUDENT

Widows & War Orphans	$175/month for wife or child of serviceman killed or disabled in combat, missing, or made prisoner of war.
War Orphans	Up to $500/yr. for N.J. resident aged 21 or younger whose father was killed or disabled as a result of active service.
Social Security Benefits	Grants may be available to children whose parents are receiving Social Security.
Nursing Scholarship	Up to $1500/yr. from U.S. for student nurses with unusual need.
Law Enforcement Education Plan	U.S. grants to students enrolled in law enforcement programs who promise to work at least 2 years in law enforcement.

Most 4-year colleges also have scholarships. See your financial aid officer.

(Continued in next display)
For a printed copy of this information, press PRINT; otherwise, press NEXT.

OTHER

Many special scholarships and grants exist for students planning careers in certain occupations. Some of the fields are listed below. See your financial aid officer even if your field is not listed.

Advertising	Chemistry	Journalism	Pharmacy
Aeronautics	Communications	Law	Psychology
Architecture	Economics	Liberal Arts	Sociology
Art	Teaching	Library Science	Technology
Astronomy and Meteorology	Engineering	Mathematics	TV-Radio
	Forestry	Medical Science	Theater Arts
Biology	Health	Mortuary Science	Therapy
Business	Home Economics	Music	

Some employers pay some or all of the college tuition of their employees. If you are employed, ask your employer if he will help you with your education.

(Continued in next display)

For a printed copy of this information, press PRINT; otherwise, press NEXT.

FIGURE 15 (Continued)

LOCAL

College-Sponsored Employment	MCCC provides part-time jobs up to 15 hours/week. This is a different program from the work-study described earlier.
Grants-in-Aid	Offered by MCCC to students with outstanding talent in certain areas, such as music, art, writing, athletics, & student government. They pay tuition, fees, & textbooks.
Scholarships	Several are available in varying amounts. Two of them cover full tuition.

The title of the financial aid officer at Mercer County Community College is Coordinator of Financial Aid. See him.

His office is in the Student Personnel Services Office.

For a printed copy of this information, Press PRINT; otherwise, press NEXT.

FIGURE 15 (Continued)

STRATEGY

What the Student Does

The student selects three occupations he wishes to consider with regard to their combined desirability and feasibility. He identifies the one he would enter at this moment. He then sees the Desirability Sums for the three occupations. Next, each sum is multiplied by the probability of obtaining a GPA of C or better in the first semester of the appropriate curriculum. If more than one curriculum can lead to the occupation, the student chooses the curriculum he intends to follow. If no predictors are available for the appropriate curriculum, the student estimates his probability of getting C or better. (The probability figures used in STRATEGY come from the PREDICTION System and equal the sum of the probability of getting A or B and the probability of getting C.)

The product of the sum times the probability is an Index showing the combined desirability and feasibility of an occupation. (To avoid decimals, probabilities and Indexes are reported as whole numbers. Therefore only the first two digits of the Index should be considered.)

After seeing the Indexes, the student determines which category of outcome the occupation with the highest Index fits: (1) it has the highest Desirability Sum AND the highest probability; (2) it has the highest Desirability Sum but not the highest probability; (3) it does not have the highest Desirability Sum but does have the highest probability; and (4) it has neither the highest Desirability Sum nor the highest probability. He sees a display appropriate to his category. Then he once again indicates which occupation he would enter.

Printouts That the Student May Get

None at the present time.

Things for the Counselor to Look For

1. The counselor should probe to see whether or not the student understands the purpose and method of STRATEGY. Some students, upon completing STRATEGY, name as their first choice an occupation which was neither their first choice originally nor the one with the highest Index. It is hard to account for such behavior unless the student did not understand what was going on. The counselor cannot identify this situation without a printout, but he can ask questions that will reveal the student's comprehension. The counselor may have to explain that the Desirability Sums express the student's desires; the probabilities express his ability to prepare for the occupation successfully; and the Index expresses the combination of these two forces. Generally, the higher the index, the better the occupation fits the student's

values and abilities. But once he understands what the numbers represent, he can interpret them to suit his own inclinations. For example, suppose the occupation with the highest Index is not also the occupation with the highest Desirability and the highest Probability: The student must then decide whether he wants to sacrifice some desirability in order to increase his chances of success, or to accept a larger risk in order to go after a more desirable occupation. Unless the student understands all three elements of STRATEGY--the Desirability Sum, the probability estimate, and the Index--he may blindly accept the Index numbers as infused with magic, or he may switch irrationally from occupation to occupation.

2. The counselor should make sure that the students who were impressed by their Desirability Sums in DESIRABILITY have actually gone through STRATEGY. This matter is discussed in the chapter on the DESIRABILITY System. Since the highest Desirability Sums are usually associated with higher level occupations, it is important that the probability figure be applied as a sort of "reality factor." STRATEGY is especially important for the student whose predictions are low.

3. When SIGI does not have probability figures for a particular occupation, the student uses his own estimates. Many students with generally unfavorable probability figures will make questionably high estimates in this situation. The counselor should ask what the student's own estimates were. (Any occupation associated with a curriculum not offered at MCCC or a curriculum preceded by an asterisk in Figure 9 will require a self-estimate.) If the self-estimate seems out of line with the student's general ability, the counselor should point out how an unrealistic probability figure will produce an Index that is misleading. The counselor needs to be especially cautious if the student has settled on an occupation with an Index inflated by a high estimated probability. The counselor can suggest that the student go through STRATEGY again with a more realistic probability estimate to see how the change affects the Index.

4. Upon entering STRATEGY, the student is invited to inspect his value weights and Interest Field and to make changes in accordance with his latest insights. Since Desirability Sums (and therefore Indexes) are functions of the weights, the counselor should check to see whether the student has come to doubt his original weights and if so, whether he brought them up to date. Changes of one point or so do not

affect the Desirability Sums much, but if there were any large changes, the student should reweight his values at the terminal. He can do this by returning to the VALUES System, where he is offered the chance to play the Value Game again, or by returning to STRATEGY, where he simply adjusts the weights without any opportunity to play the game.

5. If the student is considering an occupation high in risk in terms of his abilities, the counselor should ask to see if the student has any contingency plans. For example, the student should be urged to plan so that he can fall back to a paraprofessional occupation if his grades shut the door on a professional one. The student should be advised to use LOCATE as a means of seeing a list of occupations from which he can make contingency choices. If the student uses Early Entry as one of his values in LOCATE with a specification of 2 to 3 years of education, he will retrieve occupations that fit his most important values and are also more realistic in terms of his abilities. With this specification of Early Entry the student may have to settle for less income, prestige, independence, and so on, in order to retrieve a list of occupations, but he will still be better off than if he had no contingency plans at all and stumbled into any job that came to hand as an alternative to his first choice.

Counselor Help With Student Problems

Aside from making sure that the student understands the rationale of STRATEGY, the counselor only needs to make sure that the student uses it. Without STRATEGY, both the Desirability Sums and the predictions tend to be misleading--the one as representing uncorrected desires and the other as a list of risks unfocused on outcomes. The student needs both pieces of information to make a decision intelligently, and he should be encouraged to use STRATEGY whenever he is thinking about a new occupation.