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AN ASSESSMENT OF THREE FOREIGN LANGUAGE TEACHING STRATEGIES UTILIZING THREE LANGUAGE LABORATORY SYSTEMS.

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This is a report on a statewide experiment conducted in Pennsylvania secondary schools of all types during the 1965-66 school year. The project sought to determine the effectiveness of various teaching strategies and of the language laboratory in the environment of the real school situation. Each of 61 first-year French classes and 43 first-year German classes were assigned one of seven experimental treatments. The report tentatively concludes that while innovations in foreign language instruction have been widespread, the classroom impact may be more superficial than the profession hoped. This report is not truly final, but the first of two reports. Until the second appears, all conclusions should be viewed as tentative. (KM)

FINAL REPORT

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U.S. DEPARTMENT OF HEALTH,
EDUCATION, AND WELFARE
Office of Education
Bureau of Research

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THREE FOREIGN LANGUAGE TEACHING STRATEGIES

UTILIZING THREE LANGUAGE LABORATORY SYSTEMS

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January, 1968

The research reported herein was performed pursuant to a grant with the Office of Education, U.S. Department of Health, Education, and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.

U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

Office of Education
Bureau of Research

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PREFACE AND ACKNOWLEDGEMENTS

In studying this "Final Report" of Project 1330, the reader should be aware that it is not truly "final" but the first of two reports. The second and more meaningful report will both continue this present study and report on a replication of this first year data. In a sense then, the "final" report is but an "interim" report. Conclusions should be viewed as tentative until completion of the longitudinal study and verification by the replication.

It must be recognized that this large-scale investigation, a joint cooperative undertaking of the State Department of Public Instruction and the Cooperative Research Center of West Chester State College, was wholly dependent upon the contributions of literally hundreds of professionals - the foreign language specialists consulted, the research and statistical consultants, a large number of supportive school administrators, the Educational Testing Service and the Computer Center of West Chester State College. Specific mention must be made of the support provided by Dr. Earl F. Sykes, President, Dr. Arnold C. Fletcher, Dean of Academic Affairs, Dr. Martin J. Higgins, Director of Research, Mr. Wesley Fasnacht, Director of the Computer Center, West Chester State College, as well as Dr. Robert Hayes, Bureau of Research, the Department of Public Instruction. Special credit for providing the initial emphasis for the research is due Dr. N. Sidney Archer, then Director of the Bureau of Research, Department of Public Instruction.

It is those persons who actually conducted the research who made this report possible, Dr. Milton C. Woodlen, Dr. Alfred D. Roberts, Mr. Ralph A. Eisenstadt, Mr. William E. McDonald, Mrs. Muriel Santmyers, Miss Mary K. Gimmy and Mrs. Haydee Ern. Special thanks are due Mr. Helmut A. Baranyi of the Project Staff and to Mr. Keith Kershner, Bureau of Research, Department of Public Instruction, for many direct contributions to the analysis of data and the completion of this report. The highest professionalism was shown by the over one hundred classroom teachers in the experiment who gave themselves to both the demands and pedogogical restraints of the Project. To this date these persons have worked "in the dark" without a knowledge of the outcomes of the experiment. Their compensation has been solely one of professional satisfaction and growth. They are truly professionals.

Philip D. Smith, Jr.
Project Coordinator
Foreign Language Research Center

SUMMARY

The teaching of modern foreign languages in American secondary schools has undergone two major changes in the past decade, classroom teaching strategy and the language laboratory. Both have been shown to be effective in small-scale controlled situations. The Pennsylvania Foreign Language Research Project was an attempt to determine the effectiveness of teaching strategy and language laboratory in the environment of the real school situation.

Funded under Title VII-A of the National Defense Education Act, a large scale experiment was conducted in 104 Pennsylvania secondary schools of all types and diverse geographic and socio-economic areas. Sixty-one French I and forty-three German I classes were assigned to one of seven possible teaching strategy-language laboratory combinations: "traditional", "functional skills" or "functional-skills + grammar" with tape recorders, audio-active laboratories and audio-record laboratories. Class assignment was random across functional skills and laboratory treatment.

For the purposes of the research study definitions of "traditional," "functional skills" and "functional-skills + grammar" strategies were defined by a selected group of foreign language educators which included Robert Lado, Stanley Sapon, Wilmarth Starr, W. Freeman Twaddell, Albert Valdman and Donald Walsh. Other prominent specialists assisted in various phases of the study. Rebecca Valette contributed by writing a foreign language Listening Discrimination Test for the Project.

Objectives of the experiment included:

1. To determine which of three foreign language teaching strategies is most effective;

2. To determine which of three language laboratory systems is best suited, economically and instructionally;

3. To determine the optimum combination of teaching strategy and language laboratory;

4. To determine the best predictors of success in foreign language learning;

5. To determine the interrelationships between foreign language skills;

6. To determine the relationship of strategy and system to student ability;

7. To identify and compare student attitudes and expectations toward each teaching strategy;

8. To identify levels of foreign language mastery attainable in the secondary school program;

9. To determine the strengths and weaknesses of selected commercial programs.

10. To identify teacher factors related to student achievement.

Students and teachers were given extensive pre-testing, mid-year and post-testing. Twenty-five discrete measures and twelve attitude/opinion indices were obtained on 2,171 students. Three hundred students received additional tests of speaking and writing.

Data analysis was based upon correlation and analyses of variance, covariance and regression. For the major portion the class/group mean was used as the statistical unit for analysis.

Results at the end of one year indicated:

1. "Traditional" students exceeded or equalled "Functional Skills" students on all measures;

2. The language laboratory systems as employed twice weekly had no discernable effect;

3. There was no "optimum" combination of strategy and system;

4. The best combination of predictors of success were the MLA Cooperative Classroom Listening Test, the Modern Language Aptitude Test and Language I.Q. as measured by the California Test of Mental Maturity (Short Form).

5. Females achieved better than males;

6. Student attitude was independent of the strategy employed;

7. "Functional Skills" classes proceeded more slowly than "Traditional" classes; and

8. There was no relationship between teacher scores on all seven portions of the MLA Teacher Proficiency Tests and the achievement of their classes in foreign language skills.

The study continued through a second year of instruction, observing over 1,100 students of the original population and with a seven hundred new student replication of the first year study. A comprehensive report is now in progress.

AN ASSESSMENT OF THREE FOREIGN LANGUAGE TEACHING STRATEGIES UTILIZING THREE LANGUAGE LABORATORY SYSTEMS

SECTION I - INTRODUCTION

The role of modern foreign language education in the American educational process has assumed major importance in recent years. Long a major segment of the curriculum, the improvement of modern foreign language instruction at all levels has become "in the national interest."

The Commonwealth of Pennsylvania has long been committed to the teaching of foreign languages in the public schools. Ample testimony to this commitment is illustrated by the fact that hundreds of language laboratories are installed in its public schools and 20 percent of the teachers of foreign languages have attended NDEA summer institutes. Student enrollment in foreign language courses varies between 17 and 20 percent of the secondary school population. In support of the foreign language program the State has mandated, "... a minimum of a four-year sequence of a modern foreign language shall be offered by each school system" and requires for certification in the teaching of foreign languages that prospective candidates receive passable scores on the MLA Foreign Language Proficiency Test for Teachers and Advanced Students (Educational Testing Service, 1962).

Implicit in this strong state support for the teaching of languages is the responsibility to provide expert advice on problems of teaching methodology which ultimately determines the effectiveness of the language program. Yet, attacks on the purported usefulness of the language laboratory have been instrumental in raising doubts in the minds of both professional educators and interested lay persons previously convinced of its effectiveness. It is indeed surprising that, aside from extensive authoritative statements on the subject, there is little empirical research that can be cited as an effective rebuttal to these challenges. It was therefore important that the profession initiate a study for resolving several basic unanswered problems related to secondary school foreign language instruction.

The purpose of this research was to determine the most effective way of integrating the language laboratory into one or more of several alternative teaching strategies. It proposed to investigate this problem as it relates to foreign language teaching programs commonly found in the public secondary school classroom. Present plans are to follow the participating students for the three years that they study the foreign language. However, the first phase of the research reported herein concerned itself with evaluating only the first year of instruction.

Although this research was conducted within the Commonwealth of Pennsylvania, the area of the Department's jurisdiction, there can be little doubt that the results will be applicable to many schools throughout the nation. This was assured by utilizing schools that were socio-economically representative and by minimizing the degree to which typical teaching conditions were to be modified. Also, the instructional and testing materials were those commonly used in the teaching of foreign languages in the secondary schools.

BACKGROUND OF THE PROBLEM

Essentially, the profession is confronted with two sets of related questions:

1. Given several alternative teaching approaches to foreign language instruction which of these is better? and

2. Which of the commonly used language laboratory systems is most effective as an adjunct to foreign language instruction?

On the one hand, there is the historically older, and more widely practiced approach to foreign language instruction known as "grammar-translation" or "traditional." In opposition to this there is developing increasingly wide support for the "audiolingual" or "functional skills" approach, the origins of which extend as far back as the seventeenth century. Currently, it is receiving its greatest support from findings in linguistic science. The proponents of these two schools are in disagreement on basic assumptions regarding the nature of language learning and different priorities in selecting foreign language objectives. Each advances a distinct set of methods designed to achieve the terminal language behaviors each deems most important.

It must be emphasized that the terminal behaviors expected of these two approaches to foreign language learning are indeed distinct.

The "traditional" approach is designed to give the student "...conscious control of the phonological, grammatical and lexical patterns of a second language." (Carroll 1965) Primary importance is attached to developing an understanding of the language. Facility in its actual use will then develop as the language is used in real situations.

In contrast, the objective of the "functional skills" approach is to develop the skill to speak the foreign language in everyday situations; language analysis can be undertaken as a separate study after effective control in using the language has been gained. This dichotomy is reflected in the basic design, the procedures and the testing program of this investigation.

Traditionally, foreign language instruction stresses student mastery of the formal grammar of the target language. This emphasis on grammar can be traced to the influence of eighteenth-century grammarians who "assumed the existence of a universal grammar founded in universal reason and embodied in its purest state in the Greek and Latin of classical literature" (Guth, 1964). The textbook, consisting of carefully graded reading selections and accompanying grammar lessons, is the traditionalist's essential pedagogical tool. The assumption is that profieiency in the language can be acquired by learning a set of grammatical rules to which the language is supposed to conform and by mechanically applying these rules. Coleman's (1929) study, which has had wide influence on the teaching of foreign languages in the secondary schools, recommended the single objective of developing reading proficiency as being realistically attainable under typical classroom conditions. That oral mastery has never been a serious expectation of the foreign language program is clearly demonstrated by the almost exclusive use of paper-pencil tests to evaluate student progress in language mastery.

While, as earlier pointed out, the "audiolingual" emphasis in modern foreign language teaching has roots extending back many years, the recent dramatic changes in the approach to foreign language instruction are, in no small measure, due to the findings of linguistic science during the past 30 years. Johnston and Seerley (1961) note several linguistic propositibns that have immediate implications for the high school language program. "Language is speech. The written form comes later, considerably later in the progression of language learning which is first hearing and speaking and then reading and writing." In sharp contrast to the formalistic traditional teaching methods, many linguists claim that language learning is a behavioral skill and not an intellectual discipline. Developing this skill, like any other, requires the careful cultivation of language habits.

that are an automatic, almost unconscious, performance of highly complicated physical and mental processes. Comprehension and accurate reproduction of the sounds of a language, which are the major objectives of the audiolingual approach, can only be achieved by imitating a native speaker or one who has mastered the native accent.

Instead of sole reliance on the textbook, the audiolingual teacher employs a set of teaching techniques and materials specifically designed to develop oral and listening facility. For example, the "dialogue" rather than the reading selection, is the primary instructional tool for the beginning student. A dialogue is a recorded conversation focusing on a real situation which the student can understand, identify with, and enjoy. Its language is the standard, authentic, and contemporary informal language that would be used in equivalent circumstances by native speakers of the same age as the American students in the class. After extensive practice, using such recently devised techniques as modeling, full- and part-choral repetition with build-ups, double repetitions, and constant correction, each student is expected to master the complete dialogue. Mastery implies that the student be able to respond automatically with appropriate selections from the dialogue. Contrary to the traditional program, the audiolingual program assesses student proficiency in the listening and oral skills in addition to testing reading and writing proficiency.

The emphasis on imitation, practice, and repetition to the point of "over-learning" encouraged many schools that adopted the audiolingual approach to install language laboratory facilities. The usual classroom setting of 30 students per instructor is wholly inadequate if the recommended 15-20 minutes of daily oral practice is to be followed. In the laboratory, each student is able to practice individually without disturbing other students. In addition, Hayes (1963) notes that the language laboratory provides native models of the foreign language for imitation, extensive structure drills, a variety of native voices necessary for understanding the language in its natural setting, and facilities for testing each student for listening and speaking ability.

Resolving these issues is important because the current ferment in foreign language instruction represents a major curricular change comparable to the revisions that the secondary school science and mathematics programs have undergone. Furthermore, discarding older programs and investing in audiolingual materials and laboratory equipment is a financial investment of significant proportions. Careful study and deliberate evaluation are important factors of any decision for change.

PURPOSES AND OBJECTIVES

The unanswered questions that are directly and indirectly related to foreign language instruction in the secondary school range across the entire spectrum of language learning. Carroll (1963) cites over 50 specific problems in the area of foreign language learning that would benefit from further research. Certainly, not all of these enjoy the same priority, and no single investigation can direct its attention to any significant number of these. Consequently, the fact that the proposing agency was a state department of education served to delimit the areas in which to concentrate its research efforts. The following guidelines proved useful in selecting the specific problems.

The problems selected had to be...

1. classifiable as applied research, i.e., problems leading to a solution which would be beneficial to present classroom teachers, school administrators, and/or producers of classroom materials,

2. important and substantive issues confronting language teachers, school administrators, and/or producers of classroom materials,

3. independent of the prior solution of other as yet unsolved problems,

4. amenable to investigation within the existing administrative framework of participating schools. Modifications that might be required for the research should not tend to create an artificial situation nullifying generalization of results to other teaching conditions.

Of particular significance was Carroll's (1963) advice:

> It may be recommended that useful experiments in foreign languages can be conducted by adhering fairly closely... to patterns of teaching and types of teaching materials which have already been developed and found necessary by foreign language teachers.

The two broad areas of concern in this investigation were determining (1) the effects of the audiolingual approach upon student achievement in the learning of a second language, and (2) the type of language laboratory equipment that is most efficient in achieving the goals of the audiolingual program. The study also gathered information related to student achievement in each of the four language skills and the attitude associated with each of the experimental treatments.

Another important purpose in this study was the role of a state education agency in identifying a significant research problem and in implementing the experimental study. The Department of Public Instruction is strategically situated to identify problems of concern to public schools. In implementing the study the Department utilized the personnel and talents at one of the State Colleges. This partnership between a state education agency and an affiliated state institution of higher education should provide a model for future research studies.

RELATED RESEARCH

In surveying the enormous research literature of foreign language teaching it was decided to omit references to studies which, while pertinent to any investigation of language instruction, do not relate directly to the specific experimental variables of this proposal. Reference citations are further limited to those which have relevance to language instruction at the secondary school level.

Coleman (1929) in an extensive survey of foreign language teaching practices found conditions chaotic. In spite of the varied methods and materials, little or no evidence was discovered to support widely accepted practices. The report emphasized the need for evaluating the effects of the various practices under typical American classroom conditions. The Army Specialized Training Program (A.S.T.P.) was developed with the assistance of linguistic scientists, and is considered by many to be the precursor of the current audio-lingual trend. Birkmaier (1960) reports that a completely objective evaluation of the Army program was never made.

Scheuler (1944) doubted that reading mastery could best be obtained by means of the aural-oral methods employed by the A.S.T.P. Carroll (1963) reported,

> Proponents of 'new-type' courses which initially emphasize audiolingual skills claim, however, that reading skills will be more fluent and facile when the teaching of reading is delayed until the student has achieved a certain degree of mastery of audiolingual skills. There is no research information, however, to indicate whether this claim is sound or how long the teaching of reading should be delayed.

Following widespread interest in the A.S.T.P. and adoption of its techniques the Rockefeller Foundation supported a broad survey of the teaching of a second language. Agard and Dunkel (1948) conducted the study and reported the following results:

1. Few students in the aural-oral programs were able to attain "spontaneously fluent speech" in one or two years time.

2. The experimental groups had consistently superior pronunciation compared to conventional groups but lagged in reading proficiency.

3. Higher motivation was discerned among the aural-oral students but interest for many decreases as the material becomes more demanding.

4. Low correlations of the reading and aural test results suggest that these are separate and independent skills which must be individually developed.

Although Carroll(1963) found "much of value in this study," he describes it as deficient in "exact controls and rigorous experimental design."

Most of the efforts following the Agard-Dunkel (1948) study consisted of materials development for audiolingual instruction. Lacking instructional materials, standardized tests to evaluate listening and speaking achievement, and adequate laboratory facilities to accomodate the new program demands, little useful research comparing new and conventional programs was possible (Birkmaier, 1960). Carroll (1963) dismisses most of the available studies as being "poorly controlled or otherwise deficient from the standpoint of valid research methodology."

Pickrel, Neidt, and Gibson (1958) studied the value of tape recordings in junior high school Spanish classes. It was demonstrated that the use of tape recording is an effective method in teaching conversational Spanish when the teaching is based on tapes prepared by a Spanish specialist. Buch (1963) compared the effectiveness of four different language laboratory arrangements in beginning French. He reports that the overall best results on conventional and audiolingual tests was achieved by the group that spent eighty percent of

their laboratory time with audio-active equipment and twenty percent of the time with the record facilities. Although meticulous care was taken to develop reliable, unbiased, and accurate judge ratings of the audiolingual skills the investigator notes several weaknesses in the design which limit generalizing the results. Each experimental treatment was administered to only one class, only one teacher was involved, students were evaluated during the first year only, and the materials were not those normally intended for an audiolingual program.

A study that has attracted considerable interest in foreign language teaching circles was conducted by Keating (1963). About 5,000 students from 21 school districts participated. They represented those who studied French at Levels I, II, III, and IV. For the three skills tested--reading comprehension, listening comprehension, and speech production--significant differences favored the no-laboratory group in nearly all cases. "In only one instance, that of speech production scores at Level I, was there found a significant difference that favored the laboratory group." The consistently poor performance on the part of the "lab" groups certainly warrants further study. However, a careful reading of this study raises serious doubts regarding the generalization of these results to other foreign language teaching situations.

The author of that study notes on page 24, "a fourth limitation of this study is...this study cannot be considered an experiment in any proper sense...since all the students tested were involved in on-going programs." As if to emphasize the research design limitations the following quotation from page 38 is instructive, "...absolutely no provision was made for central control of any kind over the independent districts." A detailed critique of this study was made by Berger (1963) which analyzes weaknesses in teacher training, student matching, appropriateness of instructional materials, and soundness of the evaluation procedures.

The Bureau of Audio-Visual Instruction, Board of Education of the City of New York (196?) reported on two related studies which are to date the most careful and extensive studies on the effectiveness of the language laboratory in high school. The first "proposed to test measurable improvement in competence in speaking French and in comprehension of spoken French without significant loss in reading comprehension and in written aspects of language study." Significant gains were made by the laboratory groups in speech and listening skills without loss in traditional skills as measured by a standardized French test.

The second of these studies was concerned with the relative effectiveness of three types of language laboratory experiences. Essentially, one group used recording equipment daily, another used only nonrecording equipment daily, and the third group used recording and nonrecording equipment.

> In the global rating (overall quality) of speech, the Record-Playback-Daily group showed the greatest gain... and all experimental groups gained more than the control group in global rating of speech...In no measure did the control (traditional) group make gains significantly greater than all lab groups, whereas, the Record-Playback-Daily group stands first or second in thirteen out of fourteen measures.

Here again the instructional methods, materials, and evaluation instruments were "transitional" and the number of both pupils and teachers is insufficient to permit a definitive conclusion based on the findings.

The most extensively reported research on comparing the two teaching strategies, "traditional" and "audiolingual" or "functional skills," is that of Scherer and Wertheimer (1964). The Scherer-Wertheimer study showed that, at the end of two years of college instruction, students who had a first-year audiolingual background did better in listening and speaking but were equal to or worse than traditional students in reading, writing, and translation. Evaluation of the investigation depended to a great degree upon correlations and the direct comparison of the means of the two groups. This study, while a classic, contained some factors which the present investigation was determined to avoid. Among these were (1) a research population consisting of college students in one language only, (2) the creation of special teaching materials, (3) the small number of students completing the two-year study (N 49) and (4) the inability of the investigators to maintain the separation of the two groups under investigation.

In 1964 the School District of Philadelphia undertook a nineteen school assessment of "traditional" and "audiolingual" approaches in French and Spanish utilizing the text as the instructional variable. (Sandstrom and Rofman, 1967) Each school had both audiolingual and traditional classes assigned. Numerous meetings and workshops helped control the teacher variable.

Evaluation of the experiment was based upon (1) teacher rating of student performance and (2) the MLA Cooperative Classroom Tests in Listening and Reading administered at the end of the two-year period of instruction. No pre-experimental measures are reported. Speaking and Writing tests were administered but not used due to the small sample tested. While no statistical data is reported, the study concluded that the students in audiolingual classes performed better than "control" (traditional) students on evaluative criteria.

By 1964 no sufficiently realistic and generalizable research had been undertaken to shed light on specific questions on modern foreign language instruction facing the American secondary school: which strategy or laboratory system works best when translated from a specific local small scale setting into the larger reality of numerous secondary schools? To assist in developing answers to this question, the Commonwealth of Pennsylvania undertook the large-scale in sitio experiment which has come to be known as "Project 1330, (later, officially as No. 5-0683), An Assessment of Three Foreign Language Teaching Strategies Utilizing Three Language Laboratory Systems."

SPECIFIC OBJECTIVES OF THE RESEARCH

The investigation had as its specific objectives:

1. To determine which of three foreign language teaching strategies is most effective in achieving each of the four foreign language objectives, i.e. listening comprehension, speaking fluency, reading, and writing (main effects).

2. To determine which of three language laboratory systems is best suited, economically and instructionally, to the development of pronunciation and structural accuracy (main effects).

3. To determine the optimum combination of "strategy" and "system" in achieving the goals of the foreign language program (interaction effects).

4. To determine which variable, or combination of variables - IQ, total grade point average, and appropriate prognostic test - best predicts student achievement in foreign languages in each of the four foreign language skills and in overall language mastery.

5. To determine the intercorrelations among the four language skills.

6. To determine whether "strategy" and "system" effectiveness is related to student ability.

7. To identify and compare student attitudes toward each of the teaching strategies and language laboratory systems.

A. Which teaching procedures in both the traditional and audiolingual approaches generate student interest:

B. The factors which motivate a student to study a foreign language;

C. The degree to which the experimental and traditional programs fulfill student expectations in language mastery;

8. To identify levels of foreign language mastery that are attainable in the secondary school language program.

9. To determine the strengths and weaknesses of selected commercial programs; and

10. To identify teacher factors related to student achievement.

SECTION II - METHOD

PART I - THE EXPERIMENTAL DESIGN AND CONTROLS

The basic design of any experiment is, of course, determined by the specific objectives of the study with the concomitant influences of the environment and evaluative techniques. Initally conceived by Emanual Berger, Research Associate, Bureau of Research, Department of Public Instruction, the research schematic was further refined by a number of persons involved in the early stages of the Project. Among these were Dr. N. Sidney Archer of the Bureau of Research, Department of Public Instruction; Dr. Robert W. Cannaday, Jr., then Modern Foreign Language Coordinator for the Bureau of General and Academic Education, Department of Public Instruction; Dr. Alfred D. Roberts, Chairman of the Department of Foreign Languages, and Dr. Milton C. Woodlen, Director of Research, both at West Chester State College.

RATIONALE FOR THE EXPERIMENTAL DESIGN

Discussions among these men and others resulted in the establishment of proposed guidelines and objectives within which framework the actual experimental design had to function. The proposed research, by incorporating a number of factors omitted from reported studies, attempted to preclude some of the criticisms of research studies noted in the preceding section. Specifically, it was planned to more effectively control teacher behavior by means of (1) utilizing large numbers of teachers; (2) teacher testing; (3) employment of teachers within certain experience parameters; (4) teacher orientation and training; and (5) frequent observation of classroom behavior. Randomization of possible biasing factors was attempted by including large numbers of classes and students from many broadly representative schools.

Materials and testing instruments were to be of a type widely used and readily available to all schools. Statistical methods used in evaluation were to be as extensive and as intensive as the state of the art permitted.

A need was felt to include a "middle-of-the-road" approach between the "traditional" and the "functional skills" approaches. This reflected the thinking of a considerable segment of the modern foreign language teaching profession and is evident in the literature, particularly in the approaches advocated by Rivers (1964), Carroll (1964), and Belyayev (1964).

Accordingly, three teaching strategies were envisioned: the traditional method (TLM), the functional skills method (FSM), and a combination of functional skills plus exposure to formal grammar (FSG). In the same light, the three most widely used electro-mechanical aids needed to be included, the classroom tape recorder (TR), the listen-respond or audio-active (AA) language laboratory or electronic classroom and the audio-record (AR) language laboratory.

ABBREVIATIONS

To facilitate reading of the accompanying tables and text, note that the following abbreviations are used extensively in the reporting:

TLM	Traditional Method
FSG	Functional Skills Grammar (Method)
FSM	Functional Skills Method
TR	Tape Recorder
AA	Audio-Active Language Laboratory
AR	Audio-Record Language Laboratory
M	Male
F	Female

These will often be used in conjunction, i.e. FSM-AA-M.

With these three teaching strategies and three audio assistance systems in mind, the following specific procedures were established.

THE EXPERIMENTAL SCHEMATIC

Due to statistical considerations, the experimental unit was the intact class, following the "Nonequivalent Control Group Design"--Experimental Design 10--described by Campbell and Stanley (1963). The arrangement of teaching strategies and systems was patterned on the methods of "The Factorial Design (two factors)" discussed in Lindquist (1953). This type of design may be considered preferable in State-directed, in sitio research undertakings in which existing administrative practices have to be honored. Also, "I'm-a-guinea-pig attitude" Campbell and Stanley (1963), is minimized when utilizing intact classrooms, and without differential recruitment related to experimental treatment, the study may approach true experimentation.

The rationale for selecting "factorial design" procedures were (1) it provided increased precision in that the experimental variable(s), e.g., the specific teaching strategy,

was employed across different systems; (2) it facilitated analysis of interaction effects in addition to studying the main effects. Finally, the experiment provided teacher, school, and school system replication.

The three teaching strategies and three language laboratory treatments then fell into a seven-celled experimental schematic:

FIGURE I

THE EXPERIMENTAL CELLS

Traditional	X		
	Classroom Tape Recorder	Audio-Active Laboratory	Audio-Record Laboratory
Functional-Skills + Grammar	X	X	X
Functional Skills	X	X	X

The asymmetrical design resulted from the fact that students in the traditional classes were not expected to utilize language laboratories or classroom tape recorders other than for presentation of materials of a "cultural" or "enrichment" nature.

Independent Variables: These were the (1) foreign language teaching strategies, (2) the language laboratory systems, and (3) the strategy-system combinations.

Dependent Variables included: (1) achievement scores in each of the skill areas at selected points during the academic year, at the end of the academic year, (2) student attitudinal and interest factors, and (3) the assessment of relevant instructional procedures.

Languages: The languages studied were French and German. The inclusion of the most popular foreign languages taught in the public secondary schools was due to the following considerations:

a. It increased substantially the ability to generalize the results. If only one language was studied the findings

might not be applicable to other languages with different structures. This alone warranted the inclusion of one Romance and one non-Romance language.

b. Originally the inclusion of Spanish was strongly supported by the Department of Public Instruction's foreign language specialists and project consultants. Dr. Albert Valdman reported that it was extremely difficult to get a group of foreign language teachers who taught different languages to work on problems that seemed to be of mutual concern. Each felt that his own language presented unique problems. Independent of the conclusiveness of the results, teachers whose language was not among those studied would be skeptical that they could apply the experimental findings in their teaching. However, since the study of more than two languages seemed unwieldy and expensive, the investigators concentrated their efforts on the study of French and German, representing significantly different types of languages.

POPULATION AND SAMPLE

In the most restricted sense, the population to which inferences from the Project findings would apply is the "hypothetical" parent population - which is the group consisting of all individuals "like those in the experiment." (Lindquist, 1953) In this case these would be the teachers, students, and schools with the characteristics listed in the discussion of the sample.

However, a survey of schools in Pennsylvania with language laboratory installations supports extending the inferences to the "real" population of all schools, teachers, and students in the Commonwealth, and possibly in the United States. This survey revealed that the schools reporting language laboratories are broadly representative in geographic location, school and district size, teacher ability, instructional expenditure per child, and pupil ability. Installation of the laboratories in some schools and not in others might be readily attributed to other factcrs irrelevant to the outcomes of the experimental treatment.

Soon after the Project became a reality, school superintendents throughout Pennsylvania were apprised of the experiment and invited to attend regional discussion conferences to consider the proposal in detail. These meetings were held on March 29, 30 and 31, 1965, at Harrisburg, West Chester and Allentown and again on May 4 at California, Pennsylvania.

Approximately sixty public school representatives attended each of the four meetings.

The program for each conference was essentially the same: the demonstration of the need for educational research in naturalistic settings by Dr. N. Sidney Archer, a review of research in modern foreign language by Dr. Alfred D. Roberts and the presentation of the research proposal by Mr. Emanuel Berger. In each case this was followed by a question period to allow those administrators and curriculum planners in attendance to clearly understand the program.

By the end of the 1965 school year, one hundred and twenty teachers had been tentatively identified as Project participants and had agreed to particpate. These persons and their administrators were asked to reserve a week in late August, 1965, for a pre-experimental training conference.

Each participating school district was also asked to identify a person to act as the local project Coordinator, freeing the Superintendent from direct concern with minor administrative affairs. In many cases this person was an Assistant Superintendent or Curriuclum Coordinator. They were to prove invaluable to the later relatively smooth functioning of the experiment.

In anticipation of embarking upon a program of evaluation of the effectiveness of the language laboratory, a survey of selected teacher characteristics and laboratory facilities was undertaken. A questionnaire was designed to identify teacher qualifications for teaching the major foreign language, the specific languages being taught, the description of the equipment, and the number of students enrolled in language courses at the specified school. This was sent to each of the secondary schools in the Commonwealth reporting a language laboratory.

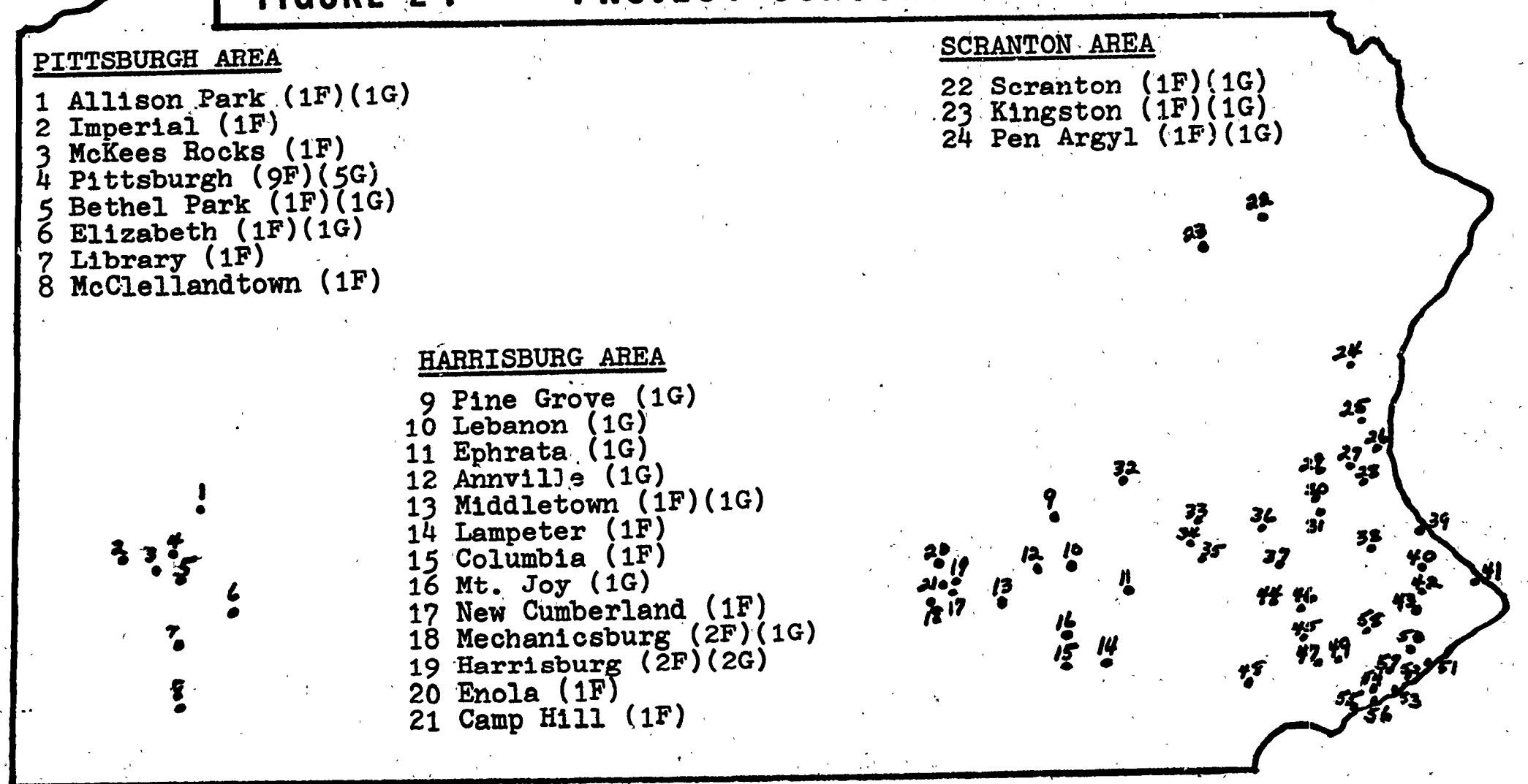
The sample schools were selected from among those responding to the survey. Those schools indicating a willingness to participate, which also had the other experimental requisites and ready geographic accessibility, consitutued the pool from which the final choice of experimental subjects was made. The specific school and teacher characteristics required included:

(Note that items 1 and 4 below were nct necessarily applicable to the traditional group).

1. The school had a language laboratory.

2. Willingness to abide by procedures demanded by research requirements.

FIGURE 2: PROJECT SCHOOLS AND CLASSES



PITTSBURGH AREA

1 Allison Park (1F)(1G)
2 Imperial (1F)
3 McKees Rocks (1F)
4 Pittsburgh (9F)(5G)
5 Bethel Park (1F)(1G)
6 Elizabeth (1F)(1G)
7 Library (1F)
8 McClellandtown (1F)

HARRISBURG AREA

9 Pine Grove (1G)
10 Lebanon (1G)
11 Ephrata (1G)
12 Annville (1G)
13 Middletown (1F)(1G)
14 Lampeter (1F)
15 Columbia (1F)
16 Mt. Joy (1G)
17 New Cumberland (1F)
18 Mechanicsburg (2F)(1G)
19 Harrisburg (2F)(2G)
20 Enola (1F)
21 Camp Hill (1F)

SCRANTON AREA

22 Scranton (1F)(1G)
23 Kingston (1F)(1G)
24 Pen Argyl (1F)(1G)

25 Nazareth (1G)
26 Easton (2F)
27 Bethlehem (1F)
28 Hellertown (1F)
29 Allentown (1F)
30 Emmaus (1F)
31 East Greenville (1G)
32 Cressona (1G)
33 Leesport (1G)
34 Lauraldale (1G)

PHILADELPHIA AREA

35 Reading (3F)
36 Kutztown (1G)
37 Boyertown (1F)(1G)
38 Fairview Village (1F)(1G)
39 Kintnerville (1G)
40 Doylestown (1F)(1G)
41 Morrisville (1G)
42 Johnsville (1F)(2G)
43 Horsham (1F)(1G)
44 Pottstown (2F)
45 Plymouth Meeting (1G)
46 Royersford (1G)
47 Malvern (1F)
48 Coatesville (1F)
49 Berwyn (1G)
50 Havertown (1F)
51 Philadelphia (6F)(4G)
52 Upper Darby (1F)
53 Glenolden (2F)
54 Media (1F)
55 Eddystone (1F)
56 Ridley Park (1F)
57 Drexel Hill (1G)
58 Norristown (1F)

3. Offering of a three and/or four-year sequence of French and German.

4. Teachers had been trained, or were willing to enroll in a course in audiolingual techniques and language laboratory procedures.

5. Teachers had a "reasonable" command of the foreign language.

DEFINITIONS OF STRATEGIES

In order to differentiate precisely the objectives, rationale and characteristics of each of the three teaching strategies, a select panel of modern foreign language educators was convened. This group of consultants included:

Dr. Robert Lado, Georgetown University
Dr. Stanley Sapon, University of Rochester
Dr. Wilmarth H. Starr, New York University
Dr. W. Freeman Twaddell, Brown University
Dr. Albert Valdman, Indiana University
Dr. Donald D. Walsh, MLA Foreign Language Program

Meeting for two days in Philadelphia, this group precisely defined the three teaching strategies and three language laboratory systems under consideration.

TEACHING STRATEGY I: THE TRADITIONAL METHOD

The major objectives of foreign language instruction according to this method are:

1. To read with facility in the foreign language.
2. To translate from the foreign language into English and vice versa.
3. To develop an appreciation for the foreign country's culture, its people and its heritage.
4. To develop a better understanding of the syntax and structure of the student's native language.

Carefully graded reading selections in the text incorporate both the grammar to be learned and the vocabulary items. The student practices the grammar rules by applying them in written form to sample sentences following the lesson. Vocabulary lists are memorized and practiced through translation from English into the foreign language.

Rationale: Traditional Method

The basis for the traditional approach is rooted in both common educational sense and a history of successful experi-

ence. Few would doubt that proficiency in a language's grammar accompanied by command of its lexicon will result in the stated objectives. Also, those who have taught and assessed student achievement in foreign language through the years report that effective teaching procedures, as in other academic subjects, produce the desired results. Unless there is convincing evidence to the contrary, "traditionalists" feel justified in supporting a "proven" method in preference to programs that have as yet to prove their worth in the classroom setting. Finally, educators maintain that a well educated person should be acquainted with the literature and culture of other countries.

List of general criteria - Traditional Method.

A. Use of native tongue in the classroom predominant. Target language not to be used for purposes of communicating instructions or information to students.

B. Translation
   1. Directly from native tongue to target language
   2. Reading by translation from target language to native tongue

C. Vocabulary
   1. Word for word equivalents
   2. Academic and literary lexicon stressed

D. Grammar
   1. Analysis before application
   2. Language organized into word lists, paradigms, principal parts, rules
   3. Analysis in depth of grammatical structures

E. Testing
   1. Grades based on written tests
   2. Use of vocabulary and idiom quiz
   3. Frequent use of dictation test
   4. Use of tests requiring thorough knowledge of paradigms or lists

F. Culture - the following cultural areas are emphasized:
   1. Great historical and literary personalities
   2. Monuments
   3. Masterpieces of art, music and literature

G. General orientation of traditional program is academic and intellectual.

Expected level of proficiency in four skills - Traditional Strategy

A. Listening comprehension
   1. At end of semester

a. Understand simple words and phrases carefully and slowly enunciated
b. Distinguish gross phonemic variations

2. At end of year
a. Understand simple directions and basic conversational phrases poken at slower than normal speed
b. Distinguish most phonemic differences

B. Speaking
1. At end of semester
a. Ability to repeat sounds, words and phrases previously learned
b. Respond with little hesitation to simple questions using previously memorized answers

2. At end of year
a. Ability to repeat after the model all sounds, words and phrases
b. Ability to vary basic structural patterns in responding to simple questions

C. Reading
1. At end of semester
a. Read and understand simple prose with known vocabulary
b. Recognize and identify grammatical structures contained in this prose

2. At end of year
a. Read and understand short narratives
b. Recognize grammatical structures
c. Sight reading of simple prose passages

D. Writing
1. At end of semester
a. Write correctly basic conversational phrases
b. Ability to take dictation of familiar material

2. At end of year
a. Ability to compose short prose passage showing correct usage of grammar
b. Ability to take dictation of some unfamiliar material with known vocabulary

TEACHING STRATEGY II: THE FUNCTIONAL SKILLS METHOD

The primary objective of foreign language instruction according to the "functionalists" is that the student be able to use the language as it is used in the foreign country. It

is considered essential that the four language skills be taught in a progression - listening first to the spoken word, following by repeating orally that which was heard, then reading the graphic symbols that were both heard and spoken, and, finally, writing that which was heard, spoken and read.

The "functional skills" are taught by means of the dialog and its associated acitivities. There is opportunity for extensive student practice in both listening and speaking in the target language. Vocabulary is learned only in context while formal prescribed grammatical analysis is avoided.

Rationale: Functional Skills Method

The principle advanced by those supporting this method is that, essentially, language is speech. Written symbols are a derived and secondary form of language. We are able to use our mother tongue effectively long before we can read or write the graphic symbols representing the spoken word. Furthermore, it is claimed that language learning is a skill, not an intellectual discipline. It follows, then, that methods effective in teaching science and mathematics are not ideally suited for cultivating language habits. More appropriately, the student is instructed to practice language forms to the point that his responses are automatic, in much the same way that he uses his own language.

List of general criteria - Functional Skills Method

A. Use of target language in classroom
   1. By the student: for all responses
   2. By the teacher: for daily routine communication

B. Native tongue to be used only for describing grammar and syntax

C. Sequence of learning
   1. Hearing
   2. Speaking
   3. Reading
   4. Writing

D. Grammar
   1. Descriptive rather than prescriptive
   2. Incidental to functional skills being taught

E. Reading
   1. Printed material always presented as a transcription of spoken forms
   2. As direct communication without the intermediary of translation from the target language to the native tongue

F. Writing - learned first as a transcription of spoken forms

G. Testing - written and oral tests given in order to test for listening comprehension and speaking proficiency as well as reading and writing skills

H. Culture - "total culture" as reflected in language behavior is taught as opposed to refinement culture

Expected level of proficiency in four skills - Functional Skills Method

A. Listening comprehension
   1. At end of semester
      a. Phonemic discrimination - all basic sounds of the language
      b. Understanding of basic words and phrases
   2. At end of year
      a. Phonemic discrimination - nearly all phonemic differences
      b. Understand simple conversation spoken at normal speed

B. Speaking
   1. At end of semester
      a. Repeat any word or phrase with good accent and intonation
      b. Ability to respond to simple questions and to vary form and structure in simple directed conversation
   2. At end of year
      a. Repeat sentences with correct accent and intonation
      b. Engage in simple conversation on a variety of basic everyday situations
      c. Ability to vary spontaneously any basic structures already learned

C. Reading
   1. At end of semester - read and understand directly (without translating) simple dialogs
   2. At end of year - read and understand directly dialogs and simple prose narratives dealing with everyday situations

D. Writing
   1. At end of semester
      a. Reproduce in writing simple phrases previously learned
      b. Reproduce from dictation basic dialogs already learned
   2. At end of year
      a. Ability to answer questions in written form with spontaneous variation of forms and structures previously learned

b. Ability to express in writing simple concepts dealing with everyday situations

TEACHING STRATEGY III: THE FUNCTIONAL-SKILLS+GRAMMAR METHOD

This condition subscribes to both the objectives and the basic methodology of the "Functional Skills Method." The major point of contention is how best to develop structural mastery - the basis of effective language usage - in the school setting.

According to this approach pattern drills are supplemented by explicit instruction in the appropriate grammar. Extreme care is exercised to limit the grammar to clarifying the pattern which was practiced during the dialog - (grammar is not taught independently of the language habits developed).

Rationale: Functional-Skills+Grammar Method

Essentially, there is no empirical evidence to support the elimination of formal grammar instruction in teaching a foreign language. Indeed, Mueller (1958) reported that students frequently fail to perceive grammatical signals even after extensive drills. Others argue that the manner in which a child learns his native tongue is not entirely analogous to the way an adolescent learns a second language in the classroom. In the latter case the student can "bring his intellect to bear on his problems and can speed up immeasurably through generalizations, shortcuts, and insights into the way the language operaties if, and when, he understands its structure analytically."

Finally, the accompanying explanation might serve to prevent possible student boredom when he indulges in repetitious practice for considerable period of time.

List of general criteria: Functional-Skills+Grammar Method

A. Use of target language in classroom
   1. By the student: for all responses
   2. By the teacher: for daily routine communication to pupils of instructions, cues and models

B. Native tongue to be used only for describing grammar and syntax

C. Sequence of learning
   1. Hearing
   2. Speaking
   3. Reading
   4. Writing

D. Grammar
   1. Descriptive rather than prescriptive
   2. Incidental to functional skills being taught

E. Reading
   1. Printed material always presented as a transcription of spoken forms
   2. As direct communication without the intermediary of translation from the target language to the native tongue

F. Writing - learned first as a transcription of spoken forms.

G. Testing - written and oral tests given in order to test for listening comprehension and speaking proficiency as well as reading and writing skills

H. Culture - "total culture" as reflected in language behavior is taught as opposed to refinement or prestige culture

Expected level of proficiency in four skills - Functional-Skills + Grammar Method

A. Listening comprehension
   1. At end of semester
      a. Phonemic discrimination - all basic sounds of the language
      b. Understanding of basic words and phrases - spoken at normal speed

   2. At end of year
      a. Phonemic discrimination - nearly all phonemic differences
      b. Understand simple conversation spoken at normal speed

B. Speaking
   1. At end of semester
      a. Repeat any word or phrase with good accent and intonation
      b. Ability to respond to simple questions and to vary form and structure in simple directed conversation

   2. At end of year
      a. Repeat sentences with correct accent and intonation
      b. Engage in simple conversation on a variety of basic everyday situations
      c. Ability to vary spontaneously any basic structures already learned

C. Reading
   1. At end of semester
      a. Read and understand directly (without translating) simple dialogs
      b. Understand grammatical functions in the reading material

   2. At end of year
      a. Read and understand directly dialogs and simple prose narratives dealing with everyday situations
      b. Ability to understand all grammatical functions in the readings

D. Writing
   1. At end of semester
      a. Write simple phrases previously learned with understanding of the grammatical functions involved
      b. Reproduce from dictation basic dialogs already learned

   2. At end of year
      a. Ability to answer questions in writing with spontaneous variation of forms and structures previously learned
      b. Ability to express in writing simple concepts dealing with everyday situations

LANGUAGE LABORATORY, SYSTEM I: CLASSROOM TAPE RECORDER

The simplest audio aid for the modern foreign language teacher is the classroom tape recorder. Its convenience and ease of operation as well as its low cost have made the tape recorder an integral part of the foreign language classroom even in schools equipped with more extensive facilities.

The inclusion of the classroom tape recorder alone as a "laboratory strategy" reflected the insistence of many teachers that it was as effective as a more elaborate language laboratory. Statistically it represented the minimum baseline or "control" strategy.

LANGUAGE LABORATORY, SYSTEM II: AUDIO-ACTIVE (LISTEN-RESPOND)

This constitutes one type of "language laboratory." Each student position is equipped with a microphone, amplifier and headset. Usually there is more than one tape recorder or other program source at the teacher console. Finally, the teacher console is wired for monitoring individual student performance.

The immediate and most cogent argument for this installation is the privacy and isolation afforded each student. Eliminating distracting noises is recommended if students are expected to discriminate new sounds that are distressingly similar to those of his own language and to other sounds in the foreign language.

It is also claimed that hearing his own voice following that of the tape master, with amplification of similar quality, allows for effective correction when there is disagreement. Multiple-program sources provide for small group instruction and facilitate flashbacks to previous lessons that require review.

LANGUAGE LABORATORY, SYSTEM III: AUDIO-ACTIVE-RECORD (LISTEN-RESPOND-COMPARE)

The addition of recording facilities at student positions provides the teacher with a significant tool in developing "functional" skills. Principally, the student records the master and his responses and then compares these during playback. Differing learning rates can be accommodated. This is a practical means for evaluating oral performances, and closer teacher supervision is possible than with less complete installations.

Competent language educators favoring the use of the record facility offer as support an argument based on the method by which language is learned. They claim that the learning of a foreign phoneme occurs as a result of conscious attention to the process of how it is produced. As a result, knowledge of the articulatory phonetics is a definite aid.

INSTRUCTIONAL CONTROLS

Careful control of the manipulative independent variables received primary consideration throughout the experiment. These controls concentrated on teacher adherence to the assigned treatment and included teacher measures, teacher training, instructional guidelines, periodic group workshops and careful observation and supervision.

TEACHER CONTROL

The principal sources of teacher effect are (1) differences in teacher ability due to training and/or experience, (2) teacher non-adherence to assigned conditions in the ex-

perimental program, and (3) the nonspecificity of the assigned treatment and the daily teacher responsibilities. Because teacher adherence to the assigned treatment is a most important factor to control, a number of steps were taken to minimize even unintentional deviations.

1. Teacher Numbers: The experiment was predicted on the basis of involving over one hundred teachers in an attempt to minimize bias due to teacher variation.

2. Teacher Ability Control: All teachers who volunteered to participate in the experiment were given the Foreign Language Proficiency Tests for Teachers and Advanced Students, (Educational Testing Service, 1962). In addition, teachers who had recently spent considerable time (two or more years) in the country where their foreign language is spoken were excluded. Participating teachers were expected to have had at least two years of teaching experience.

3. Control for nonadherence to assigned treatment:

a. Selection of Cooperating Teachers: Participants were selected from a pool of teachers who had the support of their schools and were willing to commit themselves in advance to the requirements of the experiment.

b. Pre-experimental Workshop: One of the single most important controls of the variables of the Research Project was the week-long orientation meeting and workshop held from August 22 through August 25, 1965. Here the Project Staff and participating teachers met with several Consultants on the campus at West Chester to discuss the implementation of the Project in detail.

The workshop provided for (1) an orientation to the need for the limitations on educational research; (2) a detailed introduction to the experiment; (3) several sessions on testing with particular emphasis on foreign language testing; and (4) the assignment of teachers to strategies and training in two laboratory types utilizing both college and local school facilities.

Each teacher was thoroughly briefed in his expected role and in the teaching strategy he was expected to employ. Detailed guidelines had been prepared for each teaching strategy and language laboratory treatment. Field Consultants and Workshop Consultants spent many hours in small group meetings training teachers in their assigned strategy.

Extra-Project Consultants for the workshop included:

Dr. Kenneth W. Mildenberger, Modern Language Association
Dr. J. William Moore, Chairman, Department of Education
Bucknell University
Dr. N. Sidney Archer, formerly Director, Bureau of Research,
Department of Public Instruction
Mr. Eugene Hogenauer, MLA Test Development Committee

Mrs. Mariette Reed, E ucational Testing Service
Miss Terry Gamba, Foreign Language Specialist, D.P.I.
Mr. Harold Gruver, Hanover School District
Mr. Douglas Ward, Pittsburgh School District

The Project Staff had assumed that teachers agreeing to participate in the experiment were better professionally prepared than they appeared to be at the initial meeting. Many were totally unfamiliar with the text materials that they were to use with experimental classes. The pre-experimental training thus proved of great benefit in orienting teachers to the research project. Teachers were compensated for participation in training workshops, for periodic group meetings and for collection of additional student data.

In addition to the pre-experimental meeting, three bi-monthly evaluation meetings were held in November, 1965, and January and March, 1966. At these sessions general discussions of matters pertaining to the Project and instructions relating to procedures were considered. A prominent feature of these sessions was the small group meetings structured around the various strategy-systems in which considerable attention was given to the problems peculiar to each group. Appropriate teaching techniques were demonstrated by selected teachers in each strategy-system and in panel discussions relevant topics were presented.

All teachers' meetings were held both on the campus of West Chester State College and in the Pittsburgh area to insure teacher attendance. A final meeting was held in May, 1965, to insure uniformity of final student testing dates and precedures. Mr. F. Andre Paquette of the Modern Language Association addressed the West Chester group while Dr. Joseph Mastronie of the University of Pittsburgh spoke to teachers in both western Pennsylvania and at West Chester.

TEXT MATERIALS

A complication of broad-scale research in the naturalistic setting of the public school classroom was revealed in the data submitted to the Project by prospective participating schools. The approximately eighty school districts indicated twenty-seven different sets of texts and instructional materials were utilized in the teaching of French and German. It was evident that this was one of the many variables which would seriously affect the results of the study. It was decided to reduce the number of tests to provide more homogeneity.

All participating classes were required to adopt one of the following texts during the two-year instructional period. Schools purchased the complete program. Analyses and guidelines were written by the Project Staff for each text (see Appendix).

FRENCH - Cours Elémentaire de Français, Dale and Dale
Parlez-Vous Français?, Huebener and Neuschatz
New First Year French, O'Brien and LaFrance
Audio-Lingual Materials
Ecouter et Parler, Côté, Levy and O'Conner

GERMAN - A First Course in German, Huebener and Newmark
Foundation Course in German, Hamberger and Ebelke
Audio-Lingual Materials
Verstehen und Sprechen, Rehder, Twaddell and O'Conner

INSTRUCTIONAL GUIDES

To assist in the adherence of teachers to assigned strategy and laboratory treatments, specific guides were established by the Project Staff. These were essentially the same for each instructional strategy, differing only slightly in detail of coverage depending upon the text under consideration. Samples are reproduced in the Appendixes for German only in the interest of economy since the French differed only in texts mentioned and units to be covered. Each teacher received the guidelines applicable to his assigned strategy and laboratory system.

For the Functional-Skills + Grammar classes the grammatical generalizations had to be written for those texts not including formal grammar. These were written by the Project Staff and included in the appropriate teacher's guide.

Teachers were expected to be thoroughly familiar with the guidelines and examples. They served not only as a basic blueprint for daily lessons but as a common reference point for discussions with the Field Consultants. These observers used the guidelines as a frame of reference for evaluation of teacher adherence to the assigned strategy.

FIELD CONSULTANTS

The Field Consultant was envisioned as the key figure in coordinating and unifying the many people involved in the Project. They participated in the writing of the guidelines, in the meetings with the language consultants, and were all competent and knowledgeable classroom teachers.

The Field Consultant was expected to visit each Project classroom about twice a month, discuss the experiences of the teacher and advise teachers and administrators of forthcoming Project activities. They were not concerned with judging teacher performance as it related to the local school situation but only as it concerned adherence to the assigned

teaching strategy. The Field Consultant then was to observe, advise and to act in a liaison capacity.

Field Consultants completed a report form after each teacher visitation. This was intended to describe the lesson observed and to relate it to the assigned strategy. The preliminary instrument was changed in January, 1966, to one which allowed a more precise numerical assessment of adherence on a single page. These are reproduced in the Appendixes.

Throughout the Project the field observers met bi-weekly with the headquarters staff and reported on the progress of the investigation. Problems of policy and procedure were resolved and coordination of action insured by these frequent contacts which permitted discussions among the various Field Consultants.

Teachers deviating markedly from the assigned strategy-system were dropped from that assignment and from the Project. Often the teacher remained totally unaware of this action. Field Consultants traveled many thousands of miles to visit widely scattered Project schools. One Consultant remained in residence in the Pittsburgh area.

PART 2: CONDUCT OF THE RESEARCH

IMPLEMENTATION OF THE RESEARCH

With the granting of funds to support the proposed research under USOE Grant OE-7-48-9013-262, The Pennsylvania Foreign Language Research Project was established March 1, 1965, with headquarters at the Cooperative Research Center, West Chester State College. Located approximately twenty miles southwest of Philadelphia, West Chester is the largest of the Pennsylvania State Colleges. The Foreign Language Research Project Staff was added to the regular college faculty for fiscal purposes with academic rank based upon the state college personnel system. The Project received full cooperation and support from the college, including the services of the Data Processing and Computer Center.

As described in Section 2, one of the first undertakings of the Project was to enpanel a select committee of foreign language educators to establish precise definitions of the various teaching strategies and guidelines to be followed by teachers within each treatment. In addition, the counsel of several other noted foreign language educators was solicited on various aspects of the research design and evaluation. These included Dr. John Carroll, Harvard University; Mr. F. Andre Paquette of the Modern Language Association; Dr. Harold Bligh, Harcourt, Brace and World, Inc.; Dr. William Locke, Massachusetts Institute of Technology; Mrs. Eleanor Sandstrom, Philadelphia City Schools; and Mrs. Mariam Byran, Educational Testing Service.

PROJECT STAFF

The expected role of the Project Field Consultants was defined and criteria established for the postions. These included:

1. Pennsylvania permanent certification to teach either French or German.
2. Minimum of five (5) years of teaching experience.
3. Master's degree in secondary education or language field, or equivalent supervisory experience.
4. Experience in the use of the language laboratory.

Field Consultants were employed through the regular procedures established by the Department of Foreign Languages at West Chester State College. Four competent Consultants were employed and assisted actively in laying the groundwork for the experiment.

During the first year of the instructional phase of the Foreign Language Research Project, the following persons served on the professional Project Staff at West Chester State College:

Dr. Milton C. Woodlen, Ed.D., Coordinator
Director of Research and Data Processing
Dr. Alfred D. Roberts, Ph.D., Supervisor of Instruction
Chairman, Department of Foreign Languages
Mr. Ralph A. Eisenstadt, M.A., Field Consultant
Assistant Professor
Miss Mary K. Gimmy, B.A., Field Consultant
Instructor
Mrs. Muriel Santmeyers, M.A., Field Consultant
Assistant Professor
Mr. William E. McDonald, B.A., Field Consultant
Instructor
Mrs. Haydee O. P. Ern, M.E., Computer Programmer
Lecturer

ASSIGNMENT OF TEACHING STRATEGIES

Certain realistic impositions of the naturalistic setting of <u>in sitio</u> research influenced the assignment of participating classes to the several strategy-laboratory treatments. Many schools did not have any student recording facilities and could not be included for possible selection in the audio-record (AR) group. It was also considered unwise to assign teachers to a classroom teaching strategy to which they had a strong objection.

In the main, traditional classes were taught by teachers who expressed a preference for this strategy. Many teachers indicated a willingness to dedicate themselves fully to whatever strategy they were assigned. These and all the Functional Skills Method (FSM) and Functional-Skills + Grammar (FSG) groups were arbitrarily and randomly assigned to their strategies.

Laboratory treatments depended upon the individual facilities of each school. Schools with no laboratory facilities were, of necessity, assigned to the Tape Recording (TR) group. Laboratories with no recording facilities were by definition excluded from the AR group and were assigned to the Audio-Active treatment. In many cases laboratories had only enough recording facilities for part of the class. These classes were then envisioned as "split" classes, one small class of Audio-Recording (AR) within the same strategy. Students were assigned to each treatment by use of a random numbers table. Statistical analysis of interaction among these "split" classes was included in later data processing and evaluation.

It was possible to completely randomly assign fifty-three classes, thirty-one French and twenty-two German, among the Functional Skills, Functional-Skills + Grammar, Audio-Active and Audio-Record treatment combinations. The complete breakdown within each treatment is illustrated in Figure 3.

In order to avoid both direct competition and experimental contamination it was judged advisable to permit only one teaching strategy within each school building. Therefore, while an individual school could have several Project classes in both French and German, within that school only one teaching strategy was assigned.

TEACHER DATA

During the pre-experimental training sessions large amounts of data were collected on each participating teacher. This included the type of institution of higher learning attended, the major field of study and the degree granted, the amount of post-baccaleaureate study or graduate degree, and the number of years of both general and foreign language teaching experience. Also entered was the text the teacher would use during the experiment.

Teacher proficiency in the foreign language was determined by asking the teacher to rate his own ability in the speaking, reading and writing skills. In addition, every Project teacher was required to take all seven portions of the MLA Foreign Language Proficiency Tests for Teachers and Advanced Students. New teachers entering at various stages of the experiment were also required to take the test battery. Later, most Project teachers took the Valette French and German Listening Discrimination Tests. All objective scores were recorded for analysis.

Teachers' attitudes were assessed both before and after assignment to their experimental teaching strategy by means of semantic differential opinion scales. These were developed and standardized in two forms for use on both teachers and students.

TEACHER PREPARATION AND EXPERIENCE

Project teachers whose professional preparation was examined numbered fifty-seven in French and forty in German. Of these, nine French teachers and three German teachers attended state colleges. Liberal arts colleges were attended by twenty-six French and twenty German teachers. Twenty-one French and seventeen German teachers attended universities. Only one French teacher attended a technical college; none of the German teachers did so.

FIGURE 3

DISTRIBUTION OF CLASSES BY

TEACHING STRATEGY AND LABORATORY SYSTEM

	Tape Recorder	Audio-Active Laboratory		Audio-Record Laboratory	
		non-random assignment	true random assignment	part of class recorded	full class recorded
Traditional Method	French 11 German 6				
Functional-Skills + Grammar (true random assignment)	French 3 German 5	French 5 German 4	French 7 German 5	French 4 German 3	French 4 German 1
Functional Skills Method	French 3 German 4	French 8 German 2	French 9 German 8	French 4 German 2	French 3 German 3

Total: French = 61 classes, German = 43 classes

An examination of baccalaureate degrees indicated nineteen Bachelor of Science degrees among the French teachers and fourteen Bachelor of Science degrees among the German teachers. Thirty-six French teachers had received Bachelor of Arts degrees as did twenty-five German teachers. Of three teachers without degrees, two were French teachers and one was a German teacher.

The following data illustrates the major fields in college of French and German Project teachers:

	French	German	Spanish	Latin	For. Lang.	English	Science	Soc. Studies	Math.	Elem. Ed.	Music	Business	Arts and Ltrs.
French Teachers	39	2	1	2	2	7	0	0	0	3	0	0	1
German Teachers	3	23	1	3	1	0	1	2	2	1	1	2	0

The range of graduate hours was between 0 to 99 for both French and German teachers. French teachers averaged 68.7 semester hours and German teachers averaged 47.0 semester hours beyond the Baccalaureate.

The average teaching experience among French teachers was 9.5 years. The average for German teachers was 9.9 years. Experience ranged from 0 to 29 years among French teachers and from 0 to 41 years among German teachers.

French teachers averaged 6.6 years teaching French, .3 years teaching German and 1.3 years teaching other foreign languages. German teachers averaged 6.7 years teaching German, .9 years teaching French and 1.5 years teaching other foreign languages.

MEASUREMENT INSTRUMENTS

In order to duplicate the conditions and advantages available to the normal school district, the Foreign Language Research Project based its primary evaluation program on standardized instruments. All instruments were administered to the total student population with the exception of a ten percent random sample chosen for administration of the more lengthy

and individualized portions of the final tests. In cases where standardized tests to evaluate certain student skills and attitudes were not available, instruments were produced for the Project.

TABLE 1

SKILLS AND INSTRUMENTS

Foreign Language Behavior	Criteria
1. Listening Comprehension	MLA Cooperative Classroom Listening Test
2. Listening Discrimination	Valette Listening Discrimination Test
3. Speaking	MLA Cooperative Classroom Speaking Test
4. Reading	MLA Cooperative Classroom Reading Test "Reading" section, 1939-41 Cooperative Test
5. Writing	MLA Cooperative Classroom Writing Test "Writing" section, 1939-41 Cooperative Test
6. Grammar	"Grammar" section, 1939-41 Cooperative Test
7. Vocabulary	"Vocabulary" section, 1939-41 Cooperative Test
8. Expectations	Student Expectations Scale
9. Attitudes	Student Opinion Scale (semantic differential)

PRE-EXPERIMENTAL TESTING

At the beginning of the 1965-66 year, immediately after the opening of school and before instruction in the foreign language commenced, a number of pre-experimental tests were given to students in Project classes. These had two purposes: (1) to measure student native ability and aptitude in order to permit the establishment of predictive criteria and (2)

to determine the amount of prior exposure of Project students to foreign language instruction. While it has been maintained that foreign language permits an ideal setting for research since it presumes a "zero" starting point (Carroll, 1963), it was decided to administer a foreign language pre-test due to the possibility of student exposure to some programs of foreign languages in the elementary schools, to instruction by television, to exposure by travel and the possibility of a foreign language background in the home.

During the first few days of school students took the California Short-Form Test of Mental Maturity, The Modern Language Aptitude Test (short form), the Cooperative French Test or the Cooperative German Test, and the Listening Comprehension portion of the MLA Cooperative Foreign Language Tests. Finally, each student completed an attitude and orientation inventory, the Student Opinion Scale, to assess his feelings toward foreign language instruction before such instruction commenced and answered specific questions concerning his expectations and aspirations.

The mid-year testing program, completed in January, included the Listening Comprehension and Reading portions of the MLA Cooperative Foreign Language Tests, a second administration of the Student Opinion Scale and the administration to all students of the Listening Discrimination Test for French and German especially developed for the experiment by Dr. Rebecca Valette of Boston College. In addition, a randomly selected ten percent sample of the entire student population was administered the Speaking portion of the MLA Cooperative Language Test.

The final testing was done in May and included a re-testing of the students on the French Cooperative Test and the German Cooperative Test as well as the Listening Comprehension and Reading portions of the MLA Cooperative Foreign Language Tests. The same ten percent sample of students again completed the Speaking portion and for the first time the Writing section of the MLA Tests. A third administration of the Student Opinion Scale was completed for all students.

CALIFORNIA TEST OF MENTAL MATURITY

The California Short Form Test of Mental Maturity is a one period adaption of the longer parent instrument. It is widely used in American education and is consistently updated to reflect cultural changes. The 1963 revision of the test, Level 3 (Junior High) and Level 4 (Secondary) provided the experiment with two measures of intelligence, verbal and non-verbal. Scores for these two portions are combined to give a total value of the intelligence quotient.

MODERN LANGUAGE APTITUDE TEST (SHORT FORM)

The Modern Language Aptitude Test was developed by John B. Carroll and Stanley M. Sapon to provide an indication of an individual's probable degree of success in learning a foreign language. The authors maintain that it is particularly useful in predicting success in learning to speak and understand a foreign language as well as providing an indication of probable success in the graphic skills. It was developed for English speaking persons and has been applied successfully to students in grade 9 and above. Project students completed the Short Form of the test which included three parts of the complete aptitude battery. These portions are based upon Spelling Clues, Words in Sentences, and Paired Associates. These scores are combined to provide a total number score which is used to predict success in foreign language study.

The Modern Language Aptitude Test is a fully standardized instrument published by the Psychological Corporation of New York and has been available to the profession since 1959. The 1964 printing of the test was utilized in the experiment.

THE COOPERATIVE TESTS

Since one of the main purposes of the experiment was to measure the relative effectiveness of the "traditional" and "functional skills" approaches to modern foreign language learning, it was deemed desirable to include both older and newer foreign language achievement tests in order to adequately assess both approaches. The differing objectives of both methods of instruction are clearly reflected in the types of instruments used to evaluate each. Therefore, students were administered the Cooperative Tests for French and German which were developed to measure the objectives of the "traditional" method. Since these tests are no longer available they were reprinted especially for the Project by the Educational Testing Service. The tests measure the ability of a student to read a foreign language, his vocabulary, and his knowledge of the grammar of the foreign language. The Cooperative French Test, 1941 edition, and the Cooperative German Test, 1939 edition, were administered as pre-experimental and post-experimental measures to all students in the Project.

MLA COOPERATIVE FOREIGN LANGUAGE TESTS

The Cooperative Foreign Language Tests were developed under the direction of the Modern Language Association and are published by the Educational Testing Service. They are available in two levels and in two forms. Alternating forms

of the beginning, "L", level were used throughout the experiment. These tests reflect current concepts and instructional objectives of modern foreign language instruction. The Listening portion of the test which was administered as a pre-, a mid-, and a post-experimental measure is contained on a tape recording. The Reading and Writing portions of the test can be completed by the student in a test booklet while the Speaking portion must be individually administered and recorded on tape.

The evaluation of the Speaking Test is a rigorous and possibly subjective process. In order to insure that this test was evaluated accurately, the Project Field Consultants were especially trained by the Educational Testing Service to score the Speaking Test. A training session was provided for them at the ETS Center in Princeton, New Jersy, and consultants from the Educational Testing Service visited Project headquarters at West Chester State College in a follow-up training session. At the conclusion of these two training periods the Field Consultants were considered to be adequately trained in the objective scoring of the Speaking Test.

STUDENT OPINION SCALE

A student attitude inventory was developed for the Project by Dr. Milton C. Woodlen and Mr. Emanuel Berger. The scale consists of student reactions to a single question concerning foreign language instruction and permits a choice among eighteen descriptive polar adjectives. It is reproduced in Appendix A. The second portion of the attitude inventory was changed at various times throughout the experiment in order to assess various aspects of the student's self concept and aspiration. The first administration included a fourteen item inventory of self-rating concerning foreign languages. The student was also asked to predict how long he thought he would study a foreign language and what foreign language skills he considered of importance to himself as an individual. Later administrations included the semantic differential scale with varying student questionnaires. The Student Opinion Scale was administered three times during the year.

LISTENING DISCRIMINATION TEST

The Project Staff and consultants were concerned that none of the tests available were designed specifically to measure the exact ability of a student to discriminate between the sounds of a foreign language. The Listening portion of the MLA Tests are a measure of the student's ability to comprehend the language in life-like situations. It was thought

desirable to be able to measure the student's exact ability to discriminate among the phonemes of a foreign language. Under a separate contract with the Department of Public Instruction, Dr. Rebecca Valette, Director of the Language Laboratory of Boston College and an authority on foreign language testing, developed Listening Discrimination Tests for French and German.

These tests are designed to measure every important sound in the language and consist of four parts: discrimination between very similar sounds in both English and French or German, the ability to identify the same or different sounds in the target language, the ability to identify the same and different vowel sounds in French or German, and the ability to discriminate rhymes in French and German. These four portions are combined to provide a total score which is considered to be indicative of the student's ability to closely discriminate among the sounds of spoken French and German. The tests were produced by Dr. Valette and recorded by native speakers for administration to the Project population. All students took the Listening Discrimination Test in January. Since this was the only administration of this test it was considered a "final" measurement.

After the close of the instructional period an extensive psychometric analysis of the Listening Discrimination Tests was made at the Pennsylvania State University (Williams, 1967). The "Summary and Conclusions" portion of this report observes in part:

> The psychometric characteristics of the FLDT and the GLDT were almost identical. The relationship of many of the items in the two tests to the total-test performance is quite low. This leaves open the question of whether the measurement of different linguistic areas in the FLDT and GLDT was actually accomplished in general...
>
> ...In general, the fact that some of the items show outstanding discrimination indices, makes the examination look quite promising. However, an investigation of the validity of the test by some external criterion would seem necessary...

Due to this evaluation - while providing useful and meaningful insights - the Listening Discrimination Test was not used as a final measure or a covariate in the final statistical analysis of data relating to primary objectives.

TEACHER ADHERENCE TO ASSIGNED STRATEGIES

A study was undertaken to determine the extent to which teachers assigned to Functional Skills (FSM), Functional-Skills + Grammar (FSG), and Traditional (TLM) strategies adhered to their particular assignment during the year of experimental instruction. For this purpose the Field Consultants' Observation Reports were examined.

Field Consultants rated the teachers' adherence or non-adherence to assigned strategies according to the following criteria:

1. excellent
2. good
3. fair
4. poor
5. very poor
0. not observed

The following tables illustrate per item totals the Observers assigned to the FSM, FSG, and TLM groups as well as the Means of these ratings.

An examination of the tables reveals a rather close adherence to the assigned teaching strategy. The "over-all" rating index of the traditional classes is somewhat higher than the functional skills groups largely due to the heavy percentage of "non-adherence" marks for items 7 and 9. Item 7 prescribed the writing of short free compositions by the students. Traditional teachers did not utilize this teaching device in Level I as much as had been expected, perhaps correctly so. Item 9, use of the classroom tape recorder, would have been better stated negatively since the traditional classes were not to use a tape recorder except for occassional "cultural" presentations. Specific frequent use of the tape recorder for drill work was forbidden. Therefore, non-observation of the tape recorder in use was a closer adherence to the intent of the research than if it had been observed often.

TABLE 2

ADHERENCE TO ASSIGNED TEACHING STRATEGIES - TLM

Rating Scale	Ratings 1	2	3	4	5	Item Mean	No. not Observed	% not Observed
1. Vocabluary drill	16	10	4	2	0	1.75	16	.33
2. Translation of reading lesson	14	12	1	2	0	1.69	19	.40
3. Grammar--formal analysis	28	10	2	0	1	1.44	7	.15
4. Pronunciation--teacher	11	16	10	3	1	2.20	7	.15
5. Pronunciation--student	7	11	14	5	5	2.76	6	.12
6. Reading for total comprehension	12	4	8	2	0	2.00	22	.46
7. Writing--free composition	2	0	1	5	7	4.00	33	.69
8. Culture (refinement)	10	6	7	2	1	2.15	22	.46
9. Use of tape recorder	3	2	5	2	5	3.24	31	.65
10. Use of visual aids	9	8	4	1	5	2.44	21	.44

Observations N = 48

Overall Rating = 2.37

TABLE 3

ADHERENCE TO ASSIGNED TEACHING STRAGEGIES - FSM

Rating Scale	Ratings 1	2	3	4	5	Item Mean	No. not Observed	% not Observed
1. Teacher speaks foreign language	65	27	8	2	1	1.51	1	.01
2. Students speak foreign language	26	55	14	7	0	2.02	2	.02
3. Grammar: Subsidiary to functional skills	69	16	7	4	0	1.44	8	.08
4. Speaking only what was listened to	79	18	6	1	0	1.32	0	.00
5. Reading as direct communication	36	9	3	2	0	1.42	54	.52
6. Reading only what was listened to and spoken	49	11	2	2	0	1.33	40	.38
7. Writing only what was listened to, spoken and read	55	12	3	1	0	1.30	33	.32
8. Language as a cultural behavior pattern	65	15	5	2	0	1.36	17	.16
9. Testing as demonstration of functional proficiency	42	9	5	1	0	1.40	47	.45
10. Average use of tapes--ten minutes per day	37	13	6	4	4	1.83	40	.38
11. Average pronunciation drill--3-5 minutes per day	26	27	9	3	0	1.83	39	.37
12. Vocabulary taught in context only	76	13	6	2	1	1.36	6	.06

Observation N = 104

Overall Rating = 1.51

TABLE 4

ADHERENCE TO ASSIGNED TEACHING STRATEGIES - FSG

Rating Scale	Ratings 1	2	3	4	5	Item Mean	No. not Observed	% not Observed
1. Teacher speaks foreign language	78	31	6	1	0	1.40	0	.00
2. Students speak foreign language	33	55	18	8	0	2.10	2	.02
3. Grammar: Descriptive; use before rules	69	18	4	1	1	1.35	23	.20
4. Speaking only what was listened to	88	17	4	2	1	1.31	4	.03
5. Reading as direct communication	43	7	3	1	0	1.30	62	.53
6. Reading only what was listened to and spoken	55	8	3	1	0	1.25	49	.42
7. Writing only what was listened to, spoken and read	57	6	2	0	1	1.21	50	.43
8. Language as a cultural behavior pattern	78	18	4	0	0	1.26	16	.14
9. Testing as demonstration of functional proficiency	62	5	3	0	0	1.16	46	.40
10. Average use of tapes--ten minutes per day	56	10	4	3	2	1.47	41	.35
11. Average pronunciation drill--3-5 minutes per day	43	15	10	1	2	1.65	45	.39
12. Vocabulary taught in context only	91	8	1	2	2	1.23	12	.10

Observations N = 116

Overall Rating = 1.38

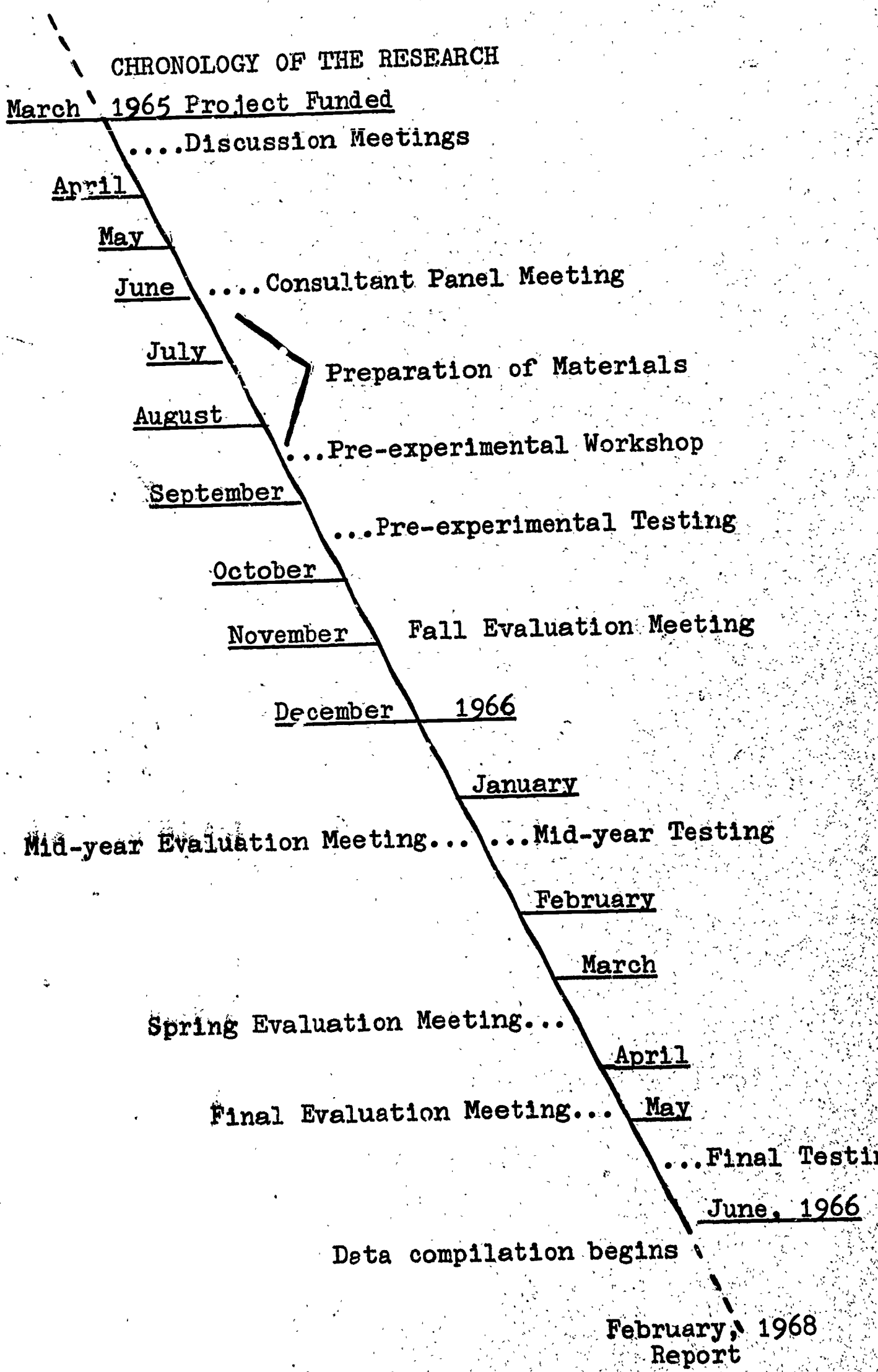
SUMMARY OF THE INSTRUCTIONAL PHASE

All students in the experimental population completed pre-, mid-year and final testing on a number of skills. Measures of both intelligence, aptitude and achievement were obtained before instruction in the foreign language commenced. Mid-year measures were obtained on the Listening and Reading skills as well as on the exact ability of the student to discriminate among the important sounds of the foreign language. Final testing included not only the Listening and Reading skills but a measure of Vocabulary and Grammar for all students. A ten percent random sample of all students was tested in the Speaking and Writing skills. Identical student attitude inventories were given before, during and at the completion of the first year of foreign language instruction in order to assess student attitude shifts and to relate these to the method of instruction.

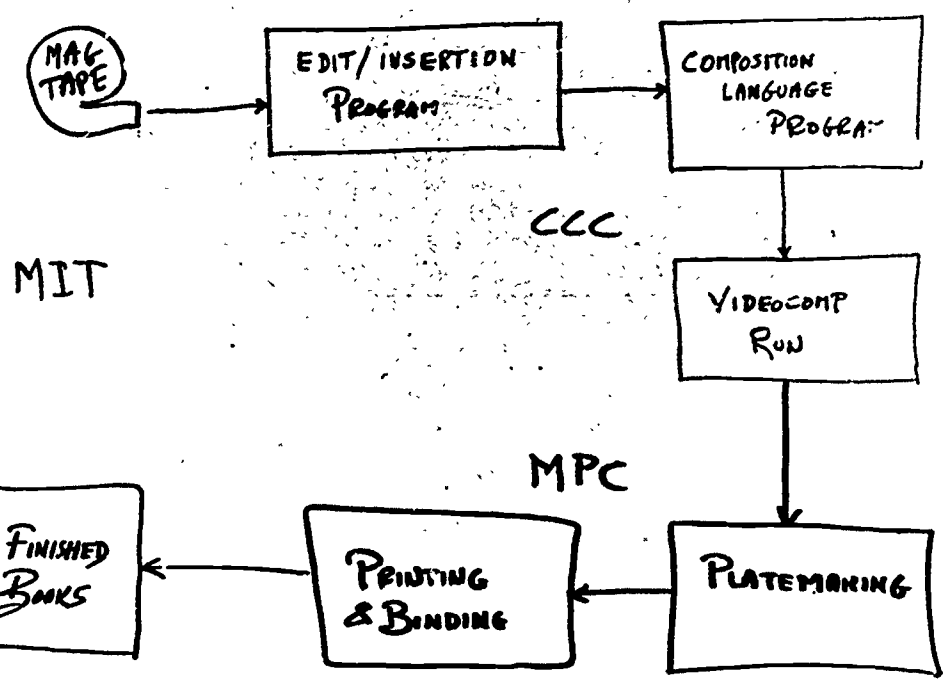
Any student who did not complete every single measure was automatically dropped from the experimental population. This resulted in an attrition from approximately 3,500 to a final 2,171 students.

Teachers generally stayed within the assigned teaching strategies as assessed by the Field Consultants during periodic unannounced observations. FSM and FSG teachers as a group were rated between "good" and "excellent" in this respect while TLM teachers as a group were rated between "fair" and "good." Every effort was made to maintain adherence and yet fairly represent the "real school" environment.

FIGURE 4


CHRONOLOGY OF THE RESEARCH
March
1965 Project Funded
....Discussion Meetings
April
May
June
....Consultant Panel Meeting
July
Preparation of Materials
August
...Pre-experimental Workshop
September
...Pre-experimental Testing
October
November
Fall Evaluation Meeting
December
1966
January
Mid-year Evaluation Meeting...
...Mid-year Testing
February
March
Spring Evaluation Meeting...
April
Final Evaluation Meeting...
May
...Final Testing
June, 1966
Data compilation begins
February, 1968
Report

The Over-all Process



Edit Insertion

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SH UN EORGE [DN,Ø][XR,6] UN 280
SH N UN EWTON [DN,Ø][QR] UN 5838

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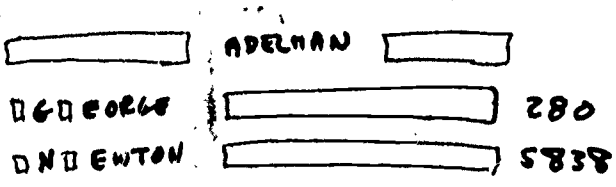
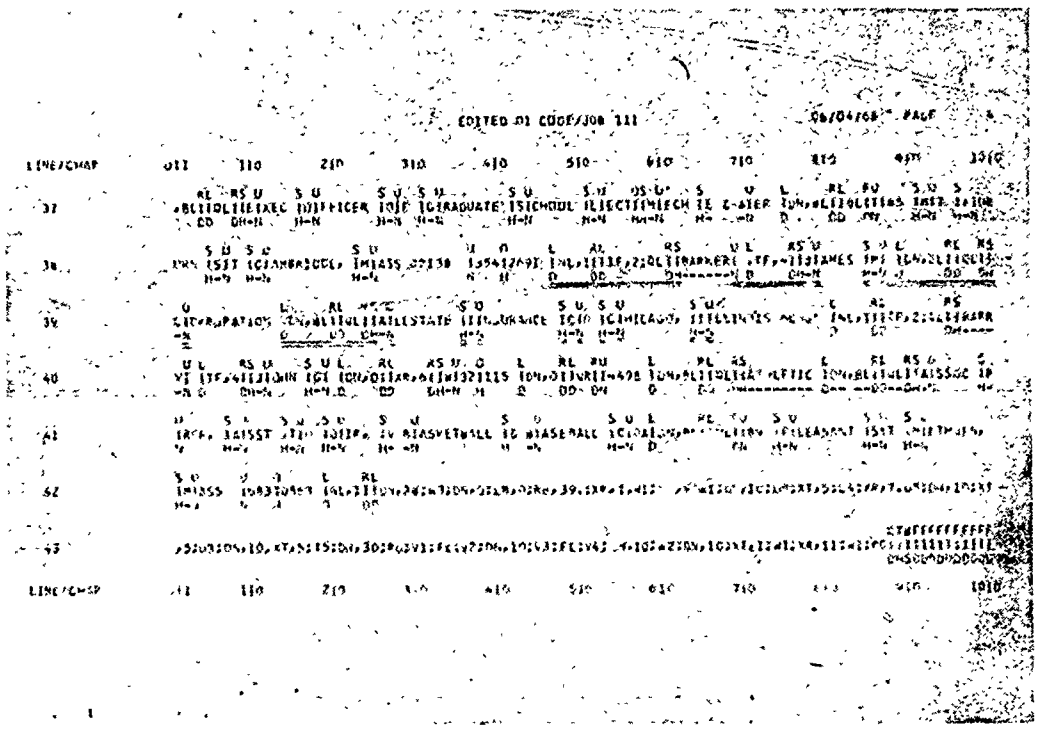


3 VIDEOCOMP RUN — ADELMAN George 280 Newton 5838



ASHWORTH Robert K N42-105 3858
4765
ADMINIS Admin Assistant, Graphic Arts
62 Bonair St Somerville, Mass 623-1620

AUSTIN James M E19-356 2102
54-1610 2287
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BARKER James M
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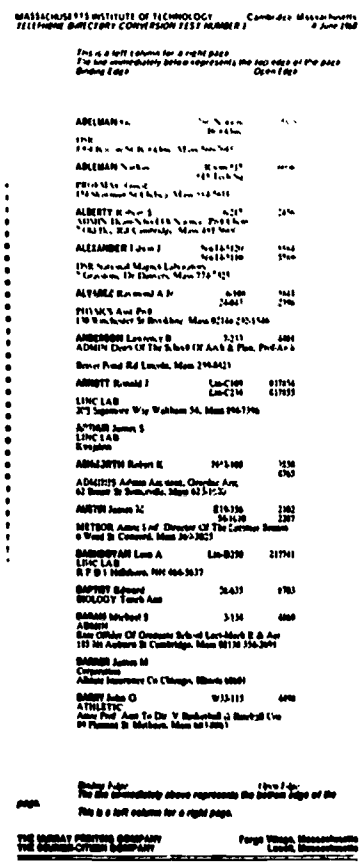
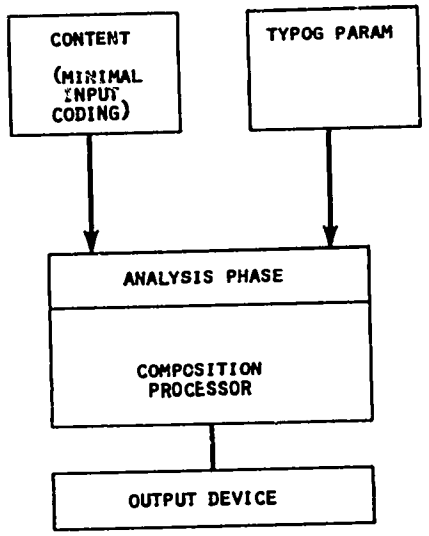
Allstate Insurance Co Chicago, Illinois 60601

BARRY John G W32-115 4498
ATHLETIC
Assoc Prof, Asst To Dir, V Basketball & Baseball Coa
89 Pleasant St Methuen, Mass 683-0863



COMPOSITION SYSTEM WORK SYSTEM NO. 2
W. W. TUNNICLIFFE, CHAIRMAN

SYSTEM FLOW CHART #4



COMPOSITION SYSTEM WORK SESSION NO. 2
W. W. TUNNICLIFFE, CHAIRMAN

COMPOSITION

		10	20
C1	CHAPTER 1	10	
			38
C2	(Problems) Introductory Session	24	
	(of Computerised Typesetting)	4 24	28
			28
C3	Chairman	8	
		1	9
C4	Mr G S Allen	8	
		6	14
C5	Speakers	8	
		1	9
C4	(Mr C J Duncan	8	
	(1	9
	(Dr D G B Edwards	8	
		18	28
C6	CHAIRMAN: We are about to hear	10	

subject of Computer Typesetting. There is working in this field.

Why Computer Typesetting?

Mr. C. J. Duncan (New Castle University): I task this morning with considerable

((Dynamic Dimensioning--1)) In this approach of dynamic dimensioning the parameter tables have dealt with what you might call *intra*-class characteristics, the characteristics which pertain to one kind of text. It is basically *width-oriented*. With regard to conditional logic these relate to *inter*-class characteristics and are more *depth-oriented* geometry. There are housekeeping requirements of 2 kinds. The rudimentary of right-and left-hand pages, the page number, things of that kind. And the more involved, which are, say, rules with regard to how many lines of body text must occur after a given class of heading at the end of the page. ((Dynamic Dimensioning--2)) This illustrates the running of the dimensioning, in the sense of each of these classes of text occurring in its particular position, filling, and the fact that you must specify minimum and optimum page ending points----and that the more latitude that you structure in here the less your probability of a page-hang will be. You must have some kind of an escape structure because you cannot, presumably, anticipate each single occurrence that will take place in each document that you process. This is a system which will start out at a given level and will grow as you encounter the circumstances which cause it to hang. The area for exercise of typographic ingenuity, of logical ingenuity, is in setting up the logical constraints for giving the typographic expression latitude or giving it escape. It will take some creative expression.

8. Conditional Logic

((Conditional Logic--1)) If we look at conditional logic, the levels of specification and application will be, as just suggested, in part by the publisher or customer and in part by the publisher's manufacturer. The publisher's manufacturer must get into this right down to the nuts and bolts level. The publisher may or may not. The publisher can specify in broad or narrow terms and then let the printer execute the given desires. If a particular question comes up, an expression of stylistic choice can be obtained from the publisher. ((Conditional Logic--2)) The purpose of the conditional logic is to *establish flexibility within a regimented page geometry* so that you will not hang every time you would if you did this strictly by the numbers that you have specified in the parameter table, which is the more likely circumstance. It is *permissiveness in terms of typographic expression and in terms of logical expression*. It will allow you to finish the "book-pass".

((Conditional Logic - Illustrative Example 1)) Illustrative examples of conditional logic in simplified form are shown in these next 2 charts. Take the directory page that we put together in the sequential series of slides. An ad "call" might occur in the midst of a run of individual directory listings. It might start at a point where its specified length is going to exceed the depth allowed for the page. So one of the *conditional logic features*, the IF statements that you must put down, implicitly or explicitly, independent of any computer program is *what to do*. These features must be specified from the point of view of the user. If such and

DYNAMIC DIMENSIONING

PARAMETER TABLES

INTRA-CLASS CHARACTERISTICS
WIDTH-ORIENTED GEOMETRY

CONDITIONAL LOGIC

INTER-CLASS CHARACTERISTICS
DEPTH-ORIENTED GEOMETRY

PLUS HOUSEKEEPING

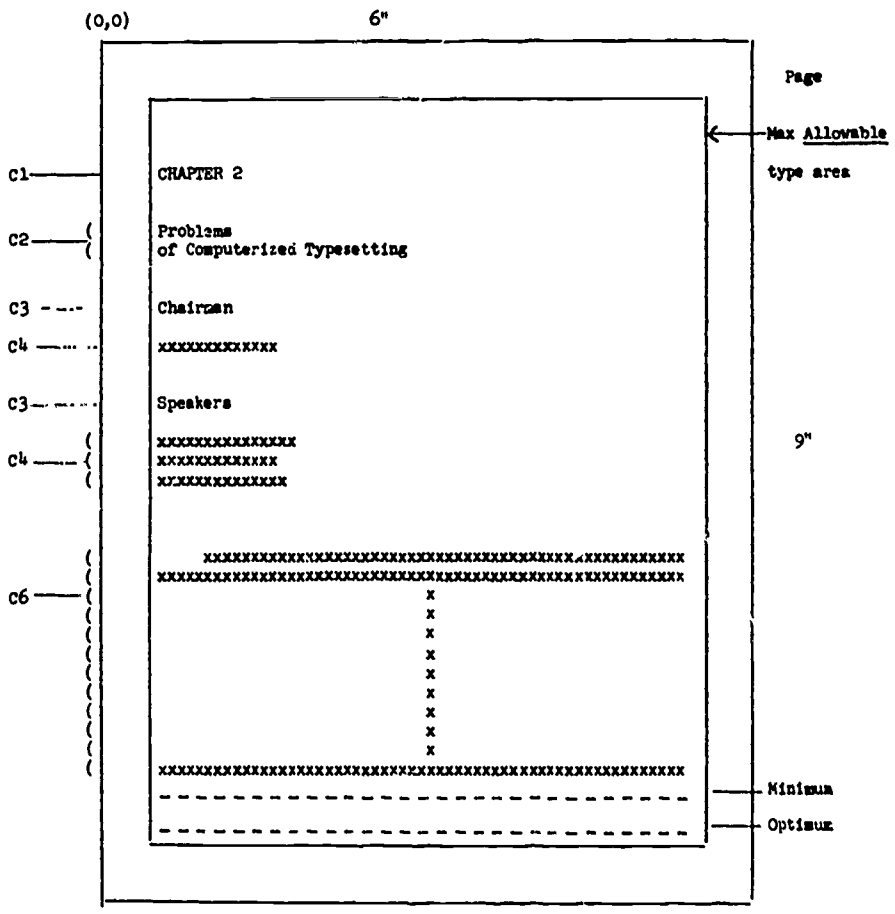
PLUS HOUSEKEEPING

SHEET 10

Computer Graphic Communications Association of Printing Industries of America, Inc.

COMPOSITION SYSTEM WORK SESSION NO. 2
W. W. TUNNICLIFFE, CHAIRMAN

DYNAMIC DIMENSIONING



CONDITIONAL LOGIC 1

LEVELS OF:

SPECIFICATION

APPLICATION

CONDITIONAL LOGIC 2

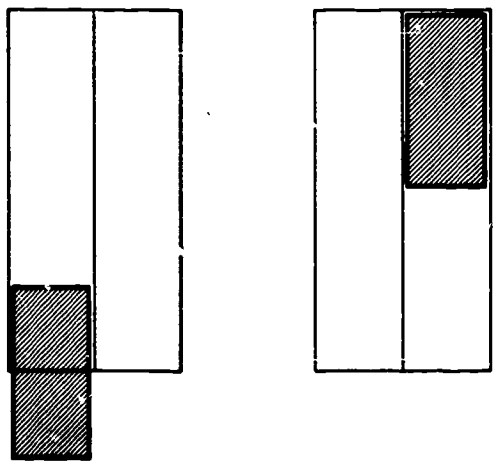
FLEXIBILITY

WITHIN A
REGIMENTED PAGE GEOMETRY

PERMISSIVENESS

TYPOGRAPHICAL EXPRESSION
WITHIN A
LOGICAL STRUCTURE

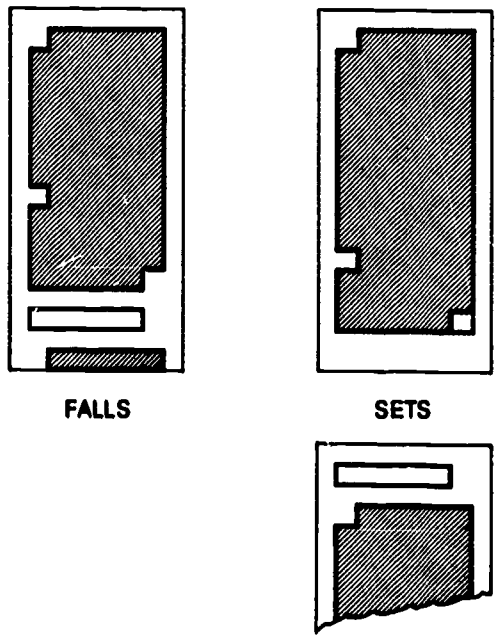
CONDITIONAL LOGIC ...ILLUSTRATIVE EXAMPLE



AS IT FALLS

AS IT IS SET

CONDITIONAL LOGIC ...ILLUSTRATIVE EXAMPLE



FALLS

SETS

such happened, I should. Or I would like. Or you may. So, in this example, the ad is spilled to the top of the next column and of course this means that the entries that came immediately after the "call" must be sloshed around to go before it. You must put it at the head and then fill in with the subsequent entries. In most utilitarian documents this won't matter. In some documents a publisher may not like this because there is ad income that relates to the intellectual callout from the directory listing to a particular ad. And that poses a different kind of condition. ((Conditional Logic--Illustrative Example 2)) The next chart illustrates, with regard to straight-text and the capability existent in some of these programs of elasticity in the vertical dimensioning, a case where the running text has come along; there is a heading illustrated in red; and there would be one line of text after this. And the publisher has said, "Completely verboten." The conditional-logic circumstance would be keeping track, so to speak, as you went down. It would know that you only had one line of text after that class of heading and the page had ended. The correction could take the form of throwing that heading to the next logical page and of expanding the leading in the running text as one obvious thing that people might do, but it might not be preferable from the point of view of the publisher. If you wanted to keep uniform spacing, uniform leading, within the body, you would look for areas of white space that it was allowable to change, such as the white space around a heading, preceding and following a heading, if that page had headings in it prior to this time. These are intended to illustrate kinds of logical solutions that you might put into this approach----coarse, to be sure, but intended to be illustrative.

((Full Page)) Witness another drug directory page, somewhat more involved than the one that you have seen. ((Running Heads, Running Feet, Filler)) This has the usual running heads, running feet, and filler; ((Text)) running directory listing copy; and ((Ads)) advertisements which will be called out. ((Full Page)) This is the page that you are seeking from these fundamental constituents and ((12-slide Paste-up Series)) the "build" of that page----with 12 pieces which all fall very nicely into place with the razor, but which may challenge you somewhat more in the machine!

((Illustrations)) These next 3 charts illustrate how one might approach the treatment of cuts on pages and in essence create a circumstance in which you can exercise *preferential logic*. ((Illustrations, continued--1)) Maybe you want the illustration in the upper right-hand corner of the page, if there is a single illustration as in a textbook. If there are two illustrations, you might want upper right and lower right. ((Illustrations, continued--2)) There may be standards of a particular publisher as to where the illustration will fall. These pose more complex logical requirements for the construction of this page by machine. And I think one should point out that it is not to be expected that there will not be required some *man/machine interrelationship*. The optimum, of course, would be that third CRT. If you consider the first one to be the soft input, the second one to be the CRT output to the photographic medium, the third one is the live, real-time man/machine interrelationship where you do page design on the computer----a la General Motors body design. And it is important to realize that the intermediate

SHEET 13A

COMPOSITION SYSTEM WORK SESSION NO. 2
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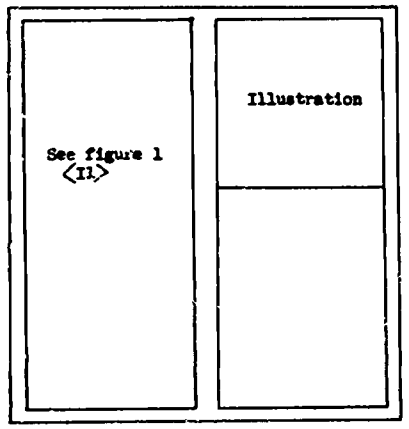
ILLUSTRATION ⟨In⟩

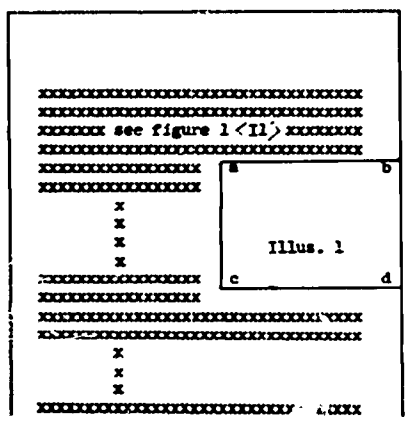
Preferential Logic: Illustration specifications take preference over text specifications

Examples:

ONE: When ⟨Il⟩ appears, put illustration in upper right corner of page (Pre-established position, recomposition may be required)



TWO: Finish line in which ⟨Il⟩ appears, add one more line, then change measure of text for Y_1 duration



X_1 = X for Il

Y_1 = Y for Il

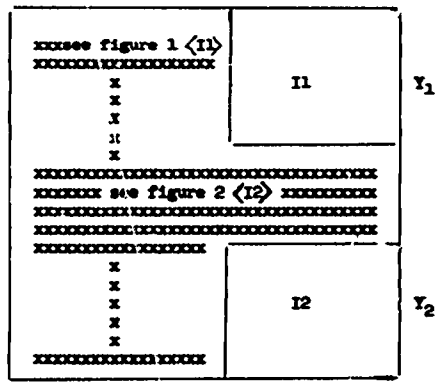
SHEET 13B

COMPOSITION SYSTEM WORK SESSION NO. 2
W. W. TUNNICLIFFE, CHAIRMAN

ILLUSTRATIONS (Continued)

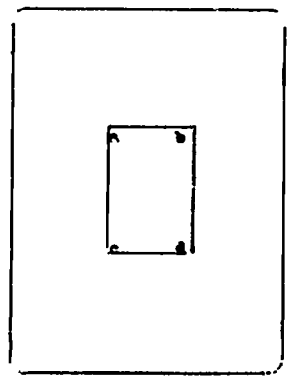
Preferential Logic Examples:

THREE: When a second ⟨In⟩ appears on one page, put second illustration in lower right corner



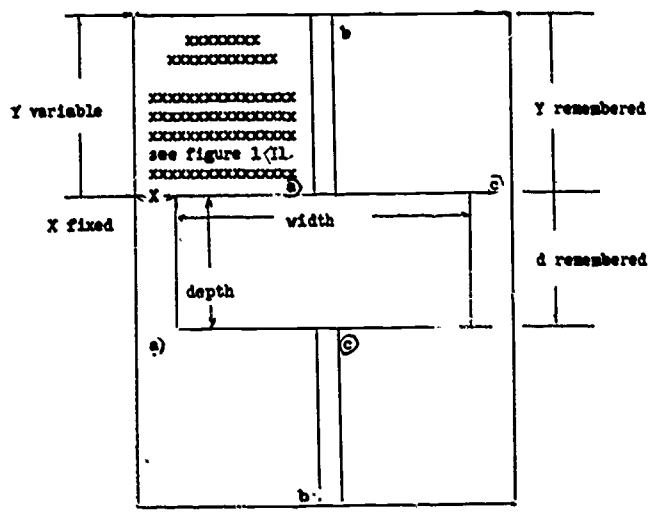
NOTES:

1. Table characteristics of each illustration
2. Wrap around:
   Relate origin (a, b, c, d) to page layout
3. Class 1 - words
   Class 2 - occasional illustrations
   Class 3 - multiplicity of illustrations



COMPOSITION SYSTEM WORK SESSION NO. 2
W. W. TUNNICLIFFE, CHAIRMAN

ILLUSTRATIONS (Continued)



Specified in Il :

X

Width

Depth

INPUTS & PROOFING

DATA
FLAGS

EMERGING
TECHNIQUES

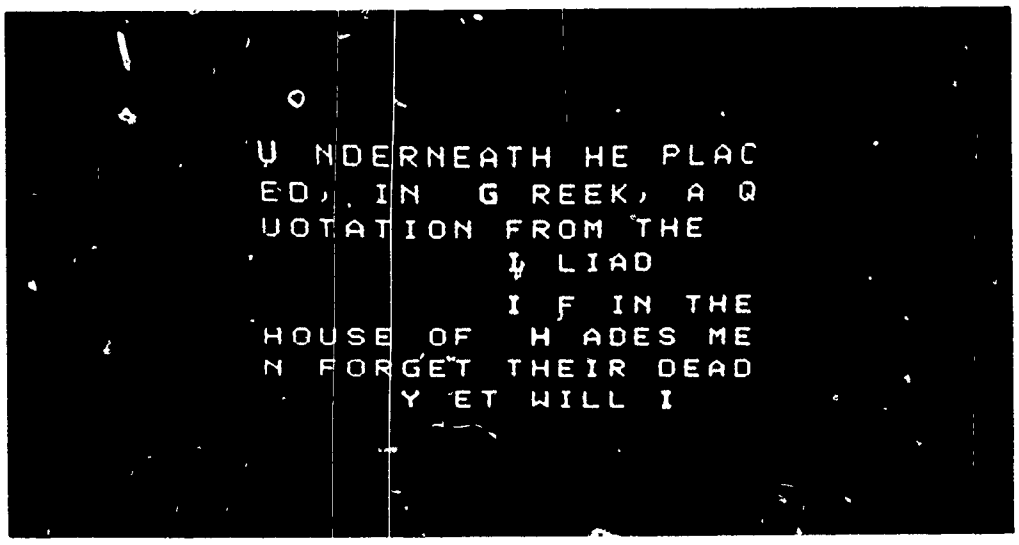
solution----a first page-pass and non-real-time fix----is more economically viable and, therefore, more imperative.

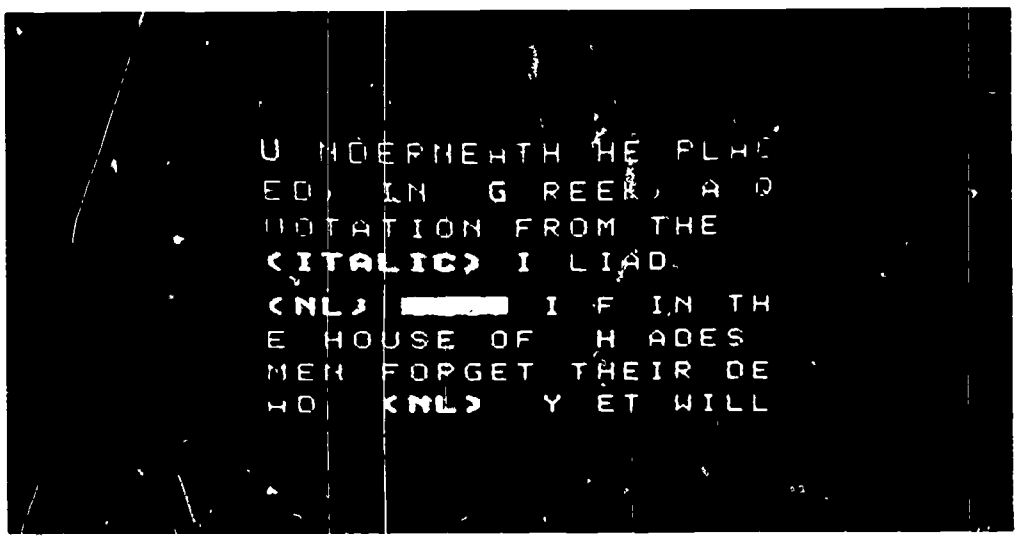
D. Input Techniques

((Inputs & Proofing)) In the input and proofing area we've talked about essentially data and flag identifiers, by whatever names you want to call them. There are some emerging techniques and the keyboard area itself is probably the most exercised of any of these areas within, say, the last 18 months in particular. There have been changes since the ((Input Text)) "Energetic Particle Observation" that appeared in the PENROSE ANNUAL in 1968 where this is the input text, ((Input Corrections)) this illustrates corrections only, as against total reset, ((Page Image)) leading to the finished page.

((7 of Fortune's top 10 companies have one thing in common. They all have better keyboard operators than you.--KTI)) Some of the countless new techniques are in education, but the main thrust of the new techniques is not simply a better keyboarding rate. ((We're out to put keypunches in their place)) Witness growing applications of minicomputer and timesharing input/editing subsystems----capable of geographic separation from the composition computer and the associated photocomposition device. *This is a factor to be considered seriously in the selection of an over-all system concept.*

((Viatron Color-CRT Keyboard Series I: 1 segment, spread apart)) Witness the possibilities of soft input----and the implicit language requirement, and opportunity, which they pose....as illustrated by the use of GENERIC function codes embedded in this synthesized example of a little Greek. ((2 segments; top, closed; bottom, spread apart)) This slide illustrates two 80-character lines where the first one appears for reference and the one currently being entered is spread apart, in terms of line separation, for ease in reading. ((2 segments, both closed)) This slide shows them both closed; ((2 segments, both closed)) this illustrates line advance ----with the first top line being replaced by the first bottom line and the first bottom line moving to the top-line position and the new line going into the bottom-line position, thus affording continuity of reference for original keyboarding or proofreading. ((2 segments, both closed)) Another line advance. ((Viatron Color-CRT Keyboard Series II: 1 segment)) This illustrates an alternate form of display encoding, another illustration of a keying variant offering backlighting as a means of emphasizing function codes ((2 segments, both closed))----perhaps for ease in proofreading separation of content and function code, or, more precisely, in the context of our present concern, MODE identifiers. Note that this approach allows of *joint or separate proofing for intellectual and typographic purpose.* ((2 segments, both closed)) Illustrating line advance ((2 segments, both closed)) and line advance again ((Underneath be placed, in Greek....)) leading, via the inevitable program, to the finished product.





Underneath he placed, in Greek, a quotation from the *Iliad*.

If in the house of Hades men forget their dead
Yet will I even there remember you, dear companion.

The most deeply felt dream of Jefferson's life was over. He, like all men, needed a personal vision to give order and direction to his life. Could he now find one to replace what he had lost? Wandering the Albemarle hills, he simply did not know. It would take almost a decade for him to realize that the words he had written in Phil-

E. Software and Standardization

((Great Moments in Data Preparation)) Where are the great moments in data preparation? ((Software)) They are, as you ladies and gentlemen know better than most, in the software! It is, in relative terms, useless to keyboard for computerized composition or, for that matter, for any purpose, if you do not have an input plan related, or relatable, to the software. ((Garbage it's not)) This is a matter far beyond the all-too-familiar GIGO -- or, to introduce a commercial note -- the issue of whose garbage it is when it turns out that way!

((World Map)) If we touch on standards for a moment, this illustrates the metric countries and those which are going metric. The red indicates those which are non-metric. As you can see, at least on an area basis, it seems to be confined largely to the United States and Canada, with some suggestion that they might change their minds. ((Life would be a lot easier if we standardized)) Of course, as in marketing, it depends on how you wrap the product. Standardization can be sold in many different ways. This is the method of the Metric Association. ((Standardized Languages Offer No Benefits to Users)) There are those who have different views about standardization in computer languages and programming languages as you can see from this illustration from ComputerWorld. But it often has to do with environment, ((Cartoon: But will he listen to your troubles?)) and a computer will not, or standards will not, necessarily listen to your troubles.

((Standardization)) Standardization has been much discussed from the point of hole or tape codes, but the things that you will find more to your need are the methodology, the structure, and the meaning. If you want a hanging indent, you want that to mean that and that only with a specified parameter. You do not want ambiguity of meaning. If one looks at printed documents and looks at the intellectual hierarchy of the document, one will often find that, from a typographic point of view, in the same book a given hierarchical level, e.g., a given heading class, may be treated differently in different portions of the book because it happened to be set on different days by different people or the copy had been provided at different times. But this system is based on the logical treatment of everything of a given class in the same identical way, subject to a set of conditions and a set of parameters, which are yours to select.

((The art of progress is to preserve order amid change and to preserve change amid order)) As to system interfaces, one cuts the cable where the wire count is lowest, or most advantageours. Establishing the interface at the INPUT zone would be most advantageour. AND it would establish interfaces appropriate to the establishment of proprietary-rights jurisdictions, which one detects from the handouts to be an issue.

STANDARDIZATION

The factors which are standardized are:

METHODOLOGY

STRUCTURE

MEANING

NOT particular machine code

THE CARE, FEEDING, AND IDENTIFICATION OF

SPONSORS -- CONTRIBUTORS

BIG DADDY THEORY
STANDARDS ORGANIZATIONS
GROUP THINK X GROUP
INDIVIDUAL EXPRESSION

OLD EGYPTIAN SAYING

WHO WILL LISTEN?

WHO WILL TALK??

COST DECISIONS

HARDWARE
SOFTWARE
PEOPLEWARE
OTHERWARE
TURMOILWEAR

J.P. MORGAN'S FRIEND

CAPABILITY

FULL
PARTIAL

IN-HOUSE
OUT-OF-HOUSE

VI. SPONSORS

((The Care, Feeding and Identification of Sponsors/Contributors)) In the care, feeding, and identification of sponsors and contributors there is the Big Daddy Theory which went right out the window, and more particularly so in recent months. There are the standards organizations, the most active of which is represented by Dr. Duncan here today. There is group-think, as expressed by the members of any cooperative endeavour and there is the area of individual expression, which might be spelled family because it all comes down to time.

((There'll Be Less Leisure Than You Think)) There must also be a state of mind; there will, indeed, be less leisure than you think. ((Everyone told the ram)) And there must be conscious intent----Everyone told the ram, "You can't...punch a hole in that dam," but the really small print says, "They forgot that determination often makes an impossible dream come true."

VII. COSTS

((Cost Decisions)) In the matter of cost decisions one can take out his handy-dandy character generation notebook which GCCA has published on CRT's. One can look at sample pages, find out the run times. These are the pages which Mr. Lannon used in his document, and one can look at the results of Mr.Lannon's work. One can talk with manufacturers and get costs. He can create circumstances of estimation which apply to his particular environment. He will include factors for hardware, software, peopleware, the other ware that we have talked about. The one thing that we haven't mentioned at all is that he better be prepared for a little turmoilwear. And this one is spelled slightly differently - and recently has been termed EMOTIONAL cost. And depending on the appetite that he has created for himself, in terms of capability, whether he wants full or partial capability, whether he wants to have the work all in-house under his control or whether he wants to allow of some being done outside his firm, he might do well to bear in mind (if he considers full capability) the response given J.P.Morgan's friend when he inquired about how much does it cost to have a yacht. You all know the answer: If you have to ask the question, you can't afford one.

((Egyptian tablet)) There is that old Egyptian saying, carefully carved on a stone tablet, that there is no such thing as a free lunch. Nobody is going to do this job for free, quickly, immediately, and hand it to anybody in this room on a silver platter, although I would love to be challenged, love to be told that I'm wrong. The basic question is not only who will listen, although that's easier to determine, but also who will talk. There are those who are practitioners and I sometimes think that, with certain notable exceptions, those who are the most successful talk the least. And it remains for those of us who are conjecturalists in the field of computerized composition, who have no operating establishment, no vested interest, no proprietary right, to talk. But somewhere in this group there must be action of that kind if this is to proceed.

((Make no Little Plans)) As regards financial magnitude one should make no little plans, ((If you need a fast, objective analysis)) nor plan on any quick triumphs, for, if you need a fast, objective analysis, and, ((THINK AGAIN!)) if the past has been a guide, one must, indeed, think again. ((Attention to even the smallest detail makes the DIFFERENCE)) As it is in the racing business, attention to detail is the only solution to that particular problem, and the detail is enormous.

VIII. ROLES AND GOALS

((CREE SQUAWS ARE AMONG THE WORLD'S BEST FEATHERPLUCKERS)) But each of us may find his place in this wild world of bits and bytes. Some of us are chicken pluckers; some of us are information processors; some of us are computer programmers; some of us are printers. But there is a role for everyone in putting this system together. ((WHEREVER A MAN GOES, THERE IS A GREEN MOUNTAIN"--A Japanese Proverb)) One must retain the spirit of optimism which runs through this old Japanese proverb, and, as you will have noticed, the mountains can be white as well as green.

((AT&T: Reach out for someone. To communicate is the Beginning of Understanding)) If we can shift to a montage paraphrase, in which Mother Bell encourages us not only to use her facilities but I think also, in our own orbital paths, to try and communicate to develop a system which will meet the needs of the publishers and the publisher's manufacturers together. ((The Not-so-Brief Case)) It will take concerted, cooperative effort to develop this not-so-brief case. ((ONE MAN'S VISION, MANY MEN'S SKILLS)) To follow Premier Smallwood's example, and persistence, in making Churchill Falls a reality -- now most urgently needed.

((Benard Cell Cloud Formation)) In our own chosen Labrador, the air may be rarified, the scenery beautiful, ((STOP: THE AREA AHEAD HAS THE WORST WEATHER IN AMERICA. MANY HAVE DIED THERE FROM EXPOSURE, EVEN IN THE SUMMER. TURN BACK NOW IF THE WEATHER IS BAD.)) the terrain dangerous, but shall we be dissuaded? or prepared?

((GOAL)) The goal is simply stated: DEFINE AND DEVELOP AN INPUT LANGUAGE OF IDENTIFICATION AND SPECIFICATION.

IX. ACKNOWLEDGMENTS

((Report from Ottawa)) It is a pleasure to acknowledge the contributions of those who have participated in the conceptual extensions of the original contribution to the Canadian Centennial, presented at a Character Generation Committee meeting in Ottawa/Hull in September 1967. The concepts were discussed and expanded in work sessions in Washington/Bethesda in July, August and September 1968. They have subsequently been described at Las Vegas in November 1968 and in New Orleans in November 1969. These meetings have all been held under the auspices of the Graphic Communications Computer Association (then the Computer Section), a section of the Printing Industries of America which has consistently provided significant support to these considerations.

((That Old Gang of Mine)) ((Contributing Organizations)) Contributing organizations are listed in the slide, and direct recognition should be given to those participants in attendance at this meeting: Norman Scharpf, Roger Schubert, John Seybold, Bernard Taymans, and Tommy Tompkins. The contributions of all are sincerely appreciated, and the responsibilities are, of course, those of the author----with the conventional disclaimer that the material presented does not represent the views or position of any of the Government agencies, associations, or commercial organizations listed.

X. EPILOGUE

((Where do you go from here? The sky's the limit.)) As to course, where would you like to go from here? It is suggested that it will take ((idea power)) the application of idea power, and, ((Motivated Men Made America Great)) one should remember, a certain degree of motivation.

((Figure at Microphone....Harangue)) By a combination of what, hopefully, has been a compatible mixture of aural and visual imagery, I have tried to portray what a USER might desire from whatever system might be created for the publisher's manufacturer ....not so much by discussion of technical detail, but rather more by the *imagery of conceptual outline* of a possible system....not in deathless prose but in a montage of audio-visual one-liners, with an occasional chart of detail. IF it has provoked your thought, if it has stimulated thoughts concerning imaginative application of software, imaginative development of economically viable and organizationally tractable business systems....then *THIS communication form will have served its intended purpose.*

CANADA	UNITED STATES
GOVERNMENTAL	
Government Printing Bureau	Government Printing Office Defense Supply Agency National Bureau of Standards National Institutes of Health
PRIVATE SECTOR	
Southern Printing Co.	The William Byrd Press, Inc. Courier-Citizen Co. Corley Printing Co. Herbick & Held Printing Co. Phillips & Van Orden Div. Radnor Graphic Arts, Inc. Rossppi, Inc.
COMPUTER MANUFACTURERS	
	International Business Machines Corp. Radio Corporation of America

Book Publishing Needs for Computer Photocomposition

Leonard Shatzkin

There is no doubt that in time the computer will be the principal method of book composition. Why is it taking so long? Why, except for highly specialized applications, has so little book work been processed through the computer?

Obviously because computer composition has failed to meet the needs of the book publisher. Are these needs so complicated? No, paradoxically, they are very simple. They have simply not been properly identified.

Certainly the book publisher's requirements are much more modest than those of the newspaper or magazine publisher who will want to enter manuscript into the computer in the midst of the creative process. This requires on-line keyboarding, instant retrieval of any item for updating or examination, running inventories of the editorial storage bank, facilities for elaborate page make-up including all graphic matter, and so on.

The book publisher deals with a completed manuscript and has the pathetically simple problem of converting that manuscript to typographic form within easily defined conditions, without introducing errors.

Instead of analysing the function of text composition in book publishing and determining the real needs to be satisfied, the computer compositors have gone to the buyers of composition to be told what was needed. As a result, they have devoted great effort and much money to making their automobile look as much like a horse as possible.

The practices that grew up out of the needs of hot metal (and particularly linotype-composition) to which the buyers of composition have become comfortably accustomed, became the norm against which computer composition was measuring its readiness to serve.

The computer compositor accepted the whole schedule of events. of galley proof, and page proof, and front matter copy and index copy waiting on pages, and the normal incidence of author's alterations, plus the need to solve typographic problems in the same manner and variety as they are solved by a stonehand. He did more than that; boasting of the computer's versatility, he added a few typographic tricks beyond the linotyper's ability.

All this managed to prove a point: if the computer is to enter the composition system with no changes in publishing practice, it will have to be subsidized because composition costs will go up - with no remarkable advantages.

Just consider the most outstanding piece of nonsense - hyphenation and justification. Imagine yourself operating a linotype machine without a quadding attachment. How can you escape hyphenating? If hyphenation did not exist, you would

have to invent it. Even more so with justification. Compositors even charge extra for the use of thin spacebands, because narrowing the justification range slows the operator so markedly.

Yet, useful as they are to the linotype operator, who can pretend that either justification or hyphenation do the reader any good. As a nuisance, justification, with its variations in word spacing is tolerable, but hyphenation is unmitigated.

And by the way, I wonder if the archaic requirement that every page end with two full text lines (to avoid being called a widow) does not go back somehow, not to the publisher's needs, but to the letterpress pressman's needs to avoid making that page ready individually.

I don't know how to estimate the amount of money that was wasted in developing hyphenation and justification routines - I am speaking of books now, not newspapers or other users - to fill a need that is about as genuine as the requirement that automobiles whinney or drop soft balls of manure behind them as they go.

The computer compositor will answer that a "need" is what his customer demands before he will buy the product - whether his customer is right or not. True. But one might have expected a little more leadership and creative selling from the people who understand the new processes best. And their failure to meet the challenge of the naive customer has contributed to high computer composition cost.

The failure is not only in accepting the unnatural burden of hyphenation and justification. It is of a piece with the galley, page-proof, author's alteration syndrome and the "we'll-give-you-any-type-face-or-typographic-format-your-wild-imagination-can-conceive"siren song to designers.

If the effort and money invested in meeting all these false needs had been devoted to the things that matter, we would be much farther along with computer composition for books today. I freely admit that this would also have required more interest and greater participation on the part of the publisher. But that would have been more likely if computer compositors had shown some leadership and attempted to develop a dialogue with publishing management rather than with production men or designers.

The first step in this direction would have been proposing to publishing management a set of practical goals in method of operation and in costs which merited some mutual effort to achieve. This would have required some initial curbs on design freedoms, probably only short term. Because it would reduce the programming cost on each book going through the system (apparently now admitted to be a real factor in the computer's failure to compete while it computes) and would simplify coding, the publisher would have

been willing to accept a narrowing of typographic formats. This would reduce the cost of detecting or correcting coding errors and perhaps permit the publisher's copy-editor to insert the codes into the manuscript.

Why should the publisher insert the codes? Because he makes all the decisions for which the codes are merely signals and it is simplest and safest for him to enter them directly.

Even more important, the successful practice of coding by the publisher would naturally lead to his undertaking the keyboarding as well, with obvious advantages to both publisher and compositor.

Perhaps this is a good point at which to come back to the topic of our discussion. What are the book publisher's needs in the matter of computer photocomposition? I must confess I don't like the question. His needs, of course, are to get the book set into type so he can print it. He may tell you he needs lower costs, but that is a meaningless conditioned response which the publisher, awake or asleep, makes to any question relating to manufacturing.

Perhaps a better question would be: What can the computer do better or differently to improve the publisher's situation, primarily his economic situation, sufficiently to warrant the effort and investment?

Now we can supply some interesting answers! Present composition methods require checking of results and intervention by the publisher at several points in the composition cycle. This is unavoidable because:

1) The publisher's instructions may have been unclear or misunderstood for whatever reason.
2) Some decisions (folios on contents pages, index entries) depend upon prior, not completely predictable steps.
3) The compositor may make an error, such as hitting the wrong key, stripping incorrectly, etc.
4) The machine may make an error, such as a transposition, wrong font, etc.

That is why the publisher must see proof of the work at various stages. Of course, folklore, as it has done with hyphenation and justification, has hallowed necessity into virtue, as though there might be some higher purpose for sticking your thumb into the cake than to see how it was coming along.

The computer should eliminate all this. If the manuscript is accurately keyboarded and the program tested, the result is determined and predictable, and there is no earthly reason to stop the process to see whether all is going well, any more than you would expect to check the computer's mathematical calculations with a pad and a Venus pencil.

The key is verification of the accuracy of the keyboarding before the tape is allowed to enter the system. This is no more mysterious than the need to assure correct input into any computer system and there are all sorts of well-tried ways and some not yet tried for doing this.

Once he understands how this new process works, the publisher will want to do his own keyboarding and the verification of his own keyboarding, because once he is satisfied he has the tape right, he can send it to his compositor and get page negatives almost by return messenger.

What does this do for the publisher?

1) Because the manuscript goes thorough the process once rather than several times, the cost of composition is reduced.
2) The elimination of proof, in itself, reduces cost substantially. For a publisher like McGraw-Hill the annual saving, if proof were eliminated, would be of the order of one million dollars, including a significant reduction in staff.
3) By sharply reducing the time required for composition and sharply increasing its predictability for scheduling subsequent operations, manufacturing time from manuscript to finished book could be reduced from 6 or 7 months to 6 or 7 weeks. This would speed turnover of the publisher's up-front investment and would make more publishing projects, those for which timeliness may be an advantage, eligible for consideration.
4) The productivity of authors and editors would be substantially improved.

In the face of this, suppose that the simplification of programming required that all running heads would be italic one size smaller than the text type, or that Times Roman could not be used for folios or some other shattering restriction on the designer's freedom to please his mother-in-law's eye for typographic style? Would anyone seriously care?

But instead of trying to solve the book publisher's problems, the computer compositor has been concentrating on the book designer's problems. He has been selling the wrong product to the wrong people at too high a price.

What is needed to operate a system based upon the publisher supplying a corrected tape (either keyboarded by him or under his supervision) which will result directly (so far as he is concerned) in final page negatives?

First, the software to make all the typographic decisions including page make-up and to deliver a tape to drive the CRT. This, at least in the beginning, will require a great deal of compromise in book design to keep the programming manageable. Some sorting will be necessary to choose manuscripts which are suitable to the current state of the program. At least temporarily, the computer will have to be

given broad leeway to adjust pages to suit the length of the book. Rules on widows and other niceties will have to be relaxed.

Secondly, the coding system must be simple. This will make more people eligible to use it (the publisher's copy-editor, for example) and will make coding errors less likely. The simplicity of the initial typographic rules will help make coding less complicated.

Thirdly, keyboarding, verification and correction must be made as easy as possible for the publisher. It is not essential, at the start, that the publisher do his own keyboarding, but it is so logical that he do it, and so convenient, as the volume becomes significant, that it should be encouraged from the beginning.

Those requirements, plus the essential one of publisher cooperation, are necessary to make the quantum jump in composition efficiency.

That is not the end, of course, but only the essential beginning. When this system is operating, refinements will follow.

The publisher will want to update already published books by addressing the published version of the book by page and line number. That should be relatively simple.

He will want to build data banks by a master indexing system which automatically selects the portions of each book which should be stored and discards other portions.

He will want to simplify copy editing by passing the manuscript through a program which does some checking and which identifies problems for solution by the author or copy-editor. This will probably involve keyboarding unedited manuscript (or passing it through an OCR) which may move keyboarding back beyond the publisher to the author.

As he gets used to the idea of fast book production and enjoys its advantages, he will be looking for ways to go from CRT to plate directly instead of through page negatives which must be assembled and exposed.

All these later refinements make sense only after the computer wins its place in book publishing by making the quantum improvement in composition. There is no doubt that it will happen. The question is really whether this improvement will take place by blindly and expensively meandering from minor contribution to minor contribution over a long period of time, or rationally solving the key problems directly and with a minimum of wasted effort.

Hardware Capabilities and Requirements

P. L. Andersson

When I was invited to prepare a paper on the requirements and capabilities of computer photocomposition hardware, I looked back over the past eight years in which computer techniques have been a factor in the graphic arts and wondered if it was possible to say anything new. So much has been written in this field that perhaps there are few worthwhile new things to say, but then I decided that there are at least many old statements well worth repeating. So with this in mind, and with the thought that I do not personally feel that the greatest need for new hardware necessitates any major breakthrough in speed, accuracy, or quality (while admitting that all of these factors can and will be improved) but do feel that total cost performance factors for all machines could stand to be improved, I have tried to collect the ideas which to me are most cogent for a statement of the capabilities and requirements of computer typesetting hardware.

A good place to begin is with the cost performance ratio of phototypesetting systems, since this is the only indicator of how well the capabilities of a system actually meet the performance requirements. The cost performance ratio of a phototypesetter is the cost of the machine divided by some performance factor, or combination of performance factors, which the user feels are important in his application. The cost cannot be taken as the price, since altogether too many other factors are involved in the ratio. Some manufacturers' habits of simply dividing the price of a machine by the speed in lines per minute to get the cost per line per minute are valid enough if speed and purchase price are the only criteria which are important, but these fall far short when one considers what must actually go into a meaningful evaluation. For instance, the time which the operator must spend coding the input tape for the computer program which drives the system, the time the computer spends perforating the tape for the system (note that this can vary considerably depending on whether or not the phototypesetter used requires one, two, three or more frames of tape for each character), the actual cost of the computer itself including maintenance, the time which the phototypesetter spends setting the particular group of lines, including set-up, and time which must be spent in pasting up the finished product until it is ready for platemaking, including the cost of corrections, etc. should be included in the overall cost. There are no hard and fast rules for what these values should be; rather they can vary over a considerable range depending on the cost of money, expressed as interest, cost of floor space, etc. as well as the type of work being done and relative wage scales which prevail in various plants. Since these values are quite dependent on specific situations, my usual practice is to evaluate these factors locally in terms of the relative cost/performance ratio of several hardware configurations which are all capable of accomplishing the given objective, then comparing the relative values obtained. If you work

through these factors, you occasionally derive some surprising results, including the fact that for some types of work, a superscale computer driving a CRT typesetter turns out to be cheaper on a job basis than one girl using a $5,000 mini-typesetter. When all the factors are taken into account also, it becomes easy to see that it is possible to make minor changes in today's typesetting machines which will greatly improve the cost effectiveness of the entire system.

Let me give you an example or two of almost trivial changes in phototypesetting machinery which would make the equipment far more useful, without materially adding to the cost of many machines. For instance, there are several different ways of setting type by columns. One of the simplest is to set type in galleys, then cut the galleys up into pages. This is the way it has been done in hot metal for many years. Suppose, instead, the phototypesetter was equipped with a reverse leading device to permit the phototypesetting paper to be backed up so that the second column could be set next to the first. Now this is a good solution, and there are machines available today which have reverse leading as an option. Unfortunately, this solves only one-half of the problem. You can reverse lead and set the second column but, when in a position to do so, the machine must start once again all the way over at the left hand edge of the original column, then reset all the white space between the left hand edge and the start of the new column. Doing this is slow, but the alternatives are few. The use of a sufficiently large computer, granted, will permit the lines to be formatted in the correct order for a once-across-the-page sweep, but without a large computer system, the only alternative is still hand paste up. All that is needed here is some way to return to an intermediate point to start the next column, a capability which could be incorporated into many, if not most, machines today at nominal cost. With machines which can be driven directly by unjustified tape, the additional circuitry to count lines, when combined with this reverse leading and "tab stop" mechanism,would add quite powerful format control facilities.

As another example, in the publications or magazine typesetting field, Roman, Bold and Italic are generally used for text in sizes from 9 to 11 points. The only other size used on many pages and, in fact, through some entire publications is a fourteen point sans-serif subhead. The manufacturer who offers the capability to set this combination will have made a major step in meeting the requirements of a large market. This combination, both in style and in size, is certainly within the easy range of many small phototypesetters today, yet no manufacturer has constructed such a machine, probably only because this was not one of the combinations available on linecasters.

So much for the examples. What I am trying to say is that today there seems to be too much of a desire among manufacturers of phototypesetters to build units which only mirror the capabilities of hot metal technology, without

concern for the systems aspects of the user's requirements. It also seems to be true that among large machine manufacturers there is a corresponding drive to construct extremely fast, all powerful systems which are capable of doing everything in the typesetting field except making money for their users.

Please remember that I am not attempting to condemn the user or the maker of either large or small systems. I am simply stating the basic principle that it is not enough to take the specifications of old machines, however well they served the user, and bring forth a new machine, developed around a basic new technology, with the same or similar specifications. The machine must be designed to perform at maximum efficiency when utilized in the application for which it is intended. When the machine or system will do that, it is a device whose capabilities meet the requirements of the user and will probably be considered the best possible system design.

The question of the large vs. the small system is due for a little more consideration than has been given the matter in the past. This is a controversy which is now raging through the computer industry. The nation's largest computer manufacturers have recently announced mini-computer systems, while at the same time the traditional mini-computer system builders are engaged in a violently competitive price war, to some extent due to the large number of manufacturers now trying to establish a foothold in the market. At least the computer industry seems to have finally realized that both the large system and the small have very definite markets and, within the framework of their limitations, there is plenty of room for both.

The prefix "mini" as it is applied to computers is somewhat of a misnomer, since it gives the impression that the machines themselves are not very powerful or very fast, while in fact, pound for pound, they may compare very favorably with larger brothers. Some mini-computers boast indexing capabilities more powerful than those of the IBM 360 series. Many machines have considerably faster cycle and add times than their larger counterparts, and many of the machines have extended arithmetic capabilities found only on very large systems. The lack of data processing peripherals and of memories are the only things which make them mini-computers. Both classes of machines are effectively used to perform all typesetting functions.

Stop and compare this field with that of typesetting for a moment. Many of the small typesetting machines have the capabilities to accept unjustified tape and provide justified and hyphenated output tape, a feature usually not found on the larger machines, so there is a certain parallel. A point by point comparison could go on and on, but the prime reason for selecting a large machine over a small one should be, but almost never is, the need for the capacity or capability represented by the larger machine. In today's

market, I believe that many of the purchasers of large typesetting systems have simply counted the linecasters in their composing rooms and, if there are ten or so, calculated the replacement cost of these with new linecasters at about $30,000 each at current prices, then decided that they would rather spend $300,000 or so for a large CRT machine. Perhaps before they sign the order they have even experimented with some electromechanical machines but they lacked the technology to keep these running properly, so they have gone on to bigger things without ever considering the even greater background of computer expertise, personnel and simple sales ability needed to keep CRT machines running.

The user who has a genuine requirement for a large machine and who keep cutting his job into bits and scraps so that he can run it on a myriad of mini-typesetters is equally foolish, but just as prevalent. The point that I am trying to make is that equipment requirements are frequently not very well matched to the capabilities of available machines by today's graphic arts personnel.

With this in mind, let us try to look at the broad spectrum of equipment capabilities and requirements for computer phototypesetting equipment in a general way. If one had asked a printer in the years after the Civil War about his requirements for composition systems, he probably would have said that he only wanted to be able to set type faster. If you had asked about the capability to set different sizes, he might have asked, "What for?" I'm certain that he would have been perfectly happy to pick the larger sizes from cases. So when the first typesetting machines were developed, and I mean both the Linotype and the Monotype, they were designed to set only text sizes. Once these were being used, however, a requirement for setting larger sizes by machine came into being. After machines had been designed to set larger sizes, then requirements were again modified to include mixing of type styles, automatic quadding, tape control, etc. Some of these requirements have been met only recently by new photocomposing machines. With the beginning of phototypesetting, the true mixing of many sizes became possible, leading to a requirement for many different type styles; so with every new advance in technology, a seemingly self-regenerating requirement for even greater advance is created, leaving the gap between the capabilities of available machines and the requirements of current users not a thin line, but a broad shifting belt. Qualified users always seem to be devising new requirements which are at best poorly met by the manufacturers of typesetting machinery. In many other high technology industries, this is far from the case. In the instrumentation field, for instance, the manufacturer generally introduces equipment containing features not even considered by the user. Perhaps this has not happened in the graphic arts because traditionally it has been necessary for the users to have to beg the manufacturer to add a feature desperately needed by each and every one. Even then, all new options for the linecasting

machine were devised by third parties and added to the standard machine only when the manufacturer was driven by dire necessity.

With this background, it is not hard to see why most graphic arts manufacturers are not very knowledgeable about, and even less responsive to, the needs of the users. It is my contention that they should be and, if they are not, the field has now become sufficiently competitive so that they can no longer survive. We are a long way from the marketplace of fifteen years ago when there were three manufacturers of typesetting machinery but only two machines, to the marketplace of today, where there are twelve manufacturers and over thirty machines.

Better systems design of all typesetting machines will be the most important improvement in the future of computer phototypesetting machinery, but other changes can be seen also. The use and general availability of better typesetting programs is bound to increase, particularly with regard to editing, correcting and merging capabilities, but this is a problem which can and will be solved by better communication between users. The simple machine qualities such as speed, line length, code acceptance, etc., is at a point where future prediction is easy indeed. Certainly there will be faster machines, but there will probably also be cheaper machines because, in any given category of users, there are always people who will accept any reasonable combination of capabilities, provided the price differential is sufficient to live with the features which have been eliminated. This means that new machines will always be introduced at the bottom of the price and capability range, while existing machines are being upgraded as a result of operating experience. A look at the specifications of typesetting machines over the past several years will show that this is exactly what has happened.

In short, I want to go on record as saying that I believe that there will always be a need and requirement for both small and large machines and that I do not believe that there will ever be a situation where all typesetting is done by corporate giants, using super systems, any more than all computing is done by computer utility systems using super scale computers.

I do believe, however, that there are some applications for systems which combine the advantages of both large and small. For instance, what about the future for small in-house typesetting machines, connected directly to telephone lines, and driven by a large scale, time-shared system? In this case, the user would benefit from tremendous on-line computing capability and memory capacity of the central system in the form of the ability to automatically index, abstract, move copy blocks, correct, edit, etc., while not having the capital investment required to maintain a computer of the size normally needed to perform these operations. Several $10,000 typesetting machines and typesetting terminals

are available, which would be entirely adequate, for applications such as some periodicals, directories, prospectuses, technical manuals, price lists, small parts lists, and some plain text technical books. There is even the possibility of using a facsimile machine as the output unit for the system, with the computer automatically generating the electrical input. This method of typesetting has been considered often in the past, but will probably not become practical until better facsimile equipment becomes available. I am not going to enter the controversy of whether it is better to use typewriters or CRT editing terminals to input data to the system, once again because there are applications for both.

In the graphic arts today, there is a good possibility that almost any sound system suggested in the past for electronic typesetting will at least be tried in the future and there is an even better possibility that many completely new schemes will be devised. People talk of using lasers so frequently that a somewhat similar device, the light emitting diode, is usually forgotten. Work now being done in the construction of large arrays of light emitting diodes will eventually lead to some very fast, high power, units which could be used instead of a CRT tube as the basis for an inexpensive method of building a super fast typesetter. Corresponding work in computer memories as well will reduce the cost of many high speed systems and techniques, and things like plated wire, flux ring and integrated circuit memories may well do much to improve the cost performance ratio of future typesetting systems.

It is no longer possible to say that we are "on the threshold" of computer phototypesetting. We are well over that legendary threshold and firmly entrenched in the era of computer phototypesetting. Of the three original manufacturers of hot metal typesetters, one ceased operations some months ago, one announced the halt of linecasting machine production on November 16th, and I have no doubt that the sole remaining manufacturer will soon follow suit. Hot metal methods, if proven technological forecasting methods are any indication, will no longer be a significant part of the printing industry by 1980. I therefore believe that the time for a closer matching of requirements and capabilities, not based on traditional factors, is here now and, in fact, is long overdue. The cost performance ratio of all equipment can and should be increased through constant attention to the needs of the user and a constant willingness on the part of the manufacturer to reflect the results of that attention in the design of new machines.

Third Generation Photocomposing Machine

Edwin R. Kolb

A photocomposition machine is one which produces typography on photosensitive material. The typography might vary from as simple an element as a character, to a line, to a galley, to a full page, or to a full page complete with graphics. The photosensitive material might be photographic paper or film or a photographic printing plate material. Generally a machine is classed as a phototypesetter, if its main output is lines of text, and as a photocomposition machine if it can output not only the text but show the text as it is arranged on a page, complete with heads, folios and other typographic variations typically found on pages.

Phototypesetting machines can be classified and referred to as first generation, second generation or third generation. An example of a first generation phototypesetter would be the Intertype Fotosetter, introduced in 1949. This machine was mechanically similar to a hot metal linecaster, except that instead of casting a line of type, it exposed a line of photographic images at a rate of about five characters per second. The second generation phototypesetters make use of electronics. Typical machines in this category are the Fototronic 1200 and TXT, the Photon 200, the 500 series, the Compugraphic series, and the Mergenthaler Linofilm series, among others. These machines store analog images of the characters to be typeset. They select the images in the correct sequence and position them in the correct locations on the output photographic material at rates ranging from 5 to 75 characters per second. Third generation photocomposition machines have in common the fact that at some point the character form exists as a sequence of electronic signals and the characters are generated piecemeal on the face of a cathode ray tube. This luminescent image is then projected and a photographic material exposed at peak character rates up to 6,000 per second. Character positioning is accomplished either electrically or mechanically or by a combination of both methods. Typical of the machines in this category are the Fototronic-CRT, the VideoComp, the Linotron 505 and the Linotron 1010. It is this last category of machines which will be discussed here.

Commercial machines in the third generation category generate the images of the typographic characters on the face of the cathode ray tube, using either dots or strokes for elements of the individual characters. The original characters are stored in the machine either in the

form of an analog image of the character, or in a digital form. The Linotron machines use the former method while the Fototronic-CRT and VideoComp use the latter method. In the former method, the character images are stored on glass plates, and each image is selected and scanned using a small character size raster. The Fototronic-CRT and VideoComp, on the other hand, store digital representations of the characters. These are read either from disk memory or from core and the selected sequence of characters regenerated on the output cathode ray tube at the correct size and in the correct location within the line. In the Fototronic-CRT the characters are painted by a series of dots such that the beam motion always stays within the bounds of the character itself, while in the VideoComp the characters are generated from line segments. Because the characters are processed electronically and displayed on the cathode ray tube, their size can be changed by changing the horizontal and vertical gain simultaneously and in proportion. However, if these two gains are changed with a different ratio, either an expanded or a condensed face can be obtained. Also, if part of the vertical scan of the character is added to the horizontal scan, it is possible to obtain an oblique character which simulates an italic face.

In these systems the speed of writing characters is a function of the amount of time required to scan the character; consequently, it is a function of the size of the character. Typical throughput speeds tend to run from 300 to 1,500 characters per second. Because the characters are built up of elements, their resolution is limited. Resolution is referred to in terms of TV lines per inch. Acceptable quality graphic arts characters can be produced at from 500 to 1,000 lines per inch. In some cases resolution can be lowered as far as 400 lines per inch or raised to 1300 or 1800 lines per inch.

Input to these systems can take one of four main forms. First, a keyboard can be attached directly to the input of the system. In general, this is not done because the rate of keyboarding for one keyboard is a very small percentage of the throughput possible with this equipment. Typical of the slower machines is the use of a paper tape input. Where higher speed is required, a magnetic tape is used. Some of the machines have been connected directly on line to the computer system.

In general, these machines need a computer to process the raw data, to format it and prepare a properly coded tape

to drive the photocomposition machine. The computer is used to break the text into lines with or without hyphenation as desired, to break the lines into columns and to break the columns into pages. It processes running heads, folios or page numbers, footnotes, extracts and poetry and places these properly on the page. It can handle tabular matter and assemble the information in the tabular fields as desired, generating rules, both vertical and horizontal. It can merge graphics with the text, so that a complete page containing text and line drawings can be output by the photocomposer. The computer accepts the information and the typographic instructions for the assembly of the pages. It processes this information, retrieves information on graphics and fonts from storage, and outputs a correct tape capable of driving the photocomposer to produce the desired page.

The output itself is achieved by photographing the luminous display on the face of the cathode ray tube. In some systems this is done at a magnification of two times the size of the cathode ray tube. In the Fototronic-CRT, the optic system is one to one, while in the Linotron 505, it is seven and one-half to one, or a reduction from the face of the cathode ray tube to the output film. In all cases, the usual output from these systems is full size typography. However, it is possible in some of these systems to obtain microfilm directly. In addition, it is possible to expose paper offset plates directly with the light from the cathode ray tube.

Third generation photocomposition devices vary in how they assemble characters into lines and lines into pages. On the Linotron 505 the characters are assembled into a line by the mechanical motion of an optical system. Successive lines are assembled into pages by moving the photographic material. In the case of the Linotron 1010, the characters are assembled into lines and the lines are assembled into pages by using the area of the face of the cathode ray tube to represent the entire page. Page size is limited to 8 by 10 1/2 inches. In the graphics mode the VideoComp can operate the same way if the page size is limited to 7 by 9 inches. The normal mode for operating the VideoComp and the Fototronic-CRT is to set a line at a time and to move the photographic material between lines. In the case of the Fototronic-CRT, it is possible to continue setting type while the photographic material is moving. This feature, called dynamic leading, allows for any size page to be set without spending time solely moving the film or paper. Further, the reverse leading feature of this machine, as with a full face machine, allows information to be displayed in any sequence.

In addition to using the character generator to expose images on the photosensitive material, it is possible to produce images using the rule generator or vector generator. In the case of the Linotron 1010, VideoComp and Fototronic-CRT, this facility allows for the generation of line drawings and the mergings of these line drawings with text on the output media. Besides the ability to do line drawings, several of

the manufacturers are experimenting with halftones. However, this facility is not currently commercially available.

Quality of the output of the digital character generators is a function of the resolution of the images, the basic image design and the digitizing technique used. While the quality that can be produced by the different third generation photocomposers varies, it is generally equivalent to that produced by hot metal composition and is therefor acceptable to the typesetting industry. This quality is significantly better than typewriter or lineprinter quality, but is not as good as the highest quality photographic output.

Font storage capacity varies with the different machines from one font up to 40 fonts or approximately 4,000 characters or more. Typical storage capacity in use in the industry falls between 256 and 1024 characters. In general, the machines which store the characters in analog form on film grids have an upper bound on character storage, while those which store in digital form either have been modified or can be modified to store virtually any number of characters. However, characters storage costs and access vary depending on whether the basic storage is in core, fixed head disk or moveable head disk, and the efficiency of the coding used.

Compared to second generation phototypesetters, the third generation photocomposition machines are considerably more flexible. The fact that the characters are generated digitally allows considerable manipulation. Point size can be changed at will, new expanded or condensed typefonts in various degrees and oblique fonts can be instantly generated. In addition to this, the dynamic leading of the Fototronic-CRT allows long galleys to be set without any time spent in moving the film or paper. Furthermore, the Fototronic-CRT and Linotron 1010 can compose an area in any sequence, going back and forth from top to bottom or left to right, in any reasonable manner. This is also true of a VideoComp equipped with the full face option within the 7 x 9 inch page size limit.

The population of commercial and government installations of third generation photocomposers is estimated at 12 Fototronic-CRT, 5 Linotron 1010, 43 Linotron 505 and 45 VideoComp-Digiset. Table 1 shows a comparison of the four machines currently in use in this country. Applications include telephone directories, other directories, books, catalogs, price lists, parts catalogs and newspapers. Depending on the complexity of the page, these machines produce between 15 and 900 pages per hour. For example, simple book pages may run 900 per hour and 4 column telephone directories, 180 per hour.

Both the Fototronic-CRT and VideoComp can generate line drawings on the output page. The Fototronic-CRT uses an offline laser scanner called the Fototronic Graphic Digitizer to scan the graphic and produce a compressed code represen-

tation on magnetic tape for entry into the composition system. In the VideoComp system, the graphic is put on 35 mm microfilm which is then placed in a VideoComp equipped with full face writing and scanning options. The photocomposer is then used as a flying spot scanner to digitize the graphic. In both software systems, the digitized graphic is merged with the text and the photocomposer outputs the entire page. It is expected that this facility will find wide use in illustrated parts catalogs.

Two important characteristics of third generation photocomposers are the accuracy and reliability. In line casters and first generation phototypesetters, it could not be assumed that if the input typing or paper tape were correct, the output was correct - the machines themselves made mistakes. The point is very important, that a user can properly assume that if the input control tape is correct, the output will be correct. As with computers, if you have proofread the input accurately, you need not proofread the output. This is a major change for those industries using linecasters, and to take full advantage of it, basic production systems will have to be redesigned. In addition, the less mechanical and more electronic the machine, the greater its reliability. Third generation machines use a maximum of solid state electronics, including integrated circuits, and a minimum of mechanics. The performance records of machines like the Fototronic-CRT are excellent and show a minimum of downtime. Installations which were forced to have redundant equipment in the past are now successful without it.

Future third generation photocomposers may find a better output device than the cathode ray tube. A cathode ray tube will not last forever and does require extensive linearity correction circuitry. Development of a laser scanner or solid state luminous scanner would improve the system. In addition, reduced memory costs will allow for greater font and graphic storage. More precise displays will lead the way to half tone as well as line graphic output. However, most important will be the development of better systems, especially easier to use and more efficient software for generating the input tape for the photocomposer. Concurrent with this development, and really a part of it, the industry will learn how to use the full capabilities of the hardware efficiently.

The important characeristics of third generation photocomposers can be summed up as follows. They can store a large number of fonts and instantly produce them in a broad range of point sizes and varying degrees of expanded or condensed styles and in roman or oblique mode. The machines are extremely accurate and very reliable. The ability to output graphics and merge graphics and text to produce a complete output page requiring no handwork makes electronic paste-up a reality. All this coupled with their speed should lead us to the high quality, lower cost complex typography required by our modern civilization.

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Table 1 - Third Generation Photocomposers[1]

Characteristic	Fototronic-CRT	Linotron 1010	Linotron 505	VideoComp
1. Input	Magnetic Tape	Magnetic Tape	Paper Tape or Magnetic Tape	Magnetic Tape
2. Character Storage	Digital	Analog	Analog	Digital
3. Character[2] Capacity				
Primary	256-4096	1024	1016	200-540
Secondary	16,320	--	--	50,000
4. Point Size Range	4-28 (144)	5-18	4-72	4-96
5. Sizes in the Range	50	8	28	33
6. Expanded/ Condensed	Yes	Yes	Yes	Yes
7. Oblique	Yes	Yes	Yes	Yes
8. Typical Character Thruput[3]	460-1500	520-1100	12-65	400-1200
9. Character Generation	dot matrix	raster	stroke	raster
10. Character Resolution (lines/inch)	400-1440	835	650-1300	225-1800

Table 1 - Third Generation Photocomposers (cont'd) Page 2 of 3

Characteristic	Fototronic-CRT	Linotron 1010	Linotron 505	VideoComp
11. Character Positioning	electronic	electronic	mechanical	electronic
12. Line Positioning	electronic/ mechanical	electronic	mechanical	electronic/ mechanical
13. Maximum Line Length, Picas	69 (100)	63	64	70
14. Reverse Film	Yes	No	Yes	No
15. Reverse Leading	Yes	within 48x63 pica page	Yes	No[4]
16. Dynamic[5] Leading	Yes	No[6]	No	No[6]
17. Page Length Maximum	unlimited	63 pica	unlimited	unlimited
18. Rule Generator	Yes	Yes	Yes	No[7]
19. Line Drawings	Standard	Optional	No	Optional
20. Max.Graphic Resolution (l/in.)	720	835	--	450
21. Optics CRT:Film	1:1	1:2	7.5:1	1:2

Table 1 - Third Generation Photocomposers (cont'd) Page 3 of 3

Characteristic	Fototronic-CRT	Linotron 1010	Linotron 505	VideoComp
22. Programmable Input	Optional	No	No	Yes
23. On Line Paper Processor	No	No	No	Yes
24. Microfilm	Optional	No	No	Optional
25. Basic Price	$322,500	$500,000	$100,000	$341,775
26. Software	Harris Composition System, LS1403 (IBM 360); PAGATEXT (Honeywell 200)	Master Typography Program (IBM 360)	Output Modules for IBM 360,1130 Honeywell 200, PDP-8, Spectra 70, Univac 93000	Page Composition (Spectra 70, IBM 360); File Composition and Text Edit/Compose (VideoComp 1600)

NOTES:
1. Currently in use in the United States.
2. Characters selected from secondary access will reduce the thruput of the system while those selected from primary access will not.
3. Rates are based on samples run for the Federal Electronic Printing Committee, specifically Mr. Edwin R. Lannon.
4. If equipped with the full face writing option, reverse leading can be done in the 42x54 pica page. Otherwise, it requires software merge programs or is restricted to the 8 pica window.
5. Dynamic Leading is defined as writing characters while the photographic material is moving.
6. Unnecessary within the page size limitations.
7. Yes, using software routines.

Software Interfaces and Systems Aspects

John W. Seybold

INTRODUCTION:

I should like to make it clear that I am not, by trade or experience, a computer programmer or systems analyst. I am rather a layman who, over the past seven years, has become deeply involved in the management and direction of a commercial operation dedicated to computer composition. (At times this was less of a business enterprise than it was a crusade; it has always been fraught with perils and abounding in research opportunities.) I have had to make major policy decisions with respect to systems and methods, but the implementation of those decisions has been assigned to others. I believe I can claim to have had a great deal of experience in appraising industry needs, system capabilities and in applying software solutions to a wide variety of typesetting (and related data processing) applications, but I recognize that there are significant areas where others who attend this workshop will be much better informed than I and perhaps better qualified to illuminate the topics and issues. Let us hope that I can succeed, however, in identifying the proper areas for us to address ourselves to. I think the underlying theme of my paper can be summarized quite simply: who should carry the ball and where does the goal lie?

I. FRAME OF REFERENCE

I should like to present certain propositions to be considered as a possible useful frame of reference for these discussions. Obviously these propositions are debatable. They simply represent my own considered opinion of the realities of the software situation for computer composition today. I cannot take the time to support them, but in the sessions to come I will be glad to attempt to defend them if this seems a useful exercise to those of you who will be present.

1. There is no software package for computer typesetting today that is not proprietary, with the possible exception of the GPO software.
2. Software packages that have been written and are presently in use may be divided arbitrarily into the following general categories:
   a. hot metal single-pass systems, performing input, hyphenation and justification, with perhaps "allotting" of output between various linecasters.
   b. special-purpose newspaper classified ad programs for hot metal.
   c. photocomposition single-pass systems, performing input, hyphenation and justification, and output.
   d. photocomposition multi-pass systems performing input, printout, storage, update or correction, hyphenation and justification, and output.
   e. photocomposition multi-pass systems performing all of the functions listed in (d) above, plus pagination. Interim photocomposition output as

an alternative to printout may also be provided.

f. interfacing programs which permit the use of data processing techniques prior to or interleaved with the various computer passes.
g. related to (f) above, "edit insert" programs to convert data files into a format congenial to processing through typesetting software.
h. special-purpose data processing and typesetting programs written to meet the requirements of large data file-typesetting applications.

3. Not only are all of the programs as defined above proprietary (except those of the GPO) but they have been written for special configurations of computer equipment, usually in non-portable computer languages. Where they have been written in a compiler language they are probably still not very portable and are quite probably inefficient.
4. With respect to present composition programs, there is also very little universality in concepts, codes, commands, or hardware requirements.
5. Some development activity is still continuing in the field of computer typesetting software. But the major thrust at the moment seems to be in the area of programming for mini-computers.
6. Manufacturers of hardware (typesetters or computers) do not seem to be committed, presently, to major composition software development. Apparently Mergenthaler has a project under way. IBM is still perfecting its existing software package (Composition 360). Harris and RCA are improving their existing programs but apparently the modifications are not visualized as far-reaching in character. There are, as indicated above, some significant software developments in the mini-computer line.
7. I believe there is a need for general-purpose computer typesetting software which can be used on standard medium-scale computer equipment. I do not believe that any present software is sufficient, or adequate, or general enough, or straightforward enough, or versatile enough, although we can learn a great deal from it.
8. I visualize that this software would be used primarily by institutions (whether profit-making, governmental, educational, or eleemosynary) where the justification for the computer installation does not rely upon the typesetting application. The mini-computer route is probably the way to go where economic justification must be found. This is not to say, however, that if the computer installation can be justified (or mainly justified) for other purposes, the use for typesetting applications cannot pay its own way.
9. I do not believe that the cost of the development of adequate computer typesetting software for standard medium-scale computers can be justified as a prudent investment by any one manufacturer or user. The cost is too great, the project is too highly specialized, and the benefits are too uncertain. I do not see that

such development would promote the sale of computers or typesetting devices sufficiently to encourage any one manufacturer to underwrite these costs. I do not believe that any service bureau or software house could gain sufficiently to warrant the investment of time and money required. Typesetting applications will always be highly specialized, require a great deal of dedication, and an intimate relationship with customers. Nationwide computer typesetting service centers are likely to remain a dream and not a reality. If any private organization does launch such a software and systems effort its availability will not contribute substantially to the needed centering down of software approaches. It would probably encourage proliferation of system approaches at a time when the need is for standardization.

10. On the other hand, I feel very strongly that all segments of the "information industry" --public and private-- would have a great deal to gain by the availability of an adequate software package, and a good "system." Hardware manufacturers of photocomposition machines would sell more equipment. Existing equipment would be better utilized. More work would be directed into this area. There would be a better general understanding of the capabilities of the system and a higher level of information interchange could take place. Courses and tutorials could spread abroad an appreciation of the subtleties of the system and experience could be cumulated and shared.

II. POSSIBLE APPROACHES TO THE DEVELOPMENT OF A COMPUTER TYPESETTING SOFTWARE SYSTEM

There are four possible approaches that occur to me:

1. A high-level program could be written in whatever language would appear to be most efficient, for which compilers are generally available: whether FORTRAN, ALGOL, COBOL, SNOBOL, or some other.
2. A new high-level language could be developed especially for typesetting, and hardware manufacturers and others could be encouraged to develop their own compilers for this language.
3. A generalized typesetting language and system could be defined and those who presently offer typesetting programs could seek to provide interfaces between their programs and the generalized language, in the form of "pre-processor programs."
4. A new set of application programs--an entirely new system--could be written in an assembly language. It is this course of action which I recommend. This recommendation is based upon the following considerations:
   a. It appears that no high-level language for which a compiler is generally available can handle typesetting needs in an efficient manner. (This, at least, is what I am told, and my investigation has been extensive.)

b. The development of a new high-level language which would require the creation of new compilers by hardware manufacturers would be unreasonably expensive and an inefficient use of collective resources, especially when there is no reason to believe that such a new high-level language could cope with the problems any better than IBM/360 Assembly.
c. The proposal set forth in (3) above is logical, but it presumes the existence of satisfactory manufacturer-supplied software solutions of a very general nature. I do not believe that the presently-available typesetting programs are sufficiently general, or efficient, or powerful. (If one such program did exist it would be proprietary at any event.) My outline of what such programs should be will, I hope, make this clear. Moreover, it is probably easier to effectuate a fourth alternative than to improvise with a third.
d. If any software system adaptations are to be made, they should be in the mainstream of what is going to happen anyway. Other manufacturers of hardware in the computer field are gradually shaping their architecture in a compatible pattern, and are offering software bridges, or hardware accommodations, to cope, in a very general way, with IBM/360 Assembly. Hence no special software effort would be required beyond that which will occur in the normal evolution of software systems--other than the development of the applications package itself.
e. The IBM/360 series--from Mod 30 on up--is the most common medium-scale computer system in existence today. The 370 will be compatible, program-wise, with the 360. There are no fundamental differences that cannot easily be overcome between 360 programs and those for RCA Spectra 70 (and the subsequent models, for which 360 software bridge programs have already been promised). Other computer manufacturers of equipment of like power and generality (except the large scientific machines that handle long bit strings--the "word crunchers") appear to be bringing their equipment into harmony with the IBM instruction set, or providing emulators or other conversion packages. Moreover, the trend toward micro programming, already well under way, will make it possible, by firmware, simulation or otherwise, for computer manufacturers to enable their products to take on the architectural properties of the 360/370.
f. In addition, in certain programming areas it is possible to program one step removed from 360 Assembly, and to impute to present 360-type computers an architecture they do not presently

possess, but can be given through macro-programming techniques. To do this extensively would place too great a program burden upon those who wished to assemble the programs for their machines, but to do it in certain areas, such as to link to certain operating system features, would enhance the generality of the proposed solution. In other words, a degree of macro-programming can create a more ambient program environment.

III. GENERAL PARAMETERS FOR THE DEVELOPMENT OF A TYPESETTING SOFTWARE PACKAGE

A. The Operating Environment

Multi-programming. Initially computers were used to process one job through one program at a time. Over the years computer speeds have increased dramatically and now in most applications there is a tremendous disparity between the internal speed of the computer's central processing unit and the speed of its peripheral devices. Most efficient computer operations therefore run in a "multi-programmed" environment. The computer memory is divided into several partitions with a priority assigned to each one. Different jobs requiring different programs are run in each partition. If the "operating system" finds that the CPU is out of work to perform in a high priority partition it will automatically switch to the next lower priority partition in order to execute a portion of the job that is waiting to be run there. The net effect is rather like having several side-by-side computers, each working on different jobs. In fact, the key to success in a multi-programmed environment is to have enough different kinds of jobs to do. Jobs which require a great deal of input and output on slow devices (like card readers or computer line printers) are generally assigned a high priority or "foreground" partition, and jobs requiring a great deal of computation but relatively little input and output are given a low priority or "background" partition. In this way the computer can keep its peripheral devices busy and use its "spare time" to do heavy computing. Any computer program can be run in a multi-programmed environment. Obviously, it is most efficient to prepare the programs to achieve a balanced use of the computer and its peripheral devices, but there are no special programming requirements for a multi-programmed system.

Multi-job processing. In a typical data processing installation a large number of special purpose programs, each designed to handle a certain kind of job, are run every day. With the exception of "utilities," such as prints and sorts, seldom will the system be asked to work on two jobs at the same time on the same programs. In a typesetting or text editing situation quite the opposite is true. Typically, there is a very great number of jobs or "takes," all of which must be processed through the same programs. The jobs are all generally small, and many of them are under substantial time pressure. The jobs would have to be "queued" under

normal multi-programming, in order to run through the same programs one at a time, and the system will therefore work inefficiently with much waiting time.

In this kind of situation the way to utilize the computer effectively and cut down the queuing time for jobs is to develop computer programs that are capable of processing more than one job concurrently. The jobs to be processed can be read into the computer and stored on disk. As many jobs as will fit are assigned their own input/output and work areas and are processed according to their priority. Whenever the program gets ahead on one job there is another waiting to be worked on. In a typical multi-programmed operation the computer may work in turn, say, on three different jobs to be run on three different programs. In a "multi-job" environment the computer may work, in turn, on a dozen or more different jobs all using the same set of programs.

Time Sharing. A computer can be a very powerful tool to carry out the wishes of a human who is working with textual material. Since it would be inordinately expensive to give each person his own personal computer with the kind of power required for this sort of operation it makes more sense to let people share the use of one or more large, centrally-located computers. In most scientific applications such time sharing implies letting each user have his own program in the computer to do his own work. In the case of text processing and text editing it means an extension of the multi-job processing described above: a relatively small number of computer programs are on call to be shared by all users of the system.

Both multi-job processing and time sharing require the same kind of programs. In the first place the programs must be "re-entrant." They must be capable of processing even one solitary character from each of 100 jobs in turn. Unlike conventional computer typesetting programs, a re-entrant program must not be modified in any way by the material which it processes. Everything which it needs to know about the work which it is processing must be stored in a separate area for each job.

In the second place, since there is, presumably, at least one other job waiting to be processed which can and should be handled concurrently, time-sharing programs should be able to minimize the computer time it takes to perform any function, even if this means increasing the total time to do that particular job. The total time spent on all jobs should be minimized, not the elapsed time devoted to any one.

Computer programs are not generally re-entrant. It is more difficult to write programs in this fashion, but it is mandatory to do so for this kind of processing. As far as we know, there is only one such program in existence today, which was designed to be re-entrant, and its hardware at the moment precludes it being run in this way; yet typesetting programs, perhaps more than any other kind, would benefit

by this capability. The closest one can come today to such an arrangement is the text editing capability of the IBM ATS(Administrative Terminal System) software. However, this software, complex as it is, does not afford the opportunity to interface in a reactive way, with the hyphenation and justification programs of IBM or any other company, and any such modification of ATS would, I am told, be virtually impossible, or extravagant.

Special opportunities would arise as a result of design which would seek to maximize total throughput rather than individual job throughput. In batch processing of an individual job in a dedicated system, logic must be used for the primary hyphenation decision. A relatively small quantity of exception words can be searched, but a large dictionary cannot be used. Dictionary lookup time, even on a disk, is too great. Yet no logic program, even supported by an exception word dictionary in core, can produce good resuls. Moreover, the "logic" is time-consuming in terms of the compute time involved, since the routine must be quite explicit. But if the I/O time is used for dictionary lookup, and at the same time the main frame goes on to process other jobs in a multi-job processing situation, the amount of compute time is reduced, the program is simpler, and the results are substantially better. Now preferred hyphenation points can be chosen because they can be so indicated in the dictionary store. The hyphenation routine reduces itself fundamentally to a disk-search operation.

Recommendation: It may be seen, then, that our feeling is that the computer typesetting software must be largely re-entrant, and capable of being run in a multi-job environment, if not in a completely time-shared environment. It is further our belief that the operating system should be OS, but a DOS version could be offered if desired. Macros can be used to provide most of the bridge between OS and DOS, with perhaps some routines being re-written if DOS is essential. But the trend away from DOS and in favor of OS seems well established at this point of time.

B. Modularity of Program Design

Programs should be written as small modules which can be linked together to form the complex desired. This makes it easier to write, debug, and modify the routines. It also makes it possible to link together the same routines to form a variety of special programs or to share the same routines between programs. Hence they will take up less room in core. New programs, such as special high-speed processing applications for individual jobs, could be written simply by linking together the desired modules. Moreover, if the programs are written in a re-entrant fashion, once a module has been loaded into a computer core it can be accessed by a variety of programs.

C. Machine Independence

The programs should not depend upon any particular hardware/software configuration. It should be easy to change peripheral devices and it should also be as easy as possible to change computer operating systems (such as from OS to DOS) since these seem to evolve at a more rapid rate than do the computers themselves. Where possible, the programs should allow for an easy interface between the programs and the computer operating environment, but because of certain features of OS as compared to DOS, there are certain chores which can be performed by the operating system itself which otherwise would have to be done by modular routines.

D. Input/Output Independence

There should be no presumption concerning input devices or input "philosophies." The software must be able to cope with any code structure and any format, accepting compatible magnetic tape or transmission. It would help, however, to establish certain conventions with respect to groupings of characters in extended character sets, and also the positioning of typographic command codes. We have some very strong convictions in this area, but since this is a separate topic we shall refrain from developing our line of argument with respect to input conventions.

By like token, the software must be output independent, bearing in mind that as new output devices are perfected, new output routines will have to be written. But they would link to a generalized format which contains all of the information which they would require, and which would make it possible to use their capabilities to the full. Hence the conceptions must take into account not only what existing typesetting devices are capable of handling, but what evolving machines should also be able to do.

E. Terminal Orientation

It seems clear that the ideal system should provide for interaction between the user(s) and the program and computer through convenient terminals accessible by cable within the usual channel limits and also by data transmission. As indicated, for quick response time, such arrangements require re-entrant programs in a multi-job environment under a form of time-shared multi-programming. An interactive system is one which permits a group of users to call for unique selections of text in real time, to make random revisions in the text which permit the user to play back those changes for verification without undue delay. Deletions, additions to text, the examination and selection of particular articles from a file, and other similar manipulations are achieved either by the hardware, or the software, or by a combination of the two. The system should assume some "intelligence" on the part of the terminal, perhaps its ability to perform certain types of functions off-line, but to access hyphenation and justification (and perhaps also pagination) routines in a totally re-entrant manner. Of course this also implies complete reprocessability of the data. At the present time most edit programs that are linked in some way with hyphenation and justification do not permit reprocessability. It is

necessary to go back to initial input, which is cumbersome and inefficient. While typewriterlike terminals may be used, it is obvious that display terminals will provide a much greater editing capability.

F. Hyphenation and Justification

As previously mentioned, this program must be re-entrant, and must be able to be run in a multi-job environment as well as in a batch processing mode. All programs must be capable of being run well within the limits of a 65k computer, in multi-programmed batch processing, which would require even the background programs to run within 32k, with efficient overlays as necessary. A wide variety of type styles should be accommodated, as well as type sizes. Mixing of fonts and sizes within a line should be possible. Unit width values should be adaptable to the requirements of all output devices. I favor a dictionary lookup approach to hyphenation, at least as an option, and I believe the program should be capable of achieving multi-line solutions to hyphenation, in order to offer the best possible solution--far better than a journeyman could achieve within any reasonable time frame. Throughput speeds must be at least at the rate of 100,000 lines per hour, in a batch processing mode. A repertoire of commands should be evolved which handle at least the following functions: quad left, right and center; flush left and right; leader with alternating characters and spaces as specified; handle any conceivable indent in a nesting pattern; set tabular; indents with tabular; tabular with indents; self-calculating column widths; store conditions functions; different levels of hyphenation; different parameters for interword expansion; extensive use of formats, keyboard shortcuts, flags for retrieval; pagination assists, and many other similar functions. Redefinition of all elements must be possible at any time, and the content of the codes should be external to the text stream, being available on disk for reference (under an assigned definition) as required.

G. Edit Programs

These must be interactive, reprocessable and highly flexible. It should be possible to re-order or move large blocks of text. Blanket commands should be possible, such as "search and find" or"search and fix". Error checking, verification of instructions and format conditions should be a feature of all programs, but especially the edit routines.

H. Pagination

Pagination programs should solve page makeup on a chapter-by-chapter basis, achieving the most efficient and most esthetic solution for the entire chapter, and using all commands available for spacing where afforded by any typesetting device. Running heads and folios should be generated, widows avoided, logical page breaks achieved, white space floated or allocated, footnotes manipulated, and art work brought in from digitized storage. Interaction may not be possible from the standpoint of providing to the user something which looks like a page, but human intervention must be built into the system, without the need for human inter-

vention if it is not desired. All problems should be capable of some solution, however arbitrary it may appear to be. "Programming" individual pages should be avoided. It is the function of the pagination program to achieve the best solutions under normal conditions.

I. Output

The same output concepts should apply for all types of output, whether from an on-line printer or from an off-line typesetting device. Generalized output routines should be used, and specific output device programs should be linked to the generalized programs. Throughput speed and device speed must be considered at all times. Reprocessability must be protected, bearing in mind that the output device may be only for interim use.

J. Data Processing

All typesetting programs should contemplate the ability to accept data processing files or to create data processing files from typesetting input. Data processing files should be processible on the basis of the manipulation of the information about the data rather than the data themselves.

IV. HOW TO ACHIEVE THESE PROGRAMMING CONCEPTS

We have tried to suggest that these programs are too ambitious to be developed under private auspices. We believe they belong in the public domain. If this is not possible, we believe they should be developed by a broad consortium of interests. However, those in charge of the development, while sensitive to the needs and requirements of the industry and institutional uses, should not be obliged to play politics, and put something in the system to satisfy everyone, or it would never get off the ground. The modularity of the system will make it possible to make modifications later.

I visualize a not-for-profit body, independent of any other, and certainly independent of government. This organization would continue its work even after the system was completed. It would then start new assignments. It would be responsible for interpretation, communication, dissemination of information, instruction and guidance. It would not try to dominate; it would encourage the flowering of ideas in public and private sectors, and would seek to stimulate such interchange at all levels. Probably another body, to monitor or otherwise keep the agency on its toes, humble and experimentally-inclined, would be useful (if only in an ombudsman capacity) because of the critical and central role this new organization might play.

V. SUMMARY

It is my conviction that good software for computer typesetting does not now exist, and that it will not come into being by private effort. (I also feel that governmental effort, in a vacuum, would be most undesirable.) I have tried

to suggest what some of the elements of a software system might be. Perhaps I am too ambitious. But if the program were more modest then my thesis would not hold, that it is too big to accomplish except by cooperative efforts. Unless we take an ambitious stance there will be a proliferation of inadequate solutions, information interchange will not take pace in a meaningful way; the results of information processing will not be readily conveyed to the possible users, and we shall have lost many of the potential benefits of present-day technology.

Enough time has gone by, enough water has swept over the dam, that we now know enough to design a good system. Equipment is good enough and reliable enough, and economical enough, that if we can bring the right software solutions to bear, we should reap great benefits as persons concerned first and foremost with the widest possible dissemination of information, in the belief that knowledge and understanding will promote progress, peace and justice. Sometimes new institutions need to be created. Old ones may not provide adequate vehicles. There are vested interests. There are inhibiting restrictions. I therefore issue a bold call to the industry, to government, to the educational world--to all, in fact, who have the imagination and courage to go forward--to set aside parochial constraints so that the new technology will truly be a boon.

QUESTIONS FOR DISCUSSION

1. Do you agree that there should be a medium-scale computer solution as well as a mini-computer solution?
2. Do you agree that certain computers can handle typesetting software applications more efficiently than others?
3. How do you feel about high-level language solutions vs. assembly language solutions?
4. Do you feel that present software is good enough?
5. Do you feel that I have overstated the complexities and difficulties, and that it is possible to write good software without making it a major and cooperative undertaking?
6. Do you know anybody who is presently developing, or has developed, software of the sort I have described?
7. Do you accept the notion that such software should be re-entrant and permit interaction as well as multi-job processing?
8. Do you believe that the 360 Assembly language would provide a good point of departure, in the expectation of increased compatibility of that language and developing computer instructional capabilities?
9. Do you rather feel that the time has not yet come to try to consolidate our gains? That perhaps we should let individuality and experimentation run rampant for a while longer with little guidance, or attempt to standardize?
10. Have you any other suggestions as to how we might seek to consolidate our gains?

11. What is your reaction to the broad features of the programs I have suggested? What particular specifications would you like to see set forth? Would you like more detail with respect to the programs I have touched upon?
12. Do you feel that this paper is relevant or that it misses the point? Is it what you want to get out of the conference, or would the discussion of other problems be more constructive? If you feel strongly that this paper would cause the discussion to take an irrelevant tack, suggest your own subjects and propositions.

What the Author Should Know About New Printing Technology*

Victor Strauss

Since the early 1960s typesetting has been in a technological revolution which is still in progress and is far from even leveling off. Now manufacturers of composition systems, publishers and printers, and even some writers have begun to ask how precisely authors will be affected by this new technology and whether it would not be best for all interested in book publishing to get the author involved at this stage of the computer revolution.

The shotgun marriage between printing and data processing

In the late 1950s computer scientists began to apply the computer to composition and in the early 1960s the printing and publishing industry found itself suddenly face to face with the computer. This second great composition revolution differed in its abruptness from the first, which took decades and culminated in Mergenthaler's invention of the Linotype in 1884 and Lanston's development of the Monotype at about the same time. That first revolution was well within the intellectual and technical scope of printing craftsmen whereas the second, the computer revolution, was based on scientific premises that were as new as they were strange to printers.

Almost overnight the composition industry changed from a staid business into one that had received the divine spark of electronics. Since printers were no better prepared for the new technologies than computer people were for the needs of the graphic arts, the results were confusion, frustration because of language differences, and disappointed expectations. But the image makers and newsmongers had a wonderful time. They were the ones who really could enjoy themselves.

Computerized composition is a broad and highly technical subject. I will merely point out some of the tasks and problems without using more jargon than absolutely necessary. One of the newer terms is end-of-line decisions. In traditional line casting the operator looks at the manuscript as he fingers the keyboard, working much like a touch typist. But the Linotype operator must also take care of a number of functions related to the copy and its appearance as well as to machine performance. In particular he must make end-of-line decisions. This means that he must decide whether he should divide a word at the end of a line or space the line out without using the available space for an extra syllable; and if he divides a word he must do this according to the dictionary which is used in

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his composing room, or the dictionary that is especially prescribed for a job.

Computerized hyphenation and justification perfected

The first step in computerized composition was the delegation of these end-of-line decisions to the computer. Now the manuscript is transcribed on typewriterlike equipment which prepares a punched paper tape or, more recently, an encoded magnetic tape suitable for processing by the computer. The equipment may be capable of producing a typed record, known as hardcopy; if it does not have this capability, it is called a blind tape perforator. Now the operator does not divide words at the end of a line but leaves this step to the computer. Typing unencumbered by end-of-line decisions goes faster.

After hyphenation and justification programs had been perfected, the computer was used for page makeup, the operation whereby the pages of a book are determined. Page makeup is known as pagination by computer composition people.

Pagination or page makeup still in its beginning

Page makeup can be relatively simple and it can be quite difficult. Running heads and folios must be inserted, and there are certain typographic rules that must be observed, depending on the design standards of a publisher or a composing room. At the time of writing things are in flux: there are some pagination systems that work well; in certain cases existing programs need adaptations which may be time and money-consuming, but by and large pagination programs of text only, without illustrations, seem to present no major problem anymore.

The next big step will be the computerization of text in combination with pictures. Line illustrations are already included in some systems; shaded pictures such as wash-drawings or photos, which must be converted into halftones for printing, are still in the laboratory or experimental stage, and full-color images are also well advanced even though there are no publicly known operating programs for combining them with text. But there is little doubt in the minds of the experts that pagination programs for combining text with pictures are bound to make their appearance within the next five years.

You can see that the computer, in its attack on printing and publishing, is taking position after position. And it must at least be mentioned that the computer has a great deal to offer in editorial functions such as indexing, extracting, rearrangement of material and even in programmed reorganization of the format. (This last point means changing the format of a book for different purposes or markets, say from hard cover to paperback.) But no other development has played as much on the imagination of the publishing industry as CRT or electronic composition.

The glamour of CRT composition

CRT (cathode ray tube) or electronic composition became practical in the late 1960s. (Cathode ray tube is the name given your TV screen in the physics lab.) The main feature of CRT composition is, as you would expect, speed. Here I must introduce the L/M concept. L/M stands for lines per minute, and it is used to express the relative speeds of different systems. (The line in question is an 8 point 11 pica line, as used in an average newspaper column.) An operator-fingered linecasting machine produces, say, 3-4 L/M; a high-speed tape-operated machine yields approximately 15 L/M and a CRT, incredible as it may sound, can easily deliver 2,000 L/M.

This means that a 100,000-word book can be composed on a CRT in half-an-hour, give or take a few seconds. Project this figure further and you find that you need approximately ten such books per working day, or 2,500 per year if you want to keep this Moloch fully satisfied. And that is at present the greatest problem of CRT composition: to provide the necessary input for the machines.

What does input mean? So far it looks as if the CRT does the job all by itself, as if composed pages jump out of it with no more preparation than Zeus needed when he let Pallas Athene jump out of his head, fully armed and ready to play her role in Greek mythology. Our electronic mythology is just as incredible; fortunately we can get down to earth and try to understand what is really happening.

Like the Monotype caster, a tape-operated linecasting machine, and a number of photographic composition systems, the CRT depends on input before it can produce the final output, the wanted composition. The input for all these systems is prepared in the form of narrower or wider paper ribbons and of various kinds of magnetic tape. These tapes contain all information needed for the operation of the output equipment in a coded form.

Input, the bottleneck of CRT composition

Depending on the nature of the work, input is more or less difficult, or - which amounts practically to the same - time-consuming. A convenient rule of thumb is to assume that it takes about 40 input hours for one hour of CRT operation. In complicated work this time may be increased by 50 per cent and even more.

At present most input is prepared on tape perforators - typewriter-like machines that produce punched paper tape, as already mentioned; magnetic tape input equipment is gaining ground, particularly that rented or sold by IBM, but also by other companies. Some input is arrived at by optical character recognition (OCR) of typed and even printed material, and advanced technologists speak of the

great possibilities of electronic voice recognition which would go directly from dictation to computer tape. I am not up on my reading of science fiction; otherwise, I would know more about man's capability of growing electrodes right out of his skull like the horns of Michelangelo's Moses.

To return to the subject in hand, input depends still more on human beings than on machines, more on the ten fast fingers and the power of concentration of the operator than on the equipment. Another factor that has a considerable influence on input is the preparation of manuscript.

Now we have arrived at the point which is of greatest interest to us as writers, namely how can this new technology be applied to our benefit? How can it help us to improve the quality of our books? Can it really relieve us of some of the drudgery of writing and editing?

These questions cannot be answered without some comments on the whole complex of writing, editing, and proofreading as it is generally practiced.

The writer's literary rights and obligations

The writer's literary rights and obligations are not the same in all segments of the publishing industry, and there is a considerable difference between staff, or employed, and free-lance writers. The members of the Authors Guild are primarily free agents and the following discussion is written with this fact in mind.

The author is, legally if not factually, the equal of the publisher with whom he enters into a contract. From the publisher's point of view he is a supplier of manuscripts. One of his obligations is, according to tradition, the delivery of a completed manuscript, ready for the printer. The publisher may want to do minor editing, and he may suggest, and even request text changes, but the author still has the last word.

In addition to these literary rights and duties the author, traditionally, also has the obligation to read proof. Proofreading, which is technically part of quality control and has the purpose of making sure that the manuscript is correctly duplicated in type, offers the author, psychologically, an invitation to revise, rewrite or generally improve his book. Unfortunately, these changes, known as author's alterations, or a.a.'s, are costly. Publishing contracts provide that the publisher will only pay for a minimum of a.a.'s and the author is liable for all expenses beyond this point.

That's how things are in theory; now let me take a look at our actual practices.

Editing games played in publishing

There are several kinds of editors in a larger book publishing firm. One group, comparable to buyers in department stores, are literary entrepreneurs who have a flair for the opportunities of the marketplace often coupled with shrewd judgment of a writer's capabilities. They are called editor-in-chief, senior editor, or even acquisition editors. Their role in the success of a publishing company cannot be overstated, but they are outside the subject to be discussed here.

When the manuscript is delivered the writer meets another type of editor, often called copy editor or production editor. This person is concerned with the detail of writing, grammar, punctuation, abbreviation, capitalization, or generally speaking with making the text (and illustrations, if any) conform to the house rules. As everybody knows, modern mass society has an ever-growing, almost insatiable appetite for writing. The demand far outruns the supply, if not of persons masquerading as writers, then certainly of halfway competent or really good ones. Not surprisingly, a considerable number of marginal cases, people who under different conditions would concentrate their energies elsewhere, become writers.

Publishers have learned that poorly written books sell less than well-written ones and have developed editing systems to improve the quality of their books. I am referring here more to text books and technical manuals than to other kinds. But even in biographies and other non-fiction books there may be a lot of work for a copy editor. He, or she, must do what the author was supposed to do in the first place: make the manuscript ready for the printer. The edited manuscript either can be sent directly to the compositor or it can be returned to the writer for his approval. Either method has its advantages and its shortcomings. I am told that there are writers who are pleased with the corrections made by editors and who return the manuscript not only with their approval but also with thanks. And since my informants are honorable people there must be such instances. But I believe that most people dislike intensely to have their language corrected, and those likely to accept corrections on their merits usually need them least, because they are the true professionals. But these professionals are particularly irked if they are asked to accept inept, pedantic corrections made by recent English graduates in imitation of their teachers.

The psychological background of these games between the literary governesses and their often unruly charges cannot be pursued here. But what must be pursued is the appearance of the manuscript as it finally arrives at the compositor. It looks like a neatly ploughed field trampled over by a horde of drunks - a real mess. Words and sentences are now crossed out in one color, marked "stet" in another, additions are written in longhand, and directed with

graceful loops or arrows to their proper places; paragraphing is changed, and slips, marked insert at A or No. 1, are clipped and stapled to the pages. These corrections are evils which continue to beget more evils in the course of production. They have a cost-increasing effect on input, and cause trouble during proofreading. Ideally, a manuscript should be perfect, with no corrections at all.

To avoid the back and forth traffic between writer and editor some publishers send the copy-edited manuscript for proofreading. If he has the temperament of a saint he will find this procedure to his liking because liking it will prove that he is far advanced on the way to salvation. If, like most of us, he is an ordinary sinner he will blow his top and feel cornered and abused. Nobody likes to be faced with accomplished facts, and to be confronted with a fait accompli where he has by law and tradition the right of decision is particularly galling to the writer.

If he is young and inexperienced, or just inexperienced, he has a surprise coming: whenever he changes the copy editor's gems to his own language, or, after his anger has died down, to better language, stimulated by the editor's corrections, he runs the risk of having to pay for these changes as a.a.'s. And he will learn to his chagrin that a.a.'s are much more expensive than he thought. (An explanation whould be lengthy, so let me just say that service costs always come very high.)

As you can see, writing, editing, composition, and proofreading are all closely interlocked. Our whole editing and proofreading system is actually based on the dual nature of composition which must now be explained.

The dual nature of composition

All composition is done by assembly. In hand composition the compositor assembles individual type characters and spaces them into words and lines, into paragraphs, and on into pages. More modern methods have changed composition technology from the bottom up, but they are still based on the assembly principle, in CRT composition even more so. This is one side of composition which has of course its own technical rules and values.

If composition were an assembly method like many other industrial processes, say those whereby automobiles are put together, things would be much easier. Unfortunately, this assembly method has also an intellectual side. The compositor must be a literate person. For centuries he was expected to be an excellent speller and sure of his grammar, particularly of punctuation and capitalization. These abilities were, and often still are, necessary because writers are by and large not too attentive to the detail of their manuscripts. The compositor was and still is in many cases as much responsible for the grammatical correctness of composition as for its technical aspects.

For centuries it was impossible to separate the technical from the intellectual side of composition. When Tolbert Lanston invented the Monotype in 1887, he divided his new system into the keyboard and the caster and thereby made the division of the two sides possible. The keyboard was and still is used for encoding a paper ribbon with the intellectual content of the composition. This paper ribbon then is put on the caster where it controls the casting of justified lines consisting of individual type characters. Lanston hoped that writers would learn to operate the keyboard but this wish did not come true.

The separation of keyboarding from casting was applied to the Linotype in the 1930s. Again it was hoped that journalists would operate the keyboards of the TTS (Teletypesetter System) and again these hopes were disappointed. Even though TTS perforators are easier to handle for writers than Monotype keyboards, this function was in practice left to craftsmen who copied text rather than to the writers who originated it. The next experiment in making keyboarders out of writers was made approximately 30 years later. In the early 1960s,keyboards that looked and worked like typewriters, equipped for hardcopy, were used to prepare unjustified tape for the computer. It appeared logical to ask journalists, reporters, to file their copy in this manner but this logic too was short of breath; it got nowhere.

You see that these experiments of the writer as part of manufacturing were repeated by different generations. Here as in other things each succeeding generation had to find out for itself because it did not have the experience of its fathers.

Different people will draw different conclusions from these failures. Mine is that it is impossible to concentrate on anything else when you are writing and that every system which deflects the attention of the writer from his work must fail. I personally believe that that is the way it should be. A writer's job is to write, and to concentrate all his energy on writing. It cannot be the writer's job to subordinate writing to the preparation of input. Here as elsewhere those who want to kill two birds with one stone will kill none and probably smash some windows.

But I also believe that the new technology can be used to help us in our work as writers, relieve us of much of the tedious detail of editing, eliminate time wasted in proofreading, and, not least, reduce the senseless time lag between writing and publication. Much of the new technology is still in flux and can therefore still be influenced in its direction.

The crux of computer composition

The same technological revolucion that gave us hot metal machine composition (Linotype, Intertype and Monotype) also

gave us the typewriter. Either development is a departure from hand composition, and different as they are in most respects they have both one new common denominator which did not exist in hand composition: the keyboard as originally used on musical instruments. I have already sketched the several efforts made to combine writing and keyboarding and explained why they all failed. The new technology will change this situation decisively, because it is so flexible, so adaptable that it has become possible to divide the Siamese twins of composition, its intellectual and its technical side. This is the crux of the contribution made by the computer to composition. This truly revolutionary point is, unfortunately, much less ostentatious or ostensible than the fabulous speed of CRT composition. But ever more people are beginning to see that this is the point where the lever must be applied.

Another related point needs mention. A secondary, though quite important reason why it is impractical to use writers for input preparation is that the input tapes must be nearly perfect and that the correction possibilities were rather limited in older systems. Computers differ essentially in this respect; they are excellently adaptable to deletions, additions and shifting of copy, hence to editing. And their main advantage is that the already established text will not be accidentally changed because it is electronically transferred from version to version, which is quite different from passing through composition where it must be rekeyboarded and is also otherwise open to changes for the worse simply by the mechanics of handling. It has become not only possible but also entirely practical to arrive at a clean manuscript on tape and to set type from such a tape without interposition of a new keyboarding. To avoid all misunderstandings, I want to add that it is also unnecessary to introduce codes relating to the technical side of composition during this phase of the work. How the necessary function codes are to be entered is not of interest to writers, but is, rather, the job of systems designers and technicians.

Is proofreading a necessity for the quality of books?

Some authors and editors shudder to think that their books will be printed following the manuscripts with no proofreading. They assume that the final manuscripts for composition without proofreading would be of the same nature as those turned over to compositors under present conditions. But the manuscripts to be used in the future will be entirely different. Then all corrections by writer or editor will be made, and repeated so often as found necessary by a writer, before the manuscript will be released for composition. The quality of manuscripts will be greatly improved for several reasons. One of them is that the time needed for electronic composition from existing input tapes will be reduced from months to days or weeks. This time saving can be invested in rewriting and editing. Secondly nobody will have to work under the pressure of printer's schedules and need to

refrain from rewriting because he is afraid of the expenses caused by the odious a.a.'s.

When the final manuscript is established it is so to speak frozen on the tape. A final transcript of this frozen tape is made least expensively by computer printout equipment, which shows writer, editor, designer and compositor the exact text. No proofreading for content is necessary from then on. There will be no new keyboarding and therefore no mistakes. (Machine errors are so rare that they can be neglected at this stage of our discussion.) There may be an inspection of the composition though, to make sure that it is up to the typographic standards of publisher, designer or printer.

Finally I want to mention that the computer could easily take over some of the most boring and also most time-consuming chores of copy editing. I am referring here to the inconsistency in spelling, abbreviation, and so forth, which causes so much shaking of heads among our good, hard-working copy editors. Authors can be inconsistent (said less politely: "sloppy") and misspell words or mishandle compounding. Few items are as annoying as the little hyphen. Be consistent! make up your mind, and stick to your decision! Is it copy editor? copy-editor? or copyeditor? As all three versions are defensible and only the bluest of the bluebloods will be immediately offended by any, even the best copy editor is apt to overlook some infraction of these artificial rules and thereby join the ranks of the inconsistents. But the computer is not open to such human weakness; if you instruct it to join copy and editor with a hyphen, a hyphen will join them forever.

To sum up: The new technology in printing, if properly understood, can help us write our books, make our books better, reduce the time lag between writing and publication, and relieve us of much of our editing nitty gritty and all of our proofreading. If we understand what it can do for us we can greatly benefit by it.

A Cost Study of a Computer-Based Information Processing System Using Photocomposition

William G. Cox and Ronald L. Wigington

Introduction

The costs and economies associated with computer controlled photocomposition must be discussed in the framework of a total system. This paper will present cost data from the operating experience of Chemical Abstracts Service where computer controlled photocomposition is being used both as a part of internal processing and for final publication output.

Because various organizations have different environments, different needs, and different overall system structures, the economies provided by the use of computer controlled photocomposition as an output mechanism may vary more from the associated system structure than from the composition process by itself. Even the costs may vary from use of the same composing device due to method of financing (i.e., capital expenditure, lease, service bureau) and the load level over which those costs are spread. Too often, general conclusions are drawn that a particular technique is superior or inferior based on comparisons of uses in environments that are not themselves comparable. Therefore, for this discussion, as much emphasis will be placed on the description of the environment from which the cost data comes as on the data themselves.

The system structure and cost data comes from the experience of Chemical Abstracts Service in using computer systems and photocomposition for the production of Volume Subject and Formula Indexes for "Chemical Abstracts". By using computer controlled composition techniques as a key part of overall system design, it has been possible to achieve operating economies as well as to make possible new forms of system outputs. Further, we expect to improve the speed of processing.

We view computer controlled photocomposition only in the context of an overall information processing system. It provides the means by which data (information) in machine handleable form can be composed and printed in the quality of appearance that humans demand (or at least have become accustomed to in the evolution of printing) without reintroducing a human, error-prone, costly step between processing and printing at every stage of the process. Thus, it is the mechanism that allows the full power of computer-based information processing to be coupled to the art of printing which has played such a key role in the communication and recording of knowledge in all phases of human activity.

Publication Characteristics and System Evolution

The Subject and Formula Indexes are two major indexes produced each six months (a Volume period) for the issues of "Chemical Abstracts". The Subject Index contains both concept and compound entries with citations to the abstracts published

during the Volume. The Formula Index provides entry to the same information by means of molecular formulas. The range of typography requires 768 characters including Roman and Greek alphabets, italics, bold-face, various combinations of subscripts and superscripts, and many special symbols. Line drawings for chemical structures are also intermixed with the lines of text. The information is formatted in 3 columns per page with an average character density in the range of 15,000 - 18,000 characters per page. In 1967, these indexes (for Volume 65, CA) were produced by a system which included computer supported working files with line printer output for work sheets, manual alphabetizing, Varitype composition and corresponding printing methods. Unit cost data are given for these methods as used in producing the indexes for Volume 65 of "Chemical Abstracts".

In 1968, a new system was introduced for producing the Formula Index. Two innovations were included. The working files for the Formula Index portion of the information were transformed into a form that could be ordered by computer, according to sorting rules appropriate for molecular formulas, and the manual alphabetizing was eliminated. Composition at both galley and final page stages was done using photocomposition. The photocomposer produced single column output and photographic processing was used for assembling the final page photographic masters. At this stage of system development, the Subject Index was still produced by the former method. Data are given for the mixed systems which used computer controlled organization and photocomposition methods for the Formula Index and Varitype methods for the Subject Index for production, in the first half of 1970, of Volume 70 Indexes.

In the fall of 1970, a new integrated system was completed which has two major components. A new index support processing system was introduced at the beginning of 1970 which used photocomposition for output of work sheets from generalized index support working files. The other part of the new system was the index publication system which selected material from the working files and ordered, formatted, and composed it totally under computer control. In the first use of this system for production of all Formula and Subject Indexes in the fall of 1970 for CA Volume 71 material, both galley and final page were photocomposed. Data are supplied based on the experience of index production for Volume 71 indexes. Extra start-up costs and training costs have been excluded so that the comparison is not distorted and is consistent with the production rates we are observing as we process Volume 72 material.

These steps in system evolution illustrate the long term development program which is transforming Chemical Abstracts Service from a traditional secondary publication activity into an integrated computer-based information system which has a variety of outputs, both printed and computer readable. In this effort there are several principles which are guiding the design:

- Information should be handled as units which are defined and recorded in the maximum detail required and available for all uses and should not be input or processed in terms of specific outputs until the selection for packaging stage.

- These information units should be organized as a data base, not as special purpose files in a process dominated system.

- At the input and output, the system design must accommodate changes in technology which enhance the performance and economies of the overall system. Thus, the characteristics of input and output devices must be as independent as possible from the form in which the information is stored.

- Organizing and formatting for each specific output use must be defined algorithmically so that when data is selected from the data base it can be appropriately prepared for output with minimum human intervention, if any.

Thus, the CAS processing system which is being developed has three major manufacturing components: Input, Data Base, and Output.

Photocomposition Facility

The present CAS photocomposition facility is an IBM 2280 film recorder that has been modified to enhance its character generation capability[1]. It is controlled with an IBM 2840 control unit which operates as a standard peripheral on a selector channel of our IBM 360/65. Character generation is done by means of short stroke display subroutines. The characters were designed by CAS using a 2250 CRT display terminal as a character library maintenance aid. The character library is stored on disk and transferred to the 2840 controller memory as needed. The 16K byte memory of the 2840 will hold approximately 75 characters. Look ahead queuing on character subroutines needed is done to insure that the composition process is output device bound and not character library access bound. The composer will output approximately 55 6-point characters per line. On formatter material the composition rate is approximately 1200 characters per second. The composer also has general vector drawing capability which is now used only experimentally.

[1] "The Application of the 2280 Film Recorder to CAS Processes", D.F.Rule, Eighth Chemical Abstracts Service Open Forum, Chicago, Illinois, Sept. 12, 1967. Available from the Public Relations Department, Chemical Abstracts Service, The Ohio State University, Columbus, Ohio 43210.

Cost Data

The specific object of this cost study spans all three of the major CAS processing system components: Input, Data Base, and Output. It begins at the initial input of index information after the intellectual analysis is completed. The form of the information at this point is dictation tape produced by indexers. The cost model follows the steps of processing through initial input and file building, unit verification and correction, galley production and review, and production of final page film for use in printing. Because of the present level of development of the total system, line drawings for chemical structures are stripped-in during the final photoprocessing steps. Future systems will perform the merge of text and drawings electronically.

In determining the CA Volume Index to represent the cost of each of the three methods, the final Volume (Volume 65 and Volume 70) for each of the first two methods were chosen. This would reasonably represent the optimum cost efficiency for these two methods. In contrast, this cost performance is being compared with the processing cost experience at an early stage in the introduction of the current integrated system. Thus, we feel that this is a conservative estimate of improvement.

Several assumptions and adjustments were made in order to have as valid a basis as possible for determining the impact of the use of computer processing and photocomposition. Over the period of the study, the general indexing practices and average indexing density have been fairly stable with a slight tendency for an increase in the total number of substance and concept access points. Costs are stated as unit costs (per original document processed). Indexing and index production are activities separate from bibliographic or abstract processing so there is no overlap or shared costs involved. So that inflation does not invalidate the comparison, all costs were adjusted to 1970 levels based on the cost of living index.[2] Costs associated with additional outputs at galley and final page stages were excluded to the extent possible. For example, the

[2] Bureau of Labor Statistics, Bulletin 1660-27, October 1969, supplemented by monthly updates from Bureau of Labor Office, Columbus, Ohio.

additional production costs for the Registry Number Index[3] and the Index Guide[3] are not included once they are split from the integrated processing stream. However, the very small costs for the HAIC[3] segment of the Formula Index, included in Volumes 70 and 71 but not in Volume 65, and any additional cost for printing Registry Numbers as part of the relevant entries in Volume 71 but not Volume 65 and 70 of both the Subject and Formula Indexes, could not be separated from overall cost. To the extent that any of these differences biases the result, the effect is toward a conservative estimate of improvement.

While the number of documents indexed increased over the period of study (Volume 65 - 110,913 documents processed; Volume 70 - 120,933; Volume 71 - 131,383), the change was not of sufficient magnitude to make any fundamental difference in the per-unit processing costs, due solely to volume of material handled.

In Table I, cost data are given which are listed to correspond to the major processing steps involved in the production of these indexes. The three columns represent the evolution of methods outlined above. These costs include direct labor, equipment rental, capital equipment depreciation and all standard overhead costs. The processing steps are listed in "open loop" order as the material would be processed. Recycle costs for correction

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[3] --The Registry Number Index is a new index which provides access to the Subject and Formula Indexes by means of Registry Numbers, which are unique identification numbers assigned to substances by the CAS Chemical Registry System.
--The Index Guide is a compilation of cross-references, index notes and diagrammatic chemical formulas for CAS Subject Indexes.
--The Hetero Atom in Context Index (HAIC) is a listing of molecular formulas ordered on atoms other than carbon and hydrogen and provides an auxiliary entry point to the Formula Index.
--For further information on these indexes, see:
. "Some Programs and Plans of Chemical Abstracts Service", F. A. Tate, Associate Director, Twelfth Chemical Abstracts Service Open Forum, New York, New York, September 7, 1969. Available from the Public Information Department, Chemical Abstracts Service, The Ohio State University, Columbus, Ohio 43210
. "Combined Introductions, Subject, Formula, Ring Systems, HAIC Indexes to Volume 66". American Chemical Society, 1968.

of errors are included in the relevant steps, not separately broken out. Thus, the unit costs are on a net throughput basis.

Discussion

It is clear that, on an overall per-unit processing basis, the cost of index information handling has decreased as the production system has evolved into an integrated system based on computer processing and photocomposition output. However, it may be useful to examine some of the cost changes in individual processing stages and to comment upon some of the changes in the man/machine interface.

Even with the high degree of computer involvement in the system and without including the costs associated with the intellectual analysis required to derive the index entries, personnel costs, professional and clerical, dominate the overall cost. Thus, the major targets for savings are in providing a system environment in which people can be more productive. In the case of this production system, more productivity is achieved in two ways. One is to so divide the work between man and machine that man concentrates on what only he can do and the machine handles the repetitive and algorithmic processes. The other way is to retain and retrieve intellectual work so that once done and verified, it can be reused where needed in future processing. This is the only way to make significant headway in coping with the need for processing increasing volumes of information.

In Data Sheet processing, which is the unit-by-unit input and review of index entries, we note that computer controlled photocomposition causes an increasing cost for Data Sheet composition and output. This is due to the difference between line printer and photocomposer output. However, the overall processing cost at this stage decreases. Some of the factors which influence the trend will be noted later.

At the Galley Processing stage, the manual alphabetizing process has been eliminated and galley composition cost has been drastically reduced. This reduction is mostly due to the elimination of the rekeyboarding step (Varityping) and associated processing. We note that the editing cost has increased. This is due to a continuing transient of becoming accustomed to the new system. The processing of Volumes 72 and 73 will provide more experience on this aspect. Moreover, this editing is a target for further cost savings in that machine system editing aids in the Data Sheet stage will allow us to reduce the professional effort at this stage. The editing effort at this initial use of the new system is, in part, a verification that the machine system can provide the support necessary to enable complete validation of index entries at the Data Sheet stage.

TABLE I
Volume Index Production System
Unit Cost Per Document Processed

	Volume 65	Volume 70	Volume 71
Data Sheet Processing			
Keyboarding	$ 2.07	$ 1.50	$ 1.44
Chemical Registry	6.89	5.00	4.62
Data Sheet composition & output (computer)	.55	.72	.83
Content checking & editing (chemist)	3.36	3.06	2.61
SUBTOTAL	$12.87	$10.28	$ 9.50
Galley Processing			
Alphabetize	$ 1.03	$ .36	eliminated
Galley composition	2.48[1]	1.48[3]	$ .60[2]
Editing	.58	.51	.69
Keyboarding	.83	.21	.58
SUBTOTAL	$ 4.92	$ 2.56	$ 1.87
Final Page Composition (in column form)			
Composition and photo-processing	$ .06	$ .19	$ .16[4]
Editing	.04	.03	eliminated
SUBTOTAL	$ .10	$ .22	$ .16
Editorial support (including control)	$ .61	$ .44	$ .41
GRAND TOTAL	$18.50	$13.50	$11.94

[1] Varityping and photographing
[2] Computer controlled photocomposition
[3] Mixed
[4] Estimated, based on Volume 70 Formula Index experience

The "final page" composition stage is a trivial part of the cost. The output in all three cases is column composition on full sized film which is later assembled into page masters for printing. In the Volume 70 and 71 cases, the Formula Index actually is composed from our magnetic tapes by a printer using Photon equipment rather than prepared through our IBM 2280 photocomposer. The costs for the processing to the final page column form by the contractor are included in the figures in the table. The ability of a printer to do this from the magnetic tapes which we would ordinarily input to our photocomposition process, and had done in previous Volumes, is an indication of the "device independence" of the design, one of the fundamental characteristics sought in the development. We expect that the output from this system will be able to be readily handled through a wide variety of photocomposition equipment.

The man/machine factors which impact on the processing include both advantages and disadvantages. To assist the editorial work, data from several sources, not all of which will be printed in the current index, are brought together at Data Sheet and Galley stages so that index entries can be verified on a unit-by-unit basis rather than to have to depend so much upon context edit at the Galley stage. Previous verifications of compound names in earlier volumes are output along with current data. This substitutes for the context of neighboring entries at the Galley stage. The Registry System provides the unique identity link to relevant data for this purpose. In comparison to Data Sheets produced on a line printer with a limited character set (even though it may be a 120 character chain printer), the full character set, available through photocomposition, aids editing. Expansions and conventions necessary to represent the full character set on a limited output device are unnecessary, and the effort necessary to interpret them is eliminated. As an opposite influence, since more data is presented on the Data Sheet, more data is reviewed for each unit. The overall net effect of these factors is improved cost performance.

As a by-product of this system at a very small added output cost, magnetic tape files of the information processed will become available. At this time, it is not possible to place an accurate value on this output. In time, it will become an important revenue source to support the preparation of the data. At this time, however, these factors cannot be included in a value/cost analysis. Much more experience is needed with machine readable index files to learn how to use them effectively.

Conclusion

In the situation described in this paper, photocomposition coupled with an integrated computer processing system allows significant economies in processing. Better integration between processing stages is now possible as compared to the older Varitype methods which require a rekeyboarding

effort between the Data Sheet and Galley stages. More machine aids can be made available to decrease Data Sheet and Galley review work.

We expect that processing will be speeded up so that indexes can be put out on a more timely basis and it becomes practical to achieve the desired parallel processing of abstracts and index entries derived in a single analysis. We do not yet have enough data to make any accurate estimates. We are just finishing the processing of Volume 71 material and, as always, the initial set of information put through a major new system takes longer to process while we learn to schedule and control the work. However, the initial processing stages for Volume 72 material are being completed more rapidly and Volume 73 material is already beginning to enter the pipeline. We also have noted that serious bottlenecks in processing in past systems have cleared up. Both of these indications give a good prognosis for speeding up processing rates.

As it becomes possible to further expand the scope of total system integration, combining abstracting and indexing in a single analysis step and, where practical, extending the machine handling to link to primary publication processes for input savings, we anticipate further benefits from computer-based information processing using photocomposition for output to human readable form.

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Computer Composition Economics

Harold F. Drury

I was rather taken with John Seybold's Introduction to his paper on Software Interfaces and Systems Aspects. It tells us something about the author and his experience but more importantly sets a stage wherein he as principal actor states he is a layman but as a businessman has become deeply involved in a business enterprise dedicated to computer composition.

So in my introduction, I'd like to tell you who we are and what is our interest in participating in a program such as this.

I head up the Printing and Publishing Division in the Bureau of Domestic Commerce in the Department of Commerce. Specifically, we represent in the Federal Government the 15 printing and publishing industries and are concerned with their health, their printed products and their manpower. Secretary Stans puts our mission this way: "Promoting progressive business policies and growth."

We enjoy a unique position in government and, at the hub of economic activity, we observe many things. Some of these need emphasizing repeatedly so we can properly evaluate the impact of new technologies and its relation to health, profitability and growth of our industries.

Initially, let's treat these 15 industries as a major group which in effect they are, printing and publishing -- newspapers, periodicals, books, book printing, miscellaneous publishing, commercial printing, engraving and plate printing, business forms, greeting card manufacturers, bookbinding loose leaf and blank book manufacturers, photo engraving, electro-stereotyping and typesetting.

In annual shipments, we approach 25 billion dollars; if you rate us with the 20 major manufacturing groups in the U.S., we're 10th in value of shipments, 8th in value added by manufacture and 7th in value of payroll. We're a big important segment of GNP, with a number of our industries growing faster than GNP. Over one million people are employed in printing and publishing.

Now what are the characteristics of these industries? Long established, some going back to the founding of this country, stable in growth and in employment, directly tied to GNP or growth of the Nation. All characteristics that make predictions easy. No two are alike either in composition, product produced, or sources of income. Newspaper publishers get 71 per cent of their income from advertising, magazines 66 per cent, book publisher zero. So two of our three publishing activities are advertising oriented, while a third uses advertising to sell his product, books. Four of our industries render valuable services to printers:

bookbinders, typesetters, photoengravers and electro-stereotypers. Three of our industries specialize in unique products, business forms, greeting cards and looseleaf and blankbooks and our big commercial printing industry, big to the tune of almost eight billion dollars in 1970, produces a wealth of printed products for everybody.

When I entered the printing business in 1937, the index of union hourly wage scale for all workers in the printing trades stood at 37.0; for book and job printing, 36.8; for newspapers, 37.6. By 1950 this had become 75.1 for all, 74.7 for book and job, 76.3 for newspapers. By 1960, 106.3 and 1967, 131.9, 133.1 and 129.9. So in my business lifetime, I have seen wages in our industry increase over three and one-half times in a period of thirty years.

If we look at the wholesale price index for 1935 to 1967, a thirty-two year span, this index rose from 43.8 to 106.1, an increase of about two and one-half times. If we place this within the context of a group of intensely competitive industries, facing a continual skilled labor shortage, we see why the printing industries are involved in a technological revolution or evolution and why we are interested in computerized photo typesetting.

Some other observations. Offset printing became the dominant printing process about 1967 with web today probably accounting for one-third of this total; this did not just happen. It was forced upon the printer as the most economical method to produce a printed product.

We had two offset printed dailies in 1961 and 580 or about one-third of all dailies printed by offset by 1970. By 1978 ANPA predicts 1376 by offset, 184 by letterpress. Weekly plants printing by offset went from 500 in 1962 to 5069 in 1970. Again, this was not just a happening or an accident. Newspaper publishers in their scramble to remain competitive with other advertising media have had to battle rising costs in the back shop operation just as has the commercial printer. It almost goes without saying that most web offset newspapers are set by photo composition. The marriage of photo typesetting and offset printing has been a good one and will continue to be so.

Let us now look at specific industries that are large consumers of type. The newspaper, magazine and book publishing industries, publishers of catalogs and directories and commercial printers producing direct mail or advertising printing. In each area we have seen continual growth in the '60s and would expect certainly for the early '70s a similar growth.

Specifically, what is happening within these industries?

Newspapers - for 1970 ad linage down slightly but dollar revenue up over last year. Intense competition with radio, black and white TV, color TV, direct mail for the ad dollar.

Now with CATV and EVR, what next? Worse than that, with the growing introduction of the four-day week, growing use of second homes or vacation homes, the newsboy is disappearing, making distribution of newspapers increasingly difficult. Traffic congestion in the large cities make the evening newspaper a late morning. Facsimile in the home, fascimile between publishing office and satellite plants are in the future.

Fortunately, the newspaper industry is innovative, aggressive and adaptable. A publisher doesn't become enamored of a particular printing process as many commercial printers are.

Magazines - increasingly devoted to special interests. Standard Rate and Data Service list 61 major classifications of consumer and farm publications. 93 magazines offer geographic and/or demographic editions.

In the business press, about 130 major classifications with about 3500 magazines listed.

More magazines printed by offset. In the period 1963 to 1967, the Census of Manufactures placed dollar volume by offset at over double for the earlier year with a decline of about 11% for letterpress for the same period.

Needless to say, with offset goes photo typesetting.

Certainly the magazine publisher who gets two-thirds of his revenue from advertising is watching very closely the same developments the newspaper publisher watches - CATV, EVR. Facsimile in the home, in business. Certain general purpose magazines like Life and Look are being scrutanized. Are the public's tastes changing?

For the commercial printer, increased use of computerized typesetting, automatic fiber processors, automatic plate developers, mechanized or electronic stripping, electronic controlled presses, automated binding equipment, computer controlled handling and mailing. Publishers of catalogs and directories saw a 40% increase in product shipment for 1963 to 1967.

In short, a revolution for the '70s. Beyond the next ten years, a whole new ball game.

But, as I said in the beginning, we are here to learn, to observe, and to help our industries to become aware of the future. And we would agree with Art Gardner when he says "the future isn't what it used to be."

Knowledge--of Machines and Men

Frank Cremonesi

The great, all-pervasive fact of our time is burgeoning knowledge. All that man has ever learned now doubles in less than a decade. This fact affects every phase of our lives: our businesses, our personal affairs, and our education in the broad and narrow sense. The casualty rate of information today is greater than at any time. A process hailed as revolutionary in 1960 is obsolete in 1970.

In the composing room the fact of rapid change is no less true than in any industry. The year 1947 saw the coming of Harris-Intertype's Fotosetter, setting type using light and film negatives in place of lead and brass matrices. The Fotosetter, a converted Linotype, retained the circulating-mat principal of Mergenthaler's linecaster.

Within ten years the Fotosetter was made obsolete first by Photon, then by Linofilm. Photon was first to discard multiple mats for a disc containing 16 faces of type that could be enlarged to 12 different sizes - from 6 to 72 point.

The Mergenthaler Linotype Company followed closely with Linofilm, capable of setting phototype in 18 different type faces, each face set in six different sizes. But Linofilm represented a major breakthrough in that it harnessed the 20th Century science of electronics to typesetting. Thus, the printer became a relative of the radio and television technician, illustrating the pervasive quality of modern knowledge.

In 1963 the formerly staid and unchanging composing room was again subjected to a major invasion. The computer was introduced to perform some of the basic work of typesetting which had been "black-book" secrets of the compositor for 500 years. Today, seven years later (December, 1970), the impact of computer is greater in its promise than in its performance. Computer functions are still limited for the most part to the hyphenation and justification of type, and to the occasional gushing out of stored codes. While justification and hyphenation represented basic compositor skills, assigning these tasks to the computer may best symbolize the promise of computer. For reduced to elementary computer calculation functions, hyphenation and justification represent the simplest possible work the computer can perform. At present the potential of computer in the composing room can be likened to a new land only just being explored.

In 1967 the final composing room development was achieved with the coming of the Cathode Ray Tube (CRT) typesetter. The CRT eliminates entirely the negative mat of alphabetic characters, relying completely on electronics to generate characters, to set type, and to make up type into pages or forms.

The almost complete lack of correlation between teacher proficiency and class mean achievement scores--surprising the investigators who did the analysis four times, carefully checking the computer input--necessitated further refinement. Those few singificant correlations which occur in Tables 54 and 55 can themselves possibly be attributed to chance.

To investigate the possibility of non-linear relationships, both German and French teachers were broken into three groups based upon the sum of their Listening, Speaking, Reading and Writing Proficiency Tests. These groups were (1) the ten most proficient teachers, (2) the ten least proficient teachers and (3) the balance or middle group (French N=35, German N=17).

The correlation program was re-run separately for these three groups. Data is shown in Tables 56 through 60. Again, no significant relationships were found in great numbers. The reader's attention should be drawn (1) to Table 56 where classes taught by the least proficient French teachers often scored higher--sometimes markedly--on achievement tests; (2) to the lack of significant intercorrelations on the Proficiency Test sub-tests on Table 57 among both high and low French groups (in contrast with the highly significant intercorrelations for the whole population illustrated in Table 111, Appendix G) and (3) on Table 58 to the negative relationship between the low French teacher group's Reading score and class achievement in Listening Discrimination, two reading tests and the Speaking Test.

GAIN SCORES

Two achievement measures were administered to all experimental students in September and May. While students were frustrated during the pre-experimental testing, this did permit the computation of class mean gain after one year of modern foreign language instruction. Data on class gains and the relationship to the teachers scores on the MLA Teacher Proficiency Test are shown in Table 61.

Of interest is the low average gain achieved over a one-year period on the Listening Test in experimental populations in which approximately eighty percent of the students are in Functional Skills approaches to language learning (FSM and FSG).

TABLE 56

MEAN SCORES OF FRENCH TEACHER GROUPS AND THEIR CLASSES

	Most Proficient Teachers (N 10)		Middle Group (N 20)		Least Proficient Teachers (N 10)	
Tchrs' scores	Mean	S.D.	Mean	S.D.	Mean	S.D.
1. MLA Listen	51.1	3.45	38.6	5.09	31.4	3.45
2. MLA Speak	81.7	4.73	73.6	7.24	57.7	6.86
3. MLA Read	59.1	3.70	45.6	6.58	35.7	3.57
4. MLA Write	59.9	3.48	45.2	5.71	35.4	6.26
5. MLA Ling.	55.4	5.43	47.8	6.02	41.4	4.82
6. MLA Cult.	58.8	4.67	50.1	5.52	39.8	6.86
7. MLA Prof.Pr.	70.5	4.68	64.6	6.16	55.0	8.01
Class Means, Post-Experiment Tests						
8. LB Lsn.(mid)	12.33	1.3	12.51	1.68	12.64	3.05
9. LB Read(mid)	13.75	.82	13.88	1.05	13.86	2.22
10. List. Dis.	42.75	3.39	45.35	3.63	41.49	5.92
11. LA Listen	14.24	1.47	14.93	3.28	13.61	3.14
12. LA Read	14.96	1.24	15.24	3.59	16.91	3.06
13. Cooperative	35.02	6.90	39.21	10.08	47.90	11.11
14. LA Speak[1]	24.24	11.03	26.36	10.18	29.29	14.68
15. LA Write[1]	14.78	8.30	19.65	12.71	26.47	16.81

[1] 10% random sample

TABLE 57

INTERCORRELATIONS ON TEACHER PROFICIENCY TESTS

FRENCH, Most Proficient Group, N=10

	Speak	Read	Write	Ling.	Cult.	Prof.Prep.
1. Listen	-.205	-.662*	-.139	-.580	-.576	.331
2. Speak		-.089	-.034	.464	-.134	-.121
3. Read			.596	.231	.377	-.527
4. Write				.219	-.053	.184
5. Ling.					.513	-.076
6. Cult.						.280

FRENCH, Least Proficient Group, N=10

	Speak	Read	Write	Ling.	Cult.	Prof.Prep.
1. Listen	.273	.307	-.087	.596	.648*	.523
2. Speak		-.163	.349	.543	.649*	.651*
3. Read			-.045	.145	-.252	.256
4. Write				.434	-.055	.058
5. Ling.					.551	.755*
6. Cult.						.598

*r = .632 p. < .05.

TABLE 58

CORRELATIONS BETWEEN FRENCH TEACHERS' PROFICIENCY TEST SCORES AND THE MEAN ACHIEVEMENT OF THEIR CLASSES

High Group N-10; Middle Group N-32; Low Group N-10

Tchr. Prof. Test		LB List	LB Read	List Dis.	LA List	LA Read	Coop.	LA Speak	LA Write
	H	-.186	-.092	-.280	-.422	.067	.057	-.056	.122
1. Listen	L	.311	.345	.052	.339	.336	.360	.136	.231
	M	.063	-.221	-.144	.303	.020	-.164	.023	-.038
	H	-.471	-.089	.133	-.649*	-.501	.019	-.083	-.340
2. Speak	L	.119	.108	.494	.224	.184	.070	.235	-.213
	M	.204	-.002	.080	.325	.122	.107	.213	.190
	H	.379	.269	-.024	.426	.426	.140	.172	.173
3. Read	L	-.516	-.645*	-.785**	.508	-.683*	-.612	-.680*	-.512
	M	.103	-.023	-.113	.272	.235	.279	.082	.090
	H	.054	-.012	-.211	.034	.458	.073	-.007	.121
4. Write	L	.102	.009	.042	-.001	-.298	-.333	.075	.029
	M	.164	.082	-.042	.372*	.150	.106	.181	.157
	H	-.152	-.183	-.147	-.296	-.043	.311	-.169	.118
5. Ling.	L	.428	.305	.251	.489	.189	.180	.217	-.041
	M	.165	.112	.221	.470**	.247	.106	-.080	.151
	H	.358	.100	.115	.354	.345	.126	.556	.599
6. Cult.	L	.294	.389	.429	.435	.610	.606	.222	.170
	M	.008	.100	.233	.273	.119	-.045	-.173	-.043
	H	-.333	-.388	.283	.038	.030	.082	-.155	-.261
7. Prep.	L	.149	.073	.119	.215	.117	.029	-.059	-.366
	M	.276	.292	.198	.336	.148	.055	.021	-.057

H,L: at 8 df, $r > .632$ p. $< .05$, $r = .765$ p. $< .01$.

Mid: at 30 df, $r > .349$ p. $< .05$, $r = .449$ p. $< .01$.

TABLE 59

MEAN SCORES OF GERMAN TEACHER GROUPS AND THEIR CLASSES

	Most Proficient Teachers (N 10)		Middle Group (N 17)		Least Proficient Teachers (N 10)	
Tchrs' scores	Mean	S.D.	Mean	S.D.	Mean	S.D.
1. MLA Listen	49.4	4.33	40.6	5.68	31.5	2.52
2. MLA Speak	105.3	8.28	86.0	7.86	72.3	8.29
3. MLA Read	64.8	12.36	50.0	4.96	37.3	6.10
4. MLA Write	62.3	21.93	56.0	6.58	38.2	6.11
5. MLA Ling.	52.7	19.68	51.6	6.77	45.3	7.75
6. MLA Cult.	52.0	18.87	53.6	7.15	45.4	4.73
7. MLA Prof.Pr.	58.6	21.07	63.7	7.13	58.1	5.41
Class Means, Post-Experiment tests						
8. LB Lsn.(mid)	12.09	1.19	12.45	1.40	12.70	1.76
9. LB Read(mid)	12.77	1.15	13.74	1.09	13.43	.99
10. List. Dis.	41.81	2.40	40.55	3.43	39.94	4.40
11. LA Listen	15.69	2.61	15.66	2.59	14.73	2.72
12. LA Read	14.02	5.41	15.01	1.70	14.72	1.94
13. Cooperative	46.31	13.67	45.08	10.35	46.39	9.89
14. LA Speak[1]	27.20	10.50	21.76	12.29	22.74	5.50
15. LA Write[1]	28.95	13.14	26.92	18.55	27.41	13.58

[1]10% random sample

TABLE 60

CORRELATIONS BETWEEN GERMAN TEACHERS' PROFICIENCY TEST SCORES AND THE MEAN ACHIEVEMENT OF THEIR CLASSES

High Group N-10; Middle Group N-17; Low Group N-10

Tchr. Prof. Test		LB List	LB Read	List Dis	LA List	LA Read	Coop.	LA Speak	LA Write
	H	.352	-.402	.338	.349	.228	-.068	.163	-.038
1. Listen	L	-.107	.097	.329	-.016	.019	-.109	-.042	-.261
	M	-.119	-.094	-.057	-.058	.056	-.211	-.363	-.311
	H	.303	-.138	-.323	.306	-.028	-.016	-.059	-.039
2. Speak	L	.474	.355	.532	.119	.392	-.077	-.014	.175
	M	-.058	-.021	-.147	.095	-.113	-.130	-.241	.167
	H	-.160	-.146	-.495	.059	.150	-.073	.245	.437
3. Read	L	.285	.226	-.271	-.035	.035	-.185	-.516	-.367
	M	-.096	.327	-.042	.049	.301	.182	.267	.196
	H	.358	-.028	.590	-.021	.116	.019	-.060	-.289
4. Write	L	.537	.587	-.110	.674*	.075	-.027	-.214	.114
	M	.069	.144	-.212	-.124	.162	.079	-.036	-.072
	H	.313	-.035	.477	.029	.195	.004	.079	-.184
5. Cult.	L	.519	.510	-.270	.387	-.202	-.316	-.232	-.348
	M	.362	.223	-.249	-.394	-.261	-.247	-.471	-.532*
	H	.162	-.091	.538	-.080	.117	-.071	.028	-.258
6. Ling.	L	.292	.232	-.504	.062	-.204	-.419	-.807**	-.334
	M	.252	.303	.190	.032	.092	.187	-.050	-.008
	H	.177	-.003	.579	-.081	.005	-.022	-.094	-.351
7. Prep.	L	.594	.303	-.180	.452	.041	-.144	-.010	-.081
	M	.090	-.040	.236	-.038	-.248	.129	-.232	.139

H,L: for 8 df, $r > .632$ $p. < .05$, $r = .765$ $p. < .01$.

Mid: for 15 df, $r > .482$ $p. < .05$, $r = .606$ $p. < .01$.

TABLE 61

CORRELATION OF TEACHER PROFICIENCY AND CLASS GAIN

Gain Score by class	LA Listening		Cooperative		Correlation
	Mean	S.D.	Mean	S.D.	
1. French, N=59	5.07	3.36	16.31	8.86	.468**
2. German, N=42	4.49	2.82	18.48	11.63	.646**

MLA Teacher Proficiency Tests

	Listen	Speak	Read	Write	Ling.	Cult.	Prof.Prep.
	Correlation Coefficients						
French:							
LA Lsn.	.130	.189	.187	.217	.267	.251	.234
Coop.	.164	-.035	-.003	-.130	-.017	.102	.129
German:							
LA Lsn.	-.041	.013	.130	.110	-.055	-.164	-.180
Coop.	-.002	.060	.120	.051	-.036	-.092	-.001

at 50 df, r = .273 p.$<$.05, r = .354 p.$<$.01.

at 40 df, r = .304 p.$<$.05, r = .393 p.$<$.01.

In summary, a comparison was made between the MLA Teacher Proficiency Test scores in all seven areas of eighty-nine French and German teachers and the mean of scores and mean class gain achieved by the students in their classes on two mid-year and six end-of-year achievement tests. No significant relationship was found to exist.

STUDENT PERFORMANCE AND THE SEX OF THE TEACHER

An examination was made of student performance by sex on the final French and German LA Listening, LA Reading and Cooperative Tests. This performance was matched with the sex of the teacher. The following results were obtained when comparing the achievement of students of the same sex to the sex of the teacher.

TABLE 62

STUDENT PERFORMANCE AND SEX OF TEACHER

Boys

	LA Listening		LA Reading		Cooperative	
French	Mean	S.D.	Mean	S.D.	Mean	S.D.
Men Teachers	13.41	4.92	15.08	5.05	37.27	12.61
Women Teachers	14.06	6.11	14.87	4.74	37.76	14.76
German						
Men Teachers	14.60	4.97	14.42	4.37	43.33	13.90
Women Teachers	15.55	5.20 $p.<.05$	14.77	4.37	45.88	16.04 $p.<.05$

Girls

French						
Men Teachers	15.17	5.64	16.41	5.33	42.07	15.67
Women Teachers	15.07	5.55	16.49	4.87	43.23	15.49
German						
Men Teachers	15.98	5.56	15.98	7.37	48.96	15.75
Women Teachers	16.96	5.79	15.99	4.34	48.84	14.40

Using levels of significance for two-tailed tests, there were no significant differences in achievement on LA Listening, LA Reading and Cooperative final tests among boys taught French by men and boys taught French by women. The same measures administered to girls also yielded no significant differences in performance of girls taught French by men when compared to girls taught French by women.

When comparing German students, boys taught by women performed significantly higher on LA Listening and Cooperative final tests than boys taught by men. No significant difference was found in LA Reading achievement among the two groups. A comparison of performance on the three measures of girls taught German by men to girls taught German by women yielded no significant differences.

In summary, among French and German students, girls performed significantly higher than boys even when sex of student was matched to sex of teacher. When boys were matched with men and women teachers, significance appeared only in German LA Listening and Cooperative final tests favoring the group taught by women. No significant difference in performance was found among girls studying either French or German when matched with the sex of the teacher.

SECTION IV: DISCUSSION

Educational research is a "two-edged sword." Small scale, tightly controlled research is open to the criticism that it may not be transferable or sufficiently generalizable. On the other hand, any attempt to establish careful research in a "real life" situation presents problems of maintaining close and rigorous controls. The research detailed in this report is of the second type. The authors feel that it represents an attempt to replicate previous studies in a broader context with as careful controls as could reasonably and realistically be applied without seriously distorting the reality of the school environment. In the transfer of this research in foreign language methodology to the context of many varied schools, something happens to prevent the duplication of results of other studies.

A number of facets of the study, both in its conduct and in its findings, deserve some amplification or comment. Among these are (1) the role of language, (2) the role of sex, (3) the administration of language laboratories in the experimental schools as well as (4) the impact of the Project upon those involved in it.

THE ROLE OF LANGUAGE

Early in the course of the experiment it became clear that there existed differences in the two student populations, French and German. In earlier portions of this report it was pointed out that there was no initial difference in "foreign language aptitude" as measured by the Modern Language Aptitude Test. There was a slight initial difference in intelligence in favor of German students (F=113, G=115.1).

It has been widely observed for many years that more females elect to study French while males elect German. This was true in the experimental population where at the beginning of the study, initial measures were obtained on 2,634 students. These were divided by sex:

French (1,525 students)	Male	44.4%
	Female	55.6%
German (1,109 students)	Male	61.8%
	Female	38.2%

Of interest is that overall, more males were included in the initial Project population sample, 51.7% male as opposed to 48.3% female.

Throughout the analyses of the experimental data, a much higher incidence of reaching statistical levels of probability was found among the French population. For example, of one hundred and sixty-nine contrasts reported on tables related to Section III, Part 1, LANGUAGE LABORATORIES AND TEACHING STRATEGIES, French classes reached significant levels of probability on fifty-nine but German classes on only thirty-five. If the hypothesis is posited that French and German classes should have reached levels of significance at an equal level, a simple Chi-Square can be computed to test the variation between the two languages. At one degree of freedom, Chi-Square equals 6.12, significant beyond the .02 level but not reaching .01. This significant difference in the number of significant results between French and German classes clearly holds implication for the generalization of research results and the transfer of conclusions across languages.

THE ROLE OF SEX

Throughout the study sex seems to have played a major role. Highly significant differences between male and female students occurred on the pre-experimental Student Opinion Scale and throughout the remainder of the study on almost all measures.

While many published reports and studies have recognized differences in achievement between males and females, few have permitted this difference to influence the establishment of separate norms for males and f males. For example, published standardization data for a number of measures such as the Pimsleur Language Aptitude Battery and the Modern Language Aptitude Test report consistently higher scores for females. A number of recent studies have tended to minimize differences in achievement by sex. For example, in a recently reported study, Carroll (1967, p. 139) comments:

> ...that there are no significant differences in foreign language listening test scores between the males and females in our samples. This tends to discredit the popular idea that women are better language learners...

The known high intercorrelations between language skills may permit investigation of only one skill, however, it would have been interesting if this important and significant study on the proficiency of college seniors had reported if differences existed between females and males on skills other than listening comprehension.

In the body of this report, the least incidence of significant differences by sex occurred on the listening tests. Tables 34 through 38 indicate highly significant differences in achievement by sex. In the detailed tables reporting the multivariate analyses of the effect of teaching strategies and

language laboratory systems (Section III, Part 1 and Appendix D) sex differences are reported on a great many measures and contrasts. This data would tend to credit the supposition that females are better language learners at the secondary school level.

While much has been said of the successful instructional programs in foreign languages found in European schools in regard to longer sequences of study, scant mention is made of the influence that separation of sexes may play in such a situation.

ADMINISTRATION OF LANGUAGE LABORATORY EQUIPMENT

The combined total of Project classes using language laboratories was seventy-two. Of thirty-four language labs examined, twenty were used by the audio-active groups and fourteen by the audio-active-record groups.

Dates of laboratory installment varied, with the majority placed into schools in the period 1960-62. The dates of installation of fourteen laboratories was not known by the participating teachers.

Year of Installation	Number
1959	1
1960	6
1961	6
1962	5
1963	---
1964	1
1965	1
Unknown	14

Since the research was an attempt to assess the effectiveness of the language laboratory as it really exists in schools in the field, no funds or personnel were allocated for special maintenance of the laboratory systems. The upkeep and repair of the laboratory had to be within the framework of the existing school system although Field Consultants did provide advice and stress urgency to school administrators from time to time. The experiment, however, was a reflection of what actually happens rather than the idealized situation.

Of the thirty-four language laboratories, twenty-six had no maintenance contract with the installer. Field Observer's comments indicated inoperative conditions were most frequently due to headset, wiring, and recording malfunctions. Repair or replacement of this equipment ranged from one to four weeks. In several instances there was continuous malfunction of equipment. In one case where recording facilities failed early in the experiment but the audio-active portion remained operative, the class strategy was reassigned.

It cannot be supposed with accuracy that the breakdown of equipment was totally due to the lack of teacher familiarity with the equipment. Twenty-eight laboratory facilities provided initial training for teachers in the operation of equipment. However, in twenty-six cases there was no follow-up or additional training provided.

Seventeen laboratories provided no qualified laboratory technicians to maintain the equipment. Personnel in charge of language laboratory maintenance varied. Five were foreign language Department Heads, three were custodians, two were Audio-Visual Directors, two were student assistants, two also were Electric Shop teachers, and one each were the Principal and the school electrician. Twenty-nine labs of the thirty-four were not serviced periodically. A repairman was called when a malfunction occurred.

THE IMPACT OF THE PROJECT

It is the opinion of the investigators that extensive involvement of teachers and school administrators had an effect on the foreign language program of the school. Classroom teachers, department heads, supervisors and curriculum specialists were made aware of existing and projected research. Teachers met and learned from prominent foreign language educators. The four teachers' conferences provided a great deal of mutual interchange of ideas and views.

On the more concrete side, schools were required to move from twenty-eight different texts to seven basic series. All schools purchased tape programs to accompany the text when required. For the first time teachers became aware of new prognostic and achievement tests which led to their use in non-Project classes. The fact that every classroom teacher involved in the Project was expected to have and use a classroom tape recorder daily influenced other classes and other teachers.

Prior to participation in the Project, many schools only scheduled foreign language classes to use the language laboratory one day each week. The insistance of the Project on two periods per week as a minimal program for experimental classes necessitated the readjustment of the entire laboratory schedule. This resulted in a subsequent increase in participation for other classes in the school.

Overall, there was an increase in professional awareness and commitment on the part of the teachers involved with an attendant appreciation for both the problems and potential of educational research.

SECTION V: CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS

The following conclusions and recommendations do not often coincide with a number of smaller-scale, similar experiments cited in the earlier review of the research or more recently reported to the profession.

CONCLUSIONS

Objective 1. Comparative effectiveness of the three teaching strategies:

A. At the end of one year of instruction in French and German, "Traditional" classes significantly exceeded "Functional Skills" and "Functional-Skills+Grammar" classes on the 1939 and 1941 Cooperative French/German Test.

B. "Traditional" classes did significantly better than both functional skills strategies on the final MLA Cooperative Classroom Reading Test and as well as the other approaches on the Listening Test.

C. "Functional-Skills+Grammar" classes achieved significantly better than "Functional Skills" classes in two different measures of reading and a vocabulary test but only as well as FSM classes on other measures, including the "Grammar" section of the Cooperative French/German Tests.

D. In a ten-percent sample of the experimental population (French N 205, German N 138) the "Traditional" classes did significantly better than "Functional Skills" classes on the MLA Cooperative Classroom Writing Test.

E. In the same sample, "Traditional" classes did as well as "Functional Skills" classes on the MLA Cooperative Classroom Speaking Tests.

Objective 2. Comparative effectiveness of the three language laboratory systems:

A. The language laboratory systems employed had no measureable effect on achievement on tests of listening, reading, vocabulary or grammar after one year of French or German instruction.

B. In a random ten-percent sample of each class not employing a language laboratory but equipped with classroom tape recorders, "Traditional" classes did better than "Functional Skills" classes on the MLA Cooperative Classroom Speaking Test.

C. Laboratory type had no effect on Speaking Test scores.

Objective 3. Determine optimum strategy-system combination:

--None was detected in the experimental population.

Objective 4. To determine the best predictors of foreign language achievement:

A. There were significant relationships between intelligence, aptitude, attitude and student marks in other subjects and foreign language achievement.

B. The most significant combination of predictors were the Modern Language Aptitude Test, a foreign language Listening Test and the Language I.Q. for both languages in grades nine through eleven.

Objective 5. To determine the relationship among the four skills: listening, speaking, reading, writing.

--All skills were highly interrelated and also correlated significantly with listening discrimination and expressions of student attitude and interest.

Objective 6. To determine whether strategy and system relate to student ability:

A. Students achieved most in the "Traditional" strategy despite individual differences in ability.

B. Student achievement reflected ability rather than strategy.

C. Females had a significantly higher foreign language aptitude than males.

Objective 7: To identify and compare student attitude toward language learning.

A. Student expectations and orientation were still overwhelmingly traditional. Two-thirds of all students studied a foreign language for college entrance requirements. Ninety percent of a random sample (N 300) had an initial "traditional" expectation for their foreign language study.

B. Students anticipated liking foreign language study and became less favorably inclined as the school year progressed. The rate of decline was the same during the first year regardless of the language studied or the strategy employed.

C. Females had a more favorable attitude throughout a year of foreign language instruction than males. Males studying German had a somewhat better attitude toward foreign language study than males studying French.

D. Initial attitude was not related to later achievement.

Objective 8. To determine levels of functional mastery:

A. Many students achieved meaningful scores on pre-instructional foreign language tests. This implies no "zero" starting point and makes suspect research based solely on final testing.

B. Authors and publishers of "Functional Skills" materials imply too high an expectation of progress through their programs.

Other Conclusions:

A. Females achieved better in foreign languages than males; on almost all measures, in all strategies, and in all grades included in the experimental population.

B. Project teachers were well prepared by current standards, averaging ten years of teaching experience and forty-five semester hours of graduate education.

C. Assessment of teacher proficiency by competent observers correlated highly with teacher scores on the MLA Proficiency Test for Teachers and Advanced Students. They did not correlate with teacher self-ratings.

D. Sex of the teacher had little effect on student achievement.

E. There was no significant relationship between scores of eighty-nine French and German teachers on all seven parts of the Teacher Proficiency Tests and the achievement scores, both gross and gain, of their classes in foreign language skills.

RECOMMENDATIONS

In the light of the conclusions that must be drawn from the data, the reporters of the research make the following recommendations to the profession:

1. Since the results do not replicate other smaller-scale studies. . .

A. There should be established a center for the continuing long-term study of modern foreign language instruction within the milieu of the "real school" environment, especially concerning itself with the transfer and replication of localized experiments into large scale, curriculum-changing research;

B. That this experiment be immediately replicated; (already undertaken as part of Project 7-0133);

C. That a similar but more precise experiment be undertaken involving the teaching of Spanish;

D. That future research include more precise definitions of "traditional teacher" and "audio-lingual teacher" based not only upon texts employed and stated objectives but on detailed physical and verbal interaction analyses.

E. That experiments be undertaken to determine if co-educatipnal classes inhibit second language learning by females.

2. Experimental research design in foreign languages should always include extensive pre-testing, including skills tests, to permit more meaningful statistical analyses.

3. Since teacher scores on the MLA Teacher Proficiency Tests had little to do with the class achievement. . .

A. That research be undertaken to adequately determine the relationship between various levels of teacher proficiency and student achievement.

B. That the MLA Teacher Proficiency Tests not be used as a major factor in the certification of teachers until more research is accomplished.

4. Teachers should not attempt to "enrich" functional skills classes with grammatical explanations and generalizations in Level I.

5. A foreign language Listening Comprehension test should be made an integral part of foreign language aptitude tests.

6. A more careful and sound policy of language laboratory administration and maintenance be immediately initiated by responsible school authorities.

7. Separate norms should be reported for males and females on standardized modern foreign language achievement tests.

8. That secondary schools should provide a classroom tape recorder for each foreign language teacher for daily use before equipping special electronic classrooms.

9. That language laboratories be equipped with student recording facilities for testing purposes and individualized study rather than for frequent recording of regular drill sessions.

10. That detailed studies be undertaken of the role of motivation in foreign language learning by secondary school students with emphasis on identifying possible points of departure for behaviorally oriented research.

11. That the foreign language education profession become more directly aware of the implications of research on the individual classroom at all levels.

In conclusion, the study of the relative effectiveness of various teaching strategies and language laboratory systems seems to point out that curriuclum inovations in foreign languages have been widespread but that this impact may have been more superficial than the profession had hoped. Certainly, more study is needed to advance knowledge of the second language learning process in the realistic setting of the public school.

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APPENDIX A

EXPERIMENTAL CLASSES AND SCHOOLS

FIRST YEAR TEACHERS, FRENCH - 1965-66

Teacher	School	School District
Yoder, John A.	L. E. Dieruff	Allentown City
Kemmler, June	Whitehall Jr.	Baldwin-Whitehall
Bertoline, Veronica F.	Bethel Park	Bethel Park
O'Leary, H. Ola*	Nitschmann Jr.	Bethlehem Area
Maxwell, Evan A.	Boyertown Area	Boyertown Area
Taglianetti, Marie C.	Central Bucks Sr.	Central Bucks
Dickey, Kathleen	Wm. Tennent	Centennial Joint
Strange, Marian*	Churchill Area	Churchill Area
Searles, Milton J.	S. H. Scott Sr.	Coatesville Area
Cravens, Gertrude*	Columbia Borough	Columbia Borough
Fetterman, Marguerite*	Cumberland Valley	Cumberland Valley
Gromling, Roberta	Cumberland Valley	Cumberland Valley
Walker, Charles	Darby Township	Darby Township
Kunz, Sandra*	Easton Jr.	Easton Area Joint
Schneck, Dale A.	Easton Area	Easton Area Joint
Schaadt, Woodrow K.	Emmaus	East Penn Union
Blessing, Joanne*	East Pennsboro	East Pennsboro Area
Maguire, John	Eddystone	Eddystone Borough
Young, Karen	Elizabeth-Forward	Elizabeth-Forward
Kruczek, Walter L.	Fox Chapel	Fox Chapel Area
Yauger, Virginia*	German Twp. Jr. Sr.	German Township
Kiss, Lucile*	Hampton Twp. Jr. Sr.	Hampton Township
Esbenshade, Dorothy K.	Wm. Penn	Harrisburg
Timmins, Marie A.*	John Harris	Harrisburg
Foster, Bernice	Hatboro-Horsham Sr.	Hatboro-Horsham
Grant, Joanne*	Haverford	Haverford
Roseman, Rita	Hellertown-Lwr. Scn.	Hellertown-Lwr. Scn.
Regester, Robert L.	Interboro	Interboro
Lepore, Joseph D.	Kingston	Kingston Borough
Snyder, Kenneth H.	Lampeter-Strasburg	Lampeter-Strasburg
Hauser, Carol A.	Methacton Jr. Sr.	Lower Providence-Wor.
Seminara, Anthony	Media	Media Borough
Yancy, Mary	Middletown Area	Middletown Area
McCartney, Judy Lee	Mt. Lebanon	Mt. Lebanon
Edsall, Geraldine*	Mt. Penn-Lwr. Alsace	Mt. Penn-Lwr. Alsace
Mesko, Joan	Nazareth Area Sr.	Nazareth Area
Myers, Blanche*	New Cumberland Jt.	New Cumberland Jt.
McKendrick, Helen*	Rittenhouse Jr.	Norristown Borough
Kline, Eleanor	No. Allegheny Sr.	No. Allegheny
Louthan, Mary Louise*	North Hills Joint	North Hills Joint
McMichael, Margaret*	Great Valley Sr.	Paoli Area
Bedford, Dorothy	Pen Argyl Area	Pen Argyl Area
Barnett, Edith*	Central	Philadelphia
Clinchard, Johanna*	Lincoln	Philadelphia
Cunningham, Kathryn*	Bartram	Philadelphia
Forowa, Natalie	Olney	Philadelphia
Torres, Raul	Washington	Philadelphia
Waldbaum, Minerva*	High School for Girls	Philadelphia

Price, Jean	Peabody	Pittsburgh
Ries, Alice*	Taylor Allderdice	Pittsburgh
Pettigrew, Mildred*	Pottstown No. Jr.	Pottstown Borough
Smoker, Richard	Central Jr.	Pottstown Borough
Hain, Dr. Charles	Southwest Jr.	Reading
Bell, Doris*	Ridley Park	Ridley Park
Peregrim, Michael	Central	Scranton
Bruno, Robert P.	Snowden Twp. Jr. Sr.	Snowden Township
Amicone, Yolanda	Stowe Jr. Sr.	Sto-Rox
Wray, Miriam*	Beverly Hills Jr.	Upper Darby Twp.
Kaczorowski, Daniel J.	W. Allegheny Sr.	West Allegheny Jt.
Marks, Thelma*	Cedar Cliff	West Shore Joint
Fisher, Nancy*	Wilson Joint	Wilson Joint

* Mrs.

FIRST YEAR TEACHERS, GERMAN - 1965-66

Teacher	School	School District
Kruger, David B.	Annville-Cleona	Annville-Cleona
Kern, Sam	Baldwin Sr.	Baldwin-Whitehall
Doebel, Marilyn L.	Bethel Park	Bethel Park
Stutzman, Herman	Blue Mountain	Blue Mountain
Lysinger, Wilhelmine*	Boyertown Area	Boyertown Area
Barnard, Eleanor Jasch*	Wm. Tennent	Centennial Joint
Oettel, Mary E.	Wm. Tennent	Centennial Joint
Voltz, Hedwig M.*	Central Bucks	Central Bucks
Schenck, Clark B. Jr.	Cumberland Valley	Cumberland Valley
Hollinger, C. Arthur	Donegal	Donegal Union
Williams, Mary Jane*	Elizabeth-Forward	Elizabeth-Forward
Gueldner, Ingeborg	Ephrata Union	Ephrata Union
Lutz, Margaret L.	Fox Chapel	Fox Chapel Area
Budahazi, Henry	Hampton Township	Hampton Township
Brunner, William J.	Wm. Penn	Harrisburg
Loy, Erma M.	John Harris	Harrisburg
Schmid, Maria*	Hatboro-Horsham	Hatboro-Horsham
Weis, Loretta E.	Kingston	Kingston Borough
Bond, Richard C.	Kutztown Jr.	Kutztown Area
Heck, Larry G.	Lebanon	Lebanon
Oelschlager, Kenneth	Methacton Jr. Sr.	Lowr.-Prov.-Wor.
Schroeder, Margaret M.	Middletown Area	Middletown Area
Steene, Walter A.	Morrisville	Morrisville
Oesterich, Edward N.	Mt. Lebanon	Mt. Lebanon
Wollenhaupt, Wilbert	Muhlenburg Twp.	Muhlenburg Twp.
McGonigle, Ruth*	Nazareth Area Sr.	Nazareth Area
Clark, Polly	Palisades Jr. Sr.	Palisades Joint
Wolfe, Marie P.	Conestoga Sr.	Paoli Area
Kleinschmidt, Lynnea	Pen Argyl Area	Pen Argyl Area
Santner, Joseph G.	Washington	Philadelphia
Shuster, Mally*	Central	Philadelphia
Wickel, Georgiana*	High School for Girls	Philadelphia
Wunner, Louise*	Olney	Philadelphia
Hardenstine, Ruth*	Pine Grove Area	Pine Grove Area
Gordon, Fannetta*	Taylor Allderdice	Pittsburgh
Thomas, Marjorie*	Peabody	Pittsburgh
Yenias, Anthony C.	South Hills	Pittsburgh
Schmidley, J. William	Plymouth-Whitemarsh	Plymouth-Whitemarsh
Repko, Richard A.	Spring-ford Sr.	Spring-ford Joint
Reeser, F. Robert	Schuylkill Valley	Schuylkill Valley
Singer, Robert B.	West Scranton	Scranton City
Saddic, Bonnie*	Drexel Hill Jr.	Upper Darby Twp.
Schlicher, Frederick E.	Upper Perkiomen Jt.	Upper Perkiomen Jt.

* Mrs.

APPENDIX B

TEACHERS' GUIDE MATERIALS

TRADITIONAL METHOD GERMAN

Specific classroom activities.

A. Overview.

1. Text: FOUNDATION COURSE IN GERMAN, by Homberger and Ebelke, published by D. C. Heath, Revised edition, 1954-or-A FIRST COURSE IN GERMAN, by Huebener and Newmark, D. C. Heath, second edition, 1964.
   a. Teacher should have copy of textbook.
   b. Each student should have his own copy of text.
2. No required equipment or materials.
3. Optional equipment and materials.
   a. Tape recorder or record player.
   b. Available realia -- Slides, film strips, newspapers, magazines, films and books.

B. Suggestions to the teacher.

1. Use of foreign language.
   a. German may be used at teacher's discretion.
   b. Grammar instruction must be given in English.
2. Introductory lessons, 1 to 7. (1-5 for 1st Course)
   a. Approximately one third of daily class time to be used for oral practice.
   b. After lesson 7, (5 in 1st Course) oral practice should be limited to approximately one fourth of time.
3. Pronunciation.
   a. Sound system to be taught as presented in text.
4. Vocabulary.
   a. Student to memorize vocabulary lists.
   b. Student to memorize lists of idioms.
5. Grammar.
   a. To be taught as suggested in textbook.
   b. Teacher to supplement text where clarification or examples may be needed.
   c. Student to memorize paradigms.
6. Reading selections.
   a. Teacher to read aloud and explain difficult passages.
   b. Selections to be repeated by class and assigned for home study.
   c. Translation into English for clarification.
7. Writing.
   a. Should begin in first lesson.
   b. May take form of:
      1) Homework assigned from text.
      2) Classroom exercises, including blackboard work.
   c. Translation into German.
8. Culture and civilization.
   a. Selections dealing with culture and civilization to be used for outside reading and class discussion.
   b. Pertinent realia may be used.
   c. Time not to exceed one class period per week.

9. Homework.
   a. Exercises on material previously introduced.
   b. Material not previously introduced may be assigned for study.
10. Review.
   a. Daily review: teacher to use exercises provided in each lesson.
   b. General review: teacher to spend several class periods on each of the comprehensive review lessons, completing as many exercises as possible.
11. Testing may be of the following types:
   a. Dictation.
   b. Vocabulary and idiom quizzes.
   c. Translation.
   d. Reading comprehension (questions based on reading selection).
   e. Grammar.
      1) Multiple choice.
      2) Matching.
      3) Completion.
      4) Paradigms.
      5) Replacement and restructure.
      6) Translation.
12. Recommended grammar coverage.
   a. All grammar in Chapters 1 through 19 to be taught. (All grammar in text in 1st Course)
   b. Omit the following in Chapter 20. (Foundation Course only)
      1) Perfect participle as adjective.
      2) Adjective as noun.
      3) Infinitive of verb as noun.
   c. Omit chapters 21 through 25 and fourth review lesson. (Foundation Course only)

C. Recommended rate of coverage.
   1. At end of semester--9 to 10 lessons (13-15 for 1st Course)
   2. At end of year--10 to 20 lessons. (26-30 for 1st Course)

TM

DO'S AND DON'TS

Do's

1. Begin reading and writing in the first week.
2. Analyze grammar in depth.
3. Give only tests requiring reading and writing.
4. Require student mastery of paradigms.

Don'ts

1. No systematic use of lab tapes or lab records.
2. No systematic use of native speakers in the classroom.

FUNCTIONAL SKILLS METHOD

GERMAN

Specific classroom activities

A. Overview.

1. Text: DEUTSCH: VERSTEHEN UND SPRECHEN, by Rehder, Thomas, Twaddell and O'Connor, published by Holt, Rinehart and Winston, 1962 - or - A-LM, LEVEL I, Harcourt, Brace and World, 1961.
   a. Teacher to have copy of Teacher's Edition or Manual.
   b. Each student to have his own copy of text.
2. Required equipment and materials.
   a. Language laboratory.
   b. Tape recorder or record player.
   c. Complete set of sequential lab tapes.
   d. Student practice records for home use.
   e. Tests for evaluation of listening and reading comprehension.
3. Optional equipment and materials.
   a. Set of flashcards or dialog posters.
   b. Printed unit quizzes or test booklets.
   c. Grading charts.
   d. Songbooks with recordings.
   e. Complete set of test tapes.
   f. Teacher's cue cards.

B. Suggestions to the teacher.

1. Use of foreign language.
   a. Essential for teacher to conduct class in German.
   b. English to be used only when necessary for clarifying difficult points.
2. Pronunciation.
   a. Teacher's pronunciation to serve as model.
   b. Teacher to spend an average of three to five minutes daily on pronunciation drills.
   c. For detailed instructions see specific units of Teacher's Edition.
3. Vocabulary.
   a. Should be taught only within context of dialogs and drills.
   b. Continuous review insured by subsequent reintroduction of vocabulary.
4. Lab tapes.
   a. Should be used daily for an average of one fourth of class period.
   b. Should be used for reinforcing material previously introduced.
5. Grammar.
   a. Not to be taught, assigned or tested.
   b. Teacher to answer promptly and briefly all questions concerning grammatical structures.

6. Reading.
   a. Should be introduced after Unit 4 (prereading phase), and include only material previously heard.
   b. Sequence should be from choral to individual response.
   c. No formal translation permitted.

7. Homework.
   a. During prereading phase, dialog memorization with aid of student practice records.
   b. After prereading phase, dialog memorization to continue, but now with printed text in addition to practice records.
   c. Refer to Teacher's Edition or Manual for further homework suggestions.
8. Writing.
   a. Should start at conclusion of prereading phase.
   b. Should always be based on previously learned dialogs and conversations.
   c. Refer to Teacher's Edition for further suggestions for written work.
9. Culture.
   a. Only everyday activities and situations (the anthropologist's "total culture") treated in text.
   b. Refinement culture.
      1) Not developed in text (except for folksong section of VERSTEHEN UND SPRECHEN)
      2) Brief commentary permitted when specific references appear in text.
10. Review.
   a. Calculated recurrence in text of vocabulary and structure.
   b. Use review sections after Units 5, 8, 10, 13, 15. (Recombination work in Units 4, 5, 6, 8,-14, A-LM)
11. Testing.
   a. Proportion of grade based on oral testing:
      1) Prereading phase - 100 per cent.
      2) After prereading - 50 per cent.
   b. Printed tests to be administered after Units 5, 10, 15 or when directed by Teacher's Edition.
   c. To supplement, teacher may use following types of tests:
      1) Dictation (only of previously learned material).
      2) Rejoinder and completion.
      3) Multiple choice.
      4) True-false.

C. Methodology.
   1. Dialog.
      a. Give oral model of dialog sentences.
      b. Dramatize sentences, using props, gestures, etc.
      c. Drill dialog by proceeding from choral, part-choral to individual.

d. After several sentences have been learned, play that portion of practice record for class.
   1) Distribute records.
   2) Ask students to practice lines at home for 15 to 20 minutes.

2. Question-answer practice.
   a. Present oral models.
   b. Begin repetition by class, row and individual.
   c. Perform in pairs.

3. Pattern practice.
   a. Model pattern several times with first substitution item.
   b. Have students imitate model.
   c. Follow procedure (a, b) through all substitution items.
   d. Have students close books and repeat drill as before.

4. Teaching games (See Teacher's Edition).

5. Conversations.
   a. Read conversation once or twice to students who follow it in their texts.
   b. See Teacher's Edition for procedure and for extending conversations.

6. Supplement (Additional words and expressions listed in certain units, usually in paradigm form, but not necessarily incorporated in dialogs).
   a. Teach by repetition.
   b. Drill by question-answer.

7. Tapes.
   a. In the laboratory.
      1) Two 25-minute periods per week.
      2) Student must not record. (word "not" omitted for Audio-Record classes)
      3) Do <u>not</u> use dialogs.
      4) Supervise all drill (See Teacher's Edition or Manual for detailed instructions).
      5) Supplementary lab drill for individual students at discretion of teacher.
   b. In the classroom.
      1) Average of one fourth of total weekly instruction time.
      2) For reinforcement of previously introduced material.

D. Recommended minimum rate of coverage.
   1. At end of semester - 5 units (4-5 <u>A-LM</u>).
   2. At end of year - 10 units (9 <u>A-LM</u>).

FSM--AA

DO'S AND DON'TS

Do's

1. Use lab two 25-minute periods per week.
2. Supervise and monitor all lab drill.
3. Must use lab tapes in class an average of one fourth period daily.
4. Conduct class in foreign language.
5. Use English to clarify difficult points.
6. Spend an average of three to five minutes daily on pronunciation drills.
7. Teach vocabulary in context only.
8. Start writing at end of prereading phase.
9. Give writing assignments on previously learned material.

Don'ts

1. No emphasis on refinement culture.
2. No vocabulary tests.
3. No systematic presentation of grammar.
4. No memorization of grammar generalizations.
5. No word for word translation or translation tests.
6. No use of text until after prereading phase.
7. No use of dialogs in lab after prereading phase.
8. No recording by students in lab.

FIRST DAY

A. Orientation.
  1. Explantation of course objectives and procedures.
    a. Language as speech - language evolved thousands of years before reading and writing, comparatively recent developments.
    b. Language learning - acquiring skills of communication.
      1) Speaking, reading, writing.
      2) First step is to "break the sound barrier." (Speaking and Listening come before reading and writing).
      3) Like learning to play a musical instrument.
        a) Skills developed through practice, correction and more practice.
        b) Language is actually a habit, something automatic, communicative.

B. Method of first four units.
  1. Concentration of two important aspects of language learning.
    a. New sound system.
      1) No books, printed material or chalkboards until after first four lessons have been learned.
      2) After thorough mastery, students will learn to read and write the already learned materials.
      3) Memorization of basic dialogs by imitation and repetition after model.
      4) Work with pronunciation and structure drills.
      5) Teacher to serve as primary model.
        a) Others supplied by tapes and records featuring educated natives, speaking at normal speed.
    b. Basic grammatical structures.
      1) Method of attaining correct usage in regard to grammatical patterns of the language.
        a) Speaking drills - repetition, until students can say them without hesitation or mistakes.
  2. Use of names.
    a. Assign to each student his name equivalent in the foreign language.
    b. Teach each student to say "My name is _____" in the language.
    c. Substitute these names in context with the appropriate changes in syntax when teaching.
  3. Insist on active student participation.
  4. Time allowing, begin presentation of basic dialog, Unit 1.

INTERMEDIATE - UNIT 6

A. Warm-up (3 minutes).
   1. Cardinal numbers, Unit 5.
      a. Counting in and out of sequence.
      b. Choral reinforcement where needed.
B. Basic material (15 minutes).
   1. Introduce first half of dialog, Unit 6.
      a. Give English.
         1) Make use of props, gestures and dramatization.
      b. Model German.
         1) Make use of the same props, gestures and dramatization.
   2. Teach first half of dialog, Unit 6.
      a. Model each line several times.
         1) Break lines into partials where needed, using "backward build-up."
      b. Elicit choral, part-choral and individual repetition.
      c. Give English for difficult lexical items that recur.
C. Review (15 minutes).
   1. Pattern practices, Unit 5.
      a. Rapid choral repetition of patterns.
      b. Random sampling of individual repetition (May use item substitution).
      c. Choral reinforcement on weak points only.
   2. Check-up on pronunciation (Teacher's Edition).
      a. Check individual pronunciation of key words.
      b. Choral repetition where reinforcement is needed.
   3. Factual and personal questions, Unit 5.
      a. Found in conversations.
      b. Questions to elicit both first and third person questions and answers.
      c. Rapid work with pairs of students (at their seats).
      d. Cue correct responses to prevent "stumbling."
      e. Choral and part-choral repetition of correct responses.
D. Reading, writing and spelling (10 minutes).
   1. Dialog and question-answer practice, Unit 5.
      a. Review reading.
         1) Choral - individual.
      b. Dictation.
E. Re-entry (2 minutes).
   1. Choral repetition of first half of dialog, Unit 6.
F. Assignment: Practice record six, side A, band 1.

FUNCTIONAL SKILLS GRAMMAR

A-LM GERMAN LEVEL ONE

Specific classroom activities.

A. Overview.
   1. Text: A-LM GERMAN LEVEL ONE, published by Harcourt, Brace and World, 1961, 1963.
      a. Teacher to have copy of text and Teacher's Manual.
      b. Each student to have his own copy of text.
   2. Required equipment and materials.
      a. Audio-active laboratory.
      b. Tape recorder or record player.
      c. Complete set of lab tapes or records.
      d. Student practice records for home use.
   3. Optional equipment and materials.
      a. Teacher's cue cards.
      b. Dialog posters.
      c. Student test booklets.
      d. Complete set of test tapes.

B. Suggestions to the teacher.
   1. Use of foreign language.
      a. Essential for teacher to conduct class in German.
      b. English to be used only when necessary for clarifying difficult points.
   2. Pronunciation.
      a. Teacher's pronunciation to serve as model.
      b. Teacher to spend an average of three to five minutes daily on pronunciation drills.
      c. Corresponding drill tapes to be used as supplement.
      d. For detailed instructions see Teacher's Manual.
   3. Vocabulary.
      a. Should be taught only within context of dialogs and drills.
      b. Continuous review insured by subsequent reintroduction of vocabulary.
   4. Lab tapes.
      a. Should be used daily for an average of one fourth of class period.
      b. Should be used for reinforcing material previously introduced.
   5. Grammar.
      a. All grammar appearing in "Generalizations" to be taught.
      b. In addition, the following to be taught:
         1) Verbs.
            a) WISSEN, KENNEN.
            b) HABEN, SEIN (present perfect and auxiliaries).
            c) WERDEN and infinitive (future tense).

2) Dative case.
a) Comprehensive treatment.
b) Prepositions which govern dative.

6. Reading.
a. Should be introduced after Unit 4 (prereading phase), and include only material previously heard.
b. Sequence should be from choral to individual response.
c. No formal translation permitted.

7. Homework.
a. During prereading phase, dialog memorization with aid of student practice records.
b. After prereading phase, dialog memorization to continue, but now with printed text in addition to practice records.
c. Refer to "Writing" (below) for further homework suggestions.

8. Writing.
a. Should start at conclusion of prereading phase.
b. Should always be based on previously learned dialogs and conversations.
c. Consists of three types (See Teacher's Manual, Introduction, section entitled "Reading, Writing, Spelling").

9. Culture.
a. Only everyday activities and situations (the anthropologist's "total culture") treated in text.
b. Refinement culture.
1) Not developed in text.
2) Brief commentary permitted when specific references appear in text.

10. Review.
a. "Recombination Narratives," Units 4, 5, 6, 8, 9.
b. "Recombination Reading Narratives," Units 10 to 14.

11. Testing.
a. Proportion of grade based on oral testing:
1) Prereading phase - 100 per cent.
2) After prereading phase - 50 per cent.
b. Unit tests (with key) in Teacher's Manual to be administered.
c. To supplement, teacher may use following types of tests:
1) Dictation (only of previously learned material).
2) Rejoinder and completion.
3) Multiple choice.
4) True-false.

C. Methodology.
1. Dialog.
a. Give oral model of dialog sentences.
b. Dramatize sentences, using props, gestures, etc.

c. Indicate speaker, using dialog posters or stick figures.
d. Drill dialog by proceeding from choral, part-choral to individual.
e. After several sentences have been learned, play that portion of practice record for class.
   1) Distribute records.
   2) Ask students to practice lines at home for 15 to 20 minutes.
f. Have students dramatize dialog after gaining oral control.

2. Dialog adaptation.
   a. Relate dialog to student's personal experience to aid memorization.
   b. Present oral models.
   c. Practice with students.
   d. Begin "chain practice" (See Teacher's Manual).
3. Structure drills.
   a. Present frame utterance exemplifying grammatical point.
   b. For detailed instructions see Teacher's Manual.
4. Directed dialog.
   a. Stimulate controlled conversation by commands.
   b. For presentation see Teacher's Manual.
5. "Generalizations."
   a. Draw paradigms (found at end of unit in text) on blackboard.
   b. Explain grammatical rules and exceptions, and give examples.
   c. Work with applicable drills.
   d. Have student keep a notebook.
      1) This is to include grammar rules and paradigms.
      2) This material to be memorized by student.
6. "Recombination Narratives."
   a. Recite narrative once or twice and question students for comprehension.
   b. See Teacher's Manual for further procedure.
7. "Recombination Reading Narratives."
   a. Read narrative once or twice to students who follow it in their texts.
8. "Supplement."
   a. Teach by repetition.
   b. Drill by question-answer.
9. Tapes.
   a. In the laboratory.
      1) Two 25-minute periods per week.
      2) Student must not record.
      3) Do <u>not</u> use dialogs.
      4) Supervise all drill (See Teacher's Manual for detailed instructions).
      5) Supplementary lab drill for individual students at discretion of teacher.
   b. In the classroom.
      1) Average of one fourth of total weekly instruction time.

2) For reinforcement of previously introduced material.

D. Recommended minimum rate of coverage.
1. At end of semester - 4 to 5 units.
2. At end of year - 9 units.

FSG

DO'S AND DON'TS

Do's

1. Use lab two 25-minute periods per week.
2. Spend half of lab time for recording and half for playback. (Omitted for Audio-Active laboratory classes)
3. Supervise and monitor all lab drills.
4. Use lab tapes in class an average of one fourth period daily.
5. Conduct class in foreign language.
6. Use English only for explaining structures and grammar.
7. Spend an average of three to five minutes daily on pronunciation drills.
8. Teach vocabulary in context only.
9. Devote an average of one third of class time to grammar.
10. Follow grammar sequence prescribed by text.
11. Teach grammar after textual examples appear.
12. Require students to keep notebook for grammar.
13. Have students memorize rules of grammar.
14. Start writing at end of prereading phase.
15. Give writing assignments on previously learned material.

Don'ts

1. No emphasis on refinement culture.
2. No vocabulary tests.
3. No word for word translation or translation tests.
4. No use of text until after prereading phase.
5. No use of dialogs in lab after prereading phase.

FIRST DAY

A. Orientation.
  1. Explanation of course objectives and procedures.
    a. Language as combination of speeeh and grammar.
      1) Language, in its first form, is essentially speech. An integral part of language is the knowledge of grammatical constructions.
      2) Language learning - acquiring skills of communication.
        a) Speaking, reading, writing.
        b) Must "break the sound barrier" while understanding grammatical structures included.
        c) Like learning to play a musical instrument.
          1. Skills developed through practice, correction and more practice.
          2. Language is actually a habit, with correct grammatical construction being automatic.
          3. Language is communicative.

B. Method of first four units.
  1. New sound system.
    a. Mastery in speech and listening is necessary.
    b. Mastery of all four skills will take place in proper sequence with neither speech nor grammar taking procedure.
  2. Gaining control of new sound systems.
    a. Memorization of basic dialogs by imitation and repetition after model.
    b. Work with pronunciation and structure drills.
    c. Teacher to serve as primary model.
      1) Others supplied by tapes and records featuring educated natives, speaking at normal speed.
  3. Gaining control of grammatical patterns.
    a. Speaking drills.
    b. Grammar generalizations.
  4. Use of names.
    a. Assign to each student his name equivalent in the foreign language.
    b. Teach student to say "My name is ___ ___" in the language.
    c. Substitute these names in context with the appropriate changes in syntax when teaching.
    d. Insist on active student participation.
  5. Time allowing, begin presentation of basic dialog, Unit 1.

INTERMEDIATE

A. Warm-up (3 minutes).
   1. Supplement, Unit 5 (German - numbers to 100).
      a. Individual response to teacher question.
      b. Choral reinforcement as needed.
B. Basic material (10 minutes).
   1. Introduce first half of dialog, Unit 6.
      a. Give English.
         1) Make use of props, gestures and dramatization.
      b. Model German.
         1) Make use of the same props, gestures and dramatization.
   2. Teach first four lines of dialog.
      a. Model each line several times.
         1) Break lines into partials where necessary.
      b. Elicit choral, part-choral and individual repetition.
      c. Give English for difficult lexical items that recur.
C. Review (10 minutes).
   1. Personal pronouns, Unit 5.
      a. Rapid choral review of repetition drill.
      b. Random sampling of remaining drills on personal pronouns.
         1) Individual response.
         2) Choral reinforcement on weak spots only.
   2. Pronunciation Drill A, Unit 5, Teacher's Manual, p. 44.
      a. Model words and sentences.
      b. Individual repetition.
      c. Choral reinforcement when needed.
   3. Directed dialog, Unit 5.
      a. Rapid work with pairs of students (at their seats).
      b. Cue correct responses to prevent "stumbling."
      c. Choral and part-choral repetition of correct responses.
D. Reading, writing and spelling (10 minutes).
   1. Lesson 18, page 28.
      a. Review contrast drill.
      b. Dictation.
E. Grammar (10 minutes).
   1. Drawing paradigms of grammar generalization on board (to be found at end of unit in text, or in additional materials).
   2. Explanation of paradigm.
      a. Grammatical rules and exceptions.
      b. Examples.
      c. Work with applicable drills.
   3. Writing by students in notebooks.
   4. Memorization by students.
F. Re-entry (2 minutes).
   1. Choral repetition of first four lines of dialog, Unit 6.
G. Assignment.
   1. Practice record six, side A, band 1.
   2. Grammar assignment.

LAB PROCEDURES -- AA LAB

1. Equipment check.
   a. Teacher.
      1) Turn on console power and put on program.
      2) Check positions (with aid of seating charts). Then enter results in daily log sheet.
   b. Students.
      1) Check for and report any damage at once.
      2) Turn on controls.
2. Opening procedures.
   a. Teacher - start program.
   b. Students - put on headsets and adjust controls.
3. Listen-respond operations.
   a. Part I.
      1) Teacher - listen and evaluate students.
      2) Students - listen and respond to program for approximately 10 minutes.
   b. Part II.
      1) Teacher - monitor and correct students.
      2) Students - listen and respond to same program for approximately 10 minutes.
4. Closing procedures.
   a. Teacher.
      1) Rewind program tapes.
      2) Turn off console power.
   b. Students.
      1) Replace headsets.
      2) Turn off controls.

LAB PROCEDURES -- AR LAB

1. Equipment check.
   a. Teacher.
      1) Turn on console power and put on program.
      2) Check positions (with aid of seating charts). Then enter results on daily log sheet.
   b. Students.
      1) Check for and report any damage at once.
      2) Set up tape for recording.
      3) Turn on controls.
2. Opening procedures.
   a. Teacher - start program.
   b. Students - put on headsets and adjust controls.
3. Recording and playback operations.
   a. Part I.
      1) Teacher - monitor by listening at console and/or circulating around the lab.
      2) Students - listen and record program for approximately 10 minutes.
   b. Part II.
      1) Teacher - keep order while students play back and listen to their recordings.
      2) Students - listen to their recording of the program for approximately 10 minutes.
4. Closing procedures.
   a. Teacher.
      1) Rewind program tapes.
      2) Turn off console power.
   b. Students.
      1) Rewind tapes.
      2) Replace headsets.
      3) Turn off controls.

APPENDIX C

OBSERVATION REPORTS

OBSERVATION REPORT

Preliminary Model - September, 1965

Name_____ Date_____

School_____ Condition_____

1. Class Activity_____

_____

2. Teacher Activity

   a. Presentation_____

   b. A-V aids_____

   c. Use of FL_____

   d. Culture_____

   e. Other_____

3. Student Activity

   a. Group Drill_____

   b. Individual Drill_____

   c. Dramatization_____

   d. Machine Drill_____

   e. Language Lab_____

   f. Testing_____

4. Teacher Attitude_____

_____

5. Pupil Attitude_____

_____

6. Condition Deviation_____

7. Comments_____

OBSERVATION REPORT

Preliminary Model - September, 1965

Observation Report--Field Consultant_____Date_____

Teacher_____School_____Cond._____

I. Teaching Practices

	(check which)	duration (in min.)
1. Monitors and corrects students individually	1.	
2. Degree of pupil use of equipment	2.	
3. Type of lab. lesson		
a. Listening-comprehension	a.	
b. Mimicry-memorization	b.	
c. Creative practice	c.	
d. Self-evaluation	d.	
e. Quiz - listening	e.	
f. Quiz - speaking	f.	
4. Use of tapes		
a. Pronunciation	a.	
b. Dialogs	b.	
c. Structure drills	c.	
d. Testing	d.	

II. Status of Laboratory Equipment

(Report on all malfunctions occurring since last visit.)

	Date of breakdown	Action Taken	Date of Restored Service	Nature of Malfunction
Teacher Console				
Tape Deck				
Microphone				
Headphone				
Switches				
Student Booths				
Headphone and/or microphone				
Desk Equipment				
Adequacy of sound				
Record equipment				

OBSERVATION REPORT

Second Model - January, 1966

Observation Report--Field Consultant_____Date_____

Teacher_____School_____Cond._____

FSM

1. Teacher speaks foreign language
2. Students speak foreign language
3. Grammar: Subsidiary to functional skills
4. Speaking only what was listened to
5. Reading as direct communication
6. Reading only what was listened to and spoken
7. Writing only what was listened to, spoken and read
8. Language as a cultural behavior pattern
9. Testing as demonstration of functional proficiency
10. Average use of tapes--ten minutes per day
11. Average pronunciation drill--3-5 minutes per day
12. Vocabulary taught in context only

FSG

1. Teacher speaks foreign language
2. Students speak foreign language
3. Grammar: Descriptive; use before rules
4. Speaking only what was listened to
5. Reading as direct communication
6. Reading only what was listened to and spoken
7. Writing only what was listened to, spoken and read
8. Language as a cultural behavior pattern
9. Testing as demonstration of functional proficiency
10. Average use of tapes--ten minutes per day
11. Average pronunciation drill--3-5 minutes per day
12. Vocabulary taught in context only

TLM

1. Vocabulary drill
2. Translation of reading lesson
3. Grammar--formal analysis
4. Pronunciation--teacher
5. Pronunciation--student
6. Reading for total comprehension
7. Writing--free composition
8. Culture (refinement)
9. Use of tape recorder
10. Use of visual aids

APPENDIX D

STATISTICAL DATA,

MULTIVARIATE ANALYSIS OF VARIANCE

TEACHING STRATEGIES AND LANGUAGE LABORATORY SYSTEMS

TABLE 63

FRENCH: PRE-EXPERIMENTAL

GROUP MEANS AND STANDARD DEVIATIONS

N=number of classes observed

Group	Lang. I.Q.	Non-L. I.Q.	I.Q.-T	MLAT III	MLAT IV	MLAT V	MLAT Ttl.
1. TLM-M	112.25	110.05	112.60	8.71	16.61	12.30	37.61
N 10	5.83	6.10	5.68	2.95	3.44	1.82	6.39
2. TLM-F	112.15	109.49	111.87	12.40	18.24	15.13	45.75
N 9	6.33	5.06	5.34	3.44	2.52	2.37	6.53
3. FSG-TR-M	116.31	111.10	115.50	12.77	18.99	14.81	46.57
N 3	7.68	12.15	10.61	2.80	8.07	5.37	14.32
4. FSG-TR-F	110.39	106.76	109.98	14.36	21.12	14.67	49.53
N 3	6.90	9.53	8.82	4.14	3.27	3.4	2.67
5. FSG-AA-M	108.41	107.76	109.78	13.22	17.11	13.18	43.30
N 7	7.33	8.09	8.06	5.18	5.22	3.37	9.34
6. FSG-AA-F	108.43	105.26	107.88	15.98	18.37	14.76	48.85
N 7	7.77	10.55	9.42	3.90	3.62	3.75	8.96
7. FSG-AR-M	110.91	111.63	112.70	10.85	16.55	14.10	41.50
N 11	7.78	7.78	7.00	5.31	6.47	4.42	13.82
8. FSG-AR-F	111.85	109.19	113.74	15.52	21.28	16.27	52.93
N 11	6.55	8.75	4.61	4.39	3.97	3.15	8.73
9. FSM-TR-M	120.78	114.04	119.71	13.27	13.90	14.44	41.57
N 3	6.75	3.15	5.50	0.93	4.59	1.90	6.96
10. FSM-TR-F	114.76	110.39	114.08	14.36	14.60	14.34	43.02
N 2	2.88	.31	1.68	3.17	3.68	2.44	9.69
11. FSM-AA-M	112.01	112.36	113.50	12.00	15.47	13.48	40.93
N 9	4.75	4.93	3.83	2.25	2.04	2.14	4.45
12. FSM-AA-F	111.84	108.26	111.66	14.54	19.85	16.82	50.96
N 9	5.30	3.71	4.06	3.37	4.08	2.83	7.52
13. FSM-AR-M	115.34	111.27	115.11	13.31	19.81	14.48	47.71
N 11	6.17	7.73	5.87	3.47	4.46	3.13	7.78
14. FSM-AR-F	111.85	109.19	113.74	15.52	21.28	16.26	52.93
N 11	6.55	8.75	4.61	4.39	3.97	3.15	8.73

TABLE 64

FRENCH: PRE-EXPERIMENTAL

GROUP MEANS AND STANDARD DEVIATIONS

N=number of classes

	Group	Coop-R	Coop-V	Coop-G	Coop-T	LA List.
1.	TLM-M	7.69	11.01	7.66	26.37	9.75
	N 10	2.77	3.68	2.55	8.50	1.06
2.	TLM-F	7.55	11.74	7.58	26.87	9.11
	N 9	2.92	4.66	2.92	10.15	1.44
3.	FSG-TR-M	3.32	7.37	4.26	14.95	8.58
	N 3	0.63	2.76	0.35	2.91	0.80
4.	FSG-TR-F	4.07	6.56	3.82	14.45	8.18
	N 3	1.54	2.59	2.02	6.09	2.33
5.	FSG-AA-M	8.30	12.01	7.84	28.16	9.22
	N 7	1.08	1.36	1.23	2.81	0.75
6.	FSG-AA-F	7.96	11.90	7.74	27.59	8.85
	N 7	0.91	1.94	0.73	2.63	1.03
7.	FSG-AR-M	7.28	9.96	7.08	24.31	10.41
	N 11	1.66	2.50	1.76	5.11	2.51
8.	FSG-AR-F	7.15	10.74	7.52	25.41	8.99
	N 11	1.83	2.48	1.52	5.54	1.64
9.	FSM-TR-M	7.17	11.73	5.96	24.89	9.47
	N 3	2.32	4.84	3.14	9.82	1.11
10.	FSM-TR-F	7.66	13.60	7.86	29.12	10.40
	N 2	1.80	3.68	0.20	5.67	1.42
11.	FSM-AA-M	6.48	10.09	5.95	22.52	9.90
	N 9	2.19	3.16	1.70	6.70	1.82
12.	FSM-AA-F	7.47	11.14	6.63	25.24	10.08
	N 9	2.62	4.41	2.92	9.39	1.76
13.	FSM-AR-M	6.09	11.34	6.78	24.21	9.32
	N 11	3.64	4.26	4.06	11.45	3.85
14.	FSM-AR-F	6.07	11.41	7.67	20.12	10.40
	N 11	2.53	4.30	3.09	5.67	1.42

TABLE 65

FRENCH: EXPERIMENTAL

GROUP MEANS AND STANDARD DEVIATIONS

N=number of classes

Group	Mid-List.	Mid-Read.	LD-I	LD-II	LD-III	LD-IV	LD-T
1. TLM-M	12.29	13.74	9.57	11.47	10.05	11.76	42.72
N 10	1.17	0.70	0.70	2.53	1.15	2.17	5.71
2. TLM-F	13.63	15.91	9.91	12.14	11.41	12.81	46.28
N 9	1.82	1.46	0.97	1.52	1.07	1.59	4.38
3. FSG-TR-M	12.42	12.26	8.94	10.85	9.85	9.94	39.57
N 3	3.45	2.38	1.62	0.85	2.63	0.34	5.08
4. FSG-TR-F	11.37	13.46	9.50	11.81	9.23	10.64	41.18
N 3	2.16	0.69	2.32	0.73	1.02	1.19	4.72
5. FSG-AA-M	12.42	12.90	9.06	12.11	8.95	11.17	41.43
N 7	2.66	1.57	1.77	1.74	2.51	1.98	6.26
6. FSG-AA-F	12.22	13.60	10.19	12.39	9.99	12.16	44.68
N 7	2.11	1.69	1.18	1.01	1.65	1.59	4.66
7. FSG-AR-M	12.28	13.44	8.98	11.86	9.64	11.29	41.68
N 11	3.52	1.06	1.60	1.97	2.68	1.81	5.96
8. FSG-AR-F	12.36	13.15	9.73	11.89	10.34	12.01	44.03
N 11	1.95	1.02	1.07	1.52	1.64	2.21	5.49
9. FSM-TR-M	13.36	14.10	9.79	12.21	9.96	11.73	43.68
N 3	0.81	1.49	1.05	1.61	2.66	1.11	6.21
10. FSM-TR-F	12.80	14.84	10.23	11.07	9.19	11.41	41.91
N 2	2.55	1.35	0.14	0.29	0.36	0.20	1.00
11. FSM-AA-M	12.14	14.20	9.25	11.96	9.84	11.17	42.41
N 9	1.28	1.47	1.26	0.94	1.42	0.97	3.72
12. FSM-AA-F	12.87	14.43	9.98	12.22	10.78	12.26	45.24
N 9	2.09	1.49	0.90	0.85	1.57	2.01	4.79
13. FSM-AR-M	12.79	13.51	9.68	11.88	10.69	12.26	44.51
N 11	2.56	3.32	0.86	1.96	2.06	2.02	4.36
14. FSM-AR-F	13.35	14.60	9.98	12.32	10.90	12.88	46.07
N 11	2.83	1.75	1.34	1.60	1.03	2.12	4.18

TABLE 66

FRENCH

WITHIN CELLS CORRELATIONS OF CRITERIA

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1 Final LA-L												
2 Final LA-R	.755											
3 Final Coop R	.789	.840										
4 Final Coop V	.624	.666	.785									
5 Final Coop G	.655	.709	.719	.696								
6 Final Coop Total	.756	.809	.920	.927	.871							
7 Lang. I.Q.	.466	.514	.528	.513	.469	.556						
8 Non-L I.Q.	.242	.202	.219	.136	.123	.175	.560					
9 I.Q.-T	.419	.406	.435	.388	.345	.430	.893	.867				
10 MLAT-III, Spell	.384	.424	.471	.426	.367	.466	.295	.024	.189			
11 MLAT-IV, Words	.476	.443	.504	.532	.474	.557	.486	.352	.495	.431		
12 MLAT-V, Pairs	.429	.312	.437	.395	.368	.441	.403	.396	.469	.186	.547	
13 MLAT-Total	.555	.511	.606	.587	.525	.633	.518	.331	.501	.712	.881	.708
14 Pre-Coop, R	.066	.114	.244	.441	.220	.344	.266	.121	.225	.082	.160	.100
15 Pre-Coop, V	.263	.263	.403	.552	.413	.510	.225	.085	.187	.149	.211	.236
16 Pre-Coop, G	-.025	.086	.206	.392	.262	.324	.196	.092	.161	.019	.025	.104
17 Pre-Coop Total	.130	.179	.319	.504	.334	.434	.243	.103	.202	.097	.151	.169
18 Pre-LA, L	.012	-.015	.169	.240	.092	.191	.112	.104	.113	.072	.110	.147
19 Mid LB, L	.699	.511	.667	.652	.559	.693	.356	.116	.287	.254	.424	.486
20 Mid LB, R	.316	.283	.417	.293	.364	.389	.289	.325	.337	-.051	.156	.290
21 List. Discrim I	.217	.222	.154	-.004	.081	.079	.341	.312	.379	.042	.149	.165
22 List. Discrim II	.196	.262	.191	.083	.292	.197	.356	.279	.361	.105	.169	.115
23 List. Discrim III	.443	.447	.409	.482	.450	.494	.453	.267	.420	.219	.515	.295
24 List. Discrim IV	.287	.232	.218	.157	.249	.224	.353	.271	.364	.137	.222	.329
25 List. Discrim Tot.	.378	.384	.324	.253	.369	.341	.489	.362	.493	.173	.357	.304

TABLE 66 continued

Variable	13	14	15	16	17	18	19	20	21	22	23	24
13 MLAT-Total												
14 Pre-Coop, R	.151											
15 Pre-Coop, V	.249	.796										
16 Pre-Coop, G	.058	.835	.835									
17 Pre-Coop Total	.175	.921	.951	.941								
18 Pre-LA, L	.136	.534	.438	.483	.509							
19 Mid LB-L	.489	.364	.515	.291	.432	.361						
20 Mid LB-R	.161	.322	.428	.429	.424	.478	.452					
21 List. Discrim I	.152	-.108	-.118	-.117	-.122	-.092	-.001	.071				
22 Lis.Discm. II	.173	-.135	-.018	-.076	-.073	.243	-.008	-.041	.420			
23 Lis.Discm. III	.456	.144	.162	.046	.131	.009	.264	.132	.365	.369		
24 Lis.Discm. IV	.293	-.030	.062	-.042	.005	-.061	.154	.081	.469	.521	.568	
25 Lis.Discm.Tot	.364	-.034	.041	-.057	-.009	-.124	.150	.078	.684	.748	.777	.851

FRENCH

ten percent random sample

	2.	3.
1. Mid-year Speaking Test	.727	.544
2. Final Speaking Test	---	.651
3. Final Writing Test		---

TABLE 67

GERMAN: PRE-EXPERIMENTAL

GROUP MEANS AND STANDARD DEVIATIONS

N=number of classes observed

Group	Lang. I.Q.	Non-L. I.Q.	I.Q.-T	MLAT III	MLAT IV	MLAT V	MLAT Ttl.
1. TLM-M	116.66	115.33	118.42	10.67	19.41	14.08	44.23
N 6	3.72	3.61	3.55	2.09	4.39	2.75	7.69
2. TLM-F	115.83	111.39	115.38	13.71	21.91	18.39	53.94
N 6	2.82	4.35	3.54	5.67	5.62	3.27	12.01
3. FSG-TR-M	113.96	109.24	113.12	13.75	14.08	13.38	41.29
N 5	2.17	7.20	4.65	5.60	6.59	3.63	12.28
4. FSG-TR-F	113.12	105.25	110.33	17.85	17.01	15.98	49.70
N 4	5.26	10.69	7.58	4.41	9.31	5.07	15.36
5. FSG-AA-M	115.44	114.35	116.50	10.60	18.74	13.83	43.20
N 4	4.47	4.70	4.24	3.94	4.13	1.51	9.41
6. FSG-AA-F	115.21	112.67	115.60	15.17	23.51	17.45	55.94
N 4	4.74	1.82	2.87	2.90	4.70	3.18	9.23
7. FSG-AR-M	115.81	113.30	116.19	15.43	20.57	14.64	50.51
N 7	8.88	11.33	10.72	8.70	10.19	4.55	20.65
8. FSG-AR-F	114.55	108.99	113.66	18.91	19.50	16.72	55.13
N 7	6.60	5.50	4.54	9.89	4.40	2.52	14.27
9. FSM-TR-M	114.27	115.58	116.60	9.50	17.02	14.78	41.28
N 4	3.23	5.49	4.10	1.28	3.45	1.21	4.71
10. FSM-TR-F	114.78	113.02	113.66	18.91	19.50	16.72	55.13
N 4	4.08	4.29	4.51	9.89	4.39	2.52	14.27
11. FSM-AA-M	109.16	108.85	109.30	17.89	15.12	13.43	46.43
N 7	8.20	9.51	8.99	9.90	3.49	1.45	8.60
12. FSM-AA-F	111.92	113.10	113.82	18.92	18.55	15.99	53.63
N 8	6.96	6.31	6.69	8.51	5.43	3.36	11.86
13. FSM-AR-M	115.18	112.41	115.45	11.56	16.03	13.38	40.90
N 8	4.29	5.82	3.82	2.82	2.91	2.98	7.45
14. FSM-AR-M	110.55	111.16	112.35	12.86	18.44	16.43	47.86
N 7	5.08	6.09	5.02	10.03	7.50	3.18	17.86

TABLE 68

GERMAN: PRE-EXPERIMENTAL

GROUP MEANS AND STANDARD DEVIATIONS

N=number of classes

Group	Coop-R	Coop-V	Coop-G	Coop-T	LA-List.
1. TLM-M	8.54	9.95	7.58	26.24	10.03
N 6	4.51	3.73	2.19	9.91	4.16
2. TLM-F	6.59	9.11	7.30	23.00	8.33
N 6	5.10	4.88	2.68	11.95	4.00
3. FSG-TR-M	8.81	10.33	6.41	25.55	10.70
N 5	1.18	1.17	1.53	2.28	1.09
4. FSG-TR-F	8.64	10.59	7.21	26.44	10.77
N 4	1.19	0.53	3.26	4.14	0.45
5. FSG-AA-M	9.49	12.57	8.34	30.40	11.59
N 4	0.96	1.58	1.42	2.57	1.11
6. FSG-AA-F	9.28	12.20	8.79	30.28	11.25
N 4	2.41	2.41	0.91	4.50	2.98
7 FSG-AR-M	6.78	10.00	7.12	23.91	11.93
N 7	1.36	2.05	1.41	4.19	1.47
8. FSG-AR-F	9.20	10.45	8.12	27.77	11.53
N 7	3.17	1.95	2.03	6.08	1.90
9. FSM-TR-M	8.50	11.02	8.31	27.83	11.33
N 4	1.00	0.61	1.27	2.64	0.77
10. FSM-TR-F	8.13	10.08	9.77	27.98	10.82
N 4	2.64	1.31	2.57	5.82	2.31
11. FSM-AA-M	8.36	12.26	7.44	28.06	11.61
N 7	1.79	1.05	1.01	3.38	1.06
12. FSM-AA-F	9.96	11.99	7.87	29.82	11.79
N 8	2.84	1.32	0.91	4.39	1.42
13. FSM-AR-M	6.64	9.12	5.76	23.91	11.93
N 8	5.67	4.82	2.60	4.19	1.47
14. FSM-AR-F	7.16	9.21	6.03	22.42	10.47
N 7	5.71	6.73	2.35	14.05	1.73

TABLE 69

GERMAN: EXPERIMENTAL

GROUP MEANS AND STANDARD DEVIATIONS

N=number of classes

Group	Mid-List.	Mid-Read.	LD-I	LD-II	LD-III	LD-IV	LD-T
1. TLM-M	13.64	14.53	4.65	13.03	10.81	12.71	41.10
N 6	1.89	1.27	0.51	1.31	0.79	1.35	3.53
2. TLM-F	12.57	14.67	4.80	13.17	10.92	13.16	42.05
N 6	1.12	1.34	1.40	1.66	1.17	1.26	3.97
3. FSG-TR-M	12.00	12.09	5.04	12.48	8.54	10.66	36.88
N 5	0.98	0.79	.059	0.77	2.00	1.28	3.46
4. FSG-TR-F	12.33	13.49	4.98	13.05	10.57	11.33	39.93
N 4	1.29	1.47	0.87	0.90	2.32	1.83	3.83
5. FSG-AA-M	12.05	13.34	5.34	13.33	10.43	13.07	42.15
N 4	1.73	0.61	0.13	0.53	1.47	0.90	2.49
6. FSG-AA-F	13.09	13.45	4.97	13.62	11.23	14.22	44.03
N 4	1.79	1.78	0.64	0.99	0.80	0.78	2.60
7. FSG-AR-M	13.23	12.67	5.27	13.01	10.58	12.21	41.07
N 7	2.06	2.38	0.59	2.13	2.32	2.78	6.02
8. FSG-AR-F	12.57	12.25	5.34	14.40	10.97	12.99	43.70
N 7	2.35	2.31	0.53	1.40	2.19	1.72	4.32
9. FSM-TR-M	12.49	12.80	5.56	12.86	9.58	12.50	40.49
N 4	2.26	1.44	0.73	1.38	1.23	1.23	4.02
10. FSM-TR-F	13.55	14.09	5.95	12.34	11.18	13.37	42.84
N 4	2.18	1.14	0.65	1.16	2.19	1.72	5.54
11. FSM-AA-M	11.25	12.60	5.28	12.52	9.27	11.47	37.22
N 7	1.95	0.86	1.15	1.47	1.37	1.69	3.93
12. FSM-AA-F	12.05	13.37	5.34	13.33	10.43	13.07	42.54
N 8	1.73	0.61	0.13	0.53	1.47	0.90	4.55
13. FSM-AR-M	11.39	13.19	5.35	13.32	10.69	11.74	40.99
N 8	2.15	1.13	0.80	1.30	1.00	2.51	3.75
14. FSM-AR-M	12.30	12.59	5.39	12.77	10.38	11.66	40.14
N 7	3.12	4.33	0.755	1.15	2.58	4.02	7.56

TABLE 70

GERMAN

WITHIN CELLS CORRELATIONS OF CRITERIA

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1 Final LA-L												
2 Final LA-R	.535											
3 Final Coop R	.710	.633										
4 Final Coop V	.596	.454	.672									
5 Final Coop G	.437	.477	.601	.620								
6 Final Coop Ttl.	.685	.615	.904	.863	.832							
7 Lang. I.Q.	.299	.379	.485	.173	.433	.435						
8 Non-L, I.Q.	.304	.370	.416	.300	.416	.439	.523					
9 I.Q.-T	.355	.412	.520	.278	.491	.506	.868	.864				
10 MLAT-III, Spl.	.013	.066	.145	-.104	.091	.048	.048	.147	.128			
11 MLAT-IV, Words	.222	.340	.482	.183	.494	.458	.543	.538	.633	.282		
12 MLAT-V, Pairs	.173	.277	.332	.096	.163	.245	.400	.382	.473	.411	.652	
13 MLAT-Total	.162	.267	.393	.062	.325	.318	.382	.430	.486	.785	.785	.789
14 Pre-Coop, R	.381	.217	.401	.286	.048	.302	.188	.209	.243	-.082	.084	.141
15 Pre-Coop, V	.232	.127	.331	.312	.043	.247	.050	.231	.162	-.102	-.017	.015
16 Pre-Coop, G	.356	.251	.489	.327	.210	.413	.182	.366	.318	-.021	.183	.145
17 Pre-Coop, Ttl.	.353	.209	.434	.336	.055	.338	.147	.278	.253	-.083	.077	.106
18 Pre-LA,L	.340	.118	.222	.287	.049	.185	.022	.107	.079	-.049	-.124	-.020
19 Mid-LB-L	.623	.435	.582	.433	.158	.475	.319	.314	.387	.005	.194	.199
20 Mid LB-R'	.444	.350	.290	.318	.325	.354	.337	.271	.331	-.281	.046	-.043
21 List. Dis. I	.108	-.048	.022	-.059	-.073	-.034	-.051	.074	.002	.114	.206	.117
22 List. Dis. II	.337	.282	.477	.198	.307	.397	.377	.291	.383	.286	.242	.200
23 List. Dis. III	.399	.332	.517	.271	.503	.507	.405	.421	.478	.405	.683	.493
24 List. Dis. IV	.434	.300	.496	.358	.411	.495	.276	.305	.340	.395	.516	.521
25 List. Dis. Ttl.	.467	.363	.559	.327	.467	.534	.384	.395	.455	.460	.591	.524

TABLE 70 continued

Variable	13	14	15	16	17	18	19	20	21	22	23	24
13 MLAT-Total												
14 Pre-Coop, R	.027											
15 Pre-Coop, V	-.062	.794										
16 Pre-Coop, G	.105	.688	.659									
17 Pre-Coop, Total	.014	.941	.925	.821								
18 Pre-LA, L	-.088	.603	.538	.500	.612							
19 Mid LB, L	.147	.466	.360	.524	.486	.384						
20 Mid LB, R	-.141	.234	.116	.131	.184	.171	.346					
21 List. Dis. I	.191	-.004	-.098	-.203	-.090	-.096	-.096	-.007				
22 List. Dis. II	.324	.304	.147	.157	.234	.190	.349	.158	.191			
23 List. Dis. III	.672	.192	-.004	.130	.116	.041	.227	.110	.139	.399		
24 List. Dis. IV	.591	.283	.137	.168	225	.200	.154	.089	.279	.402	.681	
25 List. Dis. Ttl.	.665	.273	.072	.126	.182	.131	.227	.111	.365	.638	.841	.895

GERMAN

ten percent random sample

	2.	3.
1. Mid-year Speaking Test	.709	.682
2. Final Speaking Test	---	.687
3. Final Writing Test		---

TABLE 71

UNIVARIATE ANALYSIS OF VARIANCE

TRADITIONAL vs FUNCTIONAL SKILLS GRAMMAR

Univariate F-Tests

FINAL TEST	FRENCH (44 Classes)		GERMAN (36 Classes)	
	F-Ratio	Probability	F-Ratio	Probability
1. LA Listening	.217	.168	1.344	.250
2. LA Reading	1.928	.017* TLM > FSG	2.393	.127
3. Coop. Reading	5.864	.014**TLM > FSG	3.015	.087
4. Coop. Vocabulary	6.236	.004**TLM > FSG	0.878	.352
5. Coop. Grammar	8.938	.005**TLM > FSG	2.667	.107
6. Coop. Total	8.293	.043* TLM > FSG	0.789	.377

TABLE 72

UNIVARIAGE ANALYSIS OF VARIANCE

TRADITIONAL vs FUNCTIONAL SKILLS METHOD

Univariate F-Tests

FINAL TEST	FRENCH (53 Classes)		GERMAN (38 Classes)	
	F-Ratio	Probability	F-Ratio	Probability
1. LA Listening	.030	.863	.057	.812
2. LA Reading	4.757	.032* TLM > FSM	1.083	.302
3. Coop. Reading	14.177	.001**TLM > FSM	26.497	.001**TLM > FSM
4. Coop. Vocabulary	9.039	.003**TLM > FSM	26.591	.001**TLM > FSM
5. Coop. Grammar	20.641	.001**TLM > FSM	11.497	.001**TLM > FSM
6. Coop. Total	16.592	.001**TLM > FSM	28.293	.001**TLM > FSM

TABLE 73

UNIVARIATE ANALYSIS OF VARIANCE

FUNCTIONAL SKILLS GRAMMAR vs FUNCTIONAL SKILLS METHOD

Univariate F-Tests

FINAL TEST	FRENCH (55 Classes)		GERMAN (41 Classes)	
	F-Ratio	Probability	F-Ratio	Probability
1. LA Listening	.405	.526	1.496	.225
2. LA Reading	.297	.587	.238	.627
3. Coop. Reading	1.991	.161	.339	.562
4. Coop. Vocabulary	8.815	.004**FSG > FSM	.342	.560
5. Coop. Grammar	2.291	.133	.065	.799
6. Coop. Total	5.203	.025* FSG > FSM	.298	.587

TABLE 74

UNIVARIAGE ANALYSIS OF VARIANCE

FUNCTIONAL SKILLS GRAMMAR vs FUNCTIONAL SKILLS, LABORATORY CLASSES ONLY

Univariate F-Tests

FINAL TEST	FRENCH (38 Classes)		GERMAN (27 Classes)	
	F-Ratio	Probability	F-Ratio	Probability
1. LA Listening	.378	.540	.569	.453
2. LA Reading	2.571	.112	.118	.733
3. Coop. Reading	1.087	.300	.025	.875
4. Coop. Vocabulary	1.877	.174	.016	.900
5. Coop. Grammar	.033	.856	.004	.948
6. Coop. Total	1.022	.315	.009	.925

TABLE 75

UNIVARIATE ANALYSIS OF VARIANCE

FUNCTIONAL SKILLS STRATEGIES: MALE vs FEMALE

Univariate F-Tests

FINAL TEST	FRENCH (32 Classes)			GERMAN (23 Classes)		
	F-Ratio	Probability		F-Ratio	Probability	
1. LA Listening	.442	.507		3.876	.053*	F > M
2. LA Reading	2.852	.094		5.818	.018*	F > M
3. Coop. Reading	3.737	.056		5.738	.019*	F > M
4. Coop. Vocabulary	4.116	.045*	F > M	7.169	.009**	F > M
5. Coop. Grammar	2.152	.145		7.570	.007**	F > M
6. Coop. Total	4.029	.047*	F > M	8.429	.005**	F > M

TABLE 76

UNIVARIATE ANALYSIS OF VARIANCE

AUDIO-ACTIVE vs AUDIO-RECORD, FUNCTIONAL SKILLS STRATEGIES-RANDOMLY ASSIGNED

Univariate F-Tests

FINAL TEST	FRENCH (53 Classes)		GERMAN (38 Classes)	
	F-Ratio	Probability	F-Ratio	Probability
1. LA Listening	.004	.947	1.202	.277
2. LA Reading	.076	.784	.003	.953
3. Coop. Reading	.005	.942	.010	.919
4. Coop. Vocabulary	.670	.415	.184	.670
5. Coop. Grammar	3.229	.076	.039	.844
6. Coop. Total	.898	.346	.026	.872

TABLE 77

UNIVARIATE ANALYSIS OF VARIANCE

INTERACTION: (FSG vs FSM) X (AA vs AR)

Univariate F-Tests

FINAL TEST	FRENCH (53 Classes)		GERMAN (38 Classes)	
	F-Ratio	Probability	F-Ratio	Probability
1. LA Listening	.024	.876	.248	.620
2. LA Reading	.611	.436	.004	.948
3. Coop. Reading	2.367	.127	.000	.998
4. Coop. Vocabulary	.968	.328	.194	.661
5. Coop. Grammar	1.082	.301	.597	.442
6. Coop. Total	1.689	.197	.166	.685

TABLE 78

ANALYSIS OF COVARIANCE

Criteria : Final LA Listening Test

Covariate(s): 1. Pre-Exper. LA Listening Test
2. Language I.Q.

CONTRAST	FRENCH (53 Classes)		GERMAN (38 Classes)		
	F-Ratio	Probability	F-Ratio	Probability	
1. TLM vs FSG	.330	.567	.080	.778	
2. TLM vs FSM	.364	.548	.073	.788	
3. AA vs AR	.511	.476	1.560	.216	
4. FSG vs FSM	.030	.863	3.533	.065	
5. AA/AR vs FSG/FSM	.070	.791	.704	.404	
6. SEX	1.049	.309	5.112	.027*	F > M

TABLE 79

ANALYSIS OF COVARIANCE

Criteria : Final LA Listening Test

Covariate(s): 1. Mid-Year LB Listening Test
2. Language I.Q.

CONTRAST	FRENCH (55 Classes)		GERMAN (41 Classes)		
	F-Ratio	Probability	F-Ratio	Probability	
1. FSG vs FSM	1.202	.275	4.637	.034*	FSG > FSM

TABLE 80

ANALYSIS OF COVARIANCE

Criteria : Mid-Year LB Reading Test

Covariate(s): Language I.Q.

CONTRAST	FRENCH (55 Classes)			GERMAN (41 Classes)	
	F-Ratio	Probability		F-Ratio	Probability
1. FSG vs FSM	5.128	.026*	FSG < FSM	2.229	.14

TABLE 81

ANALYSIS OF COVARIANCE

Criteria : Final LA Reading Test

Covariate(s): 1. Mid-Year LB Reading Test
2. Language I.Q.

CONTRAST	FRENCH (53 Classes)			GERMAN (38 Classes)	
	F-Ratio	Probability		R-Ratio	Probability
1. TLM vs FSG	.055	.815		.506	.479
2. TLM vs FSM	8.119	.005**	TLM >FSM	.246	.621
3. AA vs AR	.103	.749		.005	.942
4. FSG vs FSM	.238	.627		.017	.896
5. AA/AR vs FSG/FSM	1.193	.278		.080	.778
6. SEX	3.551	.063		3.291	.074

TABLE 82

ANALYSIS OF COVARIANCE

Criteria : Final LA Reading Test

Covariate(s): Language I.Q.

CONTRAST	FRENCH (32 Classes)			GERMAN (23 Classes)	
	F-Ratio	Probability		F-Ratio	Probability
1. FSG vs FSM	5.144	.025*	FSG > FSM	2.274	.136
2. SEX	4.312	.040*	F > M	1.400	.240
3. Interaction SEX/FSG/FSM	.229	.633		.343	.560

TABLE 83

ANALYSIS OF COVARIANCE

Criteria : Final LA Reading Test

Covariate(s): Language I.Q.
Pre-Exper. Cooperative Reading Test

CONTRAST	FRENCH (32 Classes)			GERMAN (23 Classes)	
	F-Ratio	Probability		F-Ratio	Probability
1. FSG vs FSM	6.696	.011**	FSG > FSM	2.404	.125
2. SEX	3.840	.053*	F > M	.834	.364
3. Interaction SEX/FSG/FSM	.121	.724		.347	.557

TABLE 84

ANALYSIS OF COVARIANCE

Criteria : Final LA Reading Test

Covariate(s): Language I.Q.
Pre-Exper. Cooperative Test Total

CONTRAST	FRENCH (32 Classes)			GERMAN (23 Classes)	
	F-Ratio	Probability		F-Ratio	Probability
1. FSG vs FSM	6.282	.014**	FSG > FSM	2.320	.132
2. SEX	3.407	.068	F > M	1.076	.303
3. Interaction SEX/FSG/FSM	.070	.792		.329	.568

TABLE 85

ANALYSIS OF COVARIANCE

Criteria : Final Cooperative Reading Test
Covariate(s): Pre-Exper. Coop. Reading Test

CONTRAST	FRENCH (53 Classes)			GERMAN (38 Classes)		
	F-Ratio	Probability		F-Ratio	Probability	
1. TLM vs FSG	8.151	.015**	TLM > FSG	2.812	.098	
2. TLM vs FSM	16.144	.001**	TLM > FSM	32.108	.001**	TLM > FSM
3. AA vs AR	.202	.654		.804	.373	
4. FSG vs FSM	2.421	.123		.230	.633	
5. AA/AR vs FSG/FSM	5.913	.017**	F > M	6.474	.013**	F > M

TABLE 86

ANALYSIS OF COVARIANCE

Criteria : Final Cooperative Vocabulary Test
Covariate(s): Pre-Exp. Cooperative Vocabulary Test

CONTRAST	FRENCH (32 Classes)			GERMAN (23 Classes)		
	F-Ratio	Probability		F-Ratio	Probability	
1. FSG vs FSM	8.397	.005**	FSG > FSM	.154	.696	
2. SEX	3.475	.065	F > M	6.180	.015**	F > M
3. Interaction SEX FSG/FSM	.013	.908		.455	.502	
4. Reanalysis FSG vs FSM (N55)	8.225	.005**	FSG > FSM	.363	.548 (N41)	

TABLE 87

ANALYSIS OF COVARIANCE

Criteria : Final Cooperative Vocabulary
Covariate(s): Pre-Exp. Cooperative Vocabulary

CONTRAST	FRENCH (53 Classes)			GERMAN (38 Classes)		
1. TLM vs FSG	7.582	.007**	TLM > FSG	3.865	.054*	TLM > FSG
2. TLM vs FSM	19.102	.001**	TLM > FSM	31.915	.001**	TLM > FSM
3. AA vs AR	1.552	.216		.184	.669	
4. FSG vs FSM	2.576	.112		.148	.701	
5. AA/AR vs FSG/FSM	.053	.819		.357	.552	
6. SEX	7.879	.006**	F > M	5.560	.021**	F > M

TABLE 88

ANALYSIS OF COVARIANCE

Criteria : Final Cooperative Grammar Test

Covariate(s): Pre-Exp. Cooperative Grammar Test

CONTRAST	FRENCH (53 Classes)		GERMAN (38 Classes)	
	F-Ratio	Probability	F-Ratio	Probability
1. TLM vs FSG	10.438	.002** TLM > FSG	.255	.615
2. TLM vs FSM	22.677	.001** TLM > FSM	13.550	.001** TLM > FSM
3. AA vs AR	2.893	.092	.075	.786
4. FSG vs FSM	.249	.619	.192	.663
5. AA/AR vs FSG/FSM	.543	.463	.877	.352
6. SEX	4.615	.034* F > M	4.715	.034* F > M

TABLE 89

ANALYSIS OF COVARIANCE

Criteria : Final Cooperative Grammar Test

Covariate(s): Pre-Exp. Cooperative Grammar Test

CONTRAST	FRENCH (55 Classes)		GERMAN (41 Classes)	
	F-Ratio	Probability	F-Ratio	Probability
1. FSG vs FSM	.008	.929	.001	.972
2. TR vs AA vs AR	5.484	.006** TR > AR > AA	.007	.993
3. Interaction FSG-FSM/ TR-AA-AR	.652	.523	.749	.479
4. TLM vs FSG+FSM	26.016	.001** TLM > FSG+FSM	28.954	.001** TLM > FSG+FSM
5. Reanalysis FSG vs FSM	2.723	.102	.159	.691

TABLE 90

ANALYSIS OF COVARIANCE

Criteria : Final Cooperative Total
Covariate(s): Pre-Exper. Cooperative Total

CONTRAST	FRENCH (53 Classes)			GERMAN (38 Classes)		
	F-Ratio	Probability		F-Ratio	Probability	
1. TLM vs FSG	10.173	.002**	TLM > FSG	2.595	.112	
2. TLM vs FSM	23.903	.001**	TLM > FSM	34.323	.001**	TLM > FSM
3. AA vs AR	1.608	.208		.478	.492	
4. FSG vs FSM	2.482	.119		.286	.594	
5. AA/AR vs FSG/FSM	.873	.352		.391	.534	
6. SEX	7.509	.007**	F > M	7.656	.007**	F > M

TABLE 91

UNIVARIATE ANALYSIS OF VARIANCE

TRADITIONAL METHOD vs FUNCTIONAL SKILLS STRATEGIES WITH TAPE RECORDERS

Univariate F-Tests

FINAL TEST	FRENCH (14 Classes)			GERMAN (12 Classes)	
	F-Ratio	Probability		F-Ratio	Probability
1. Mid-Year LB Speaking	1.386	.243		2.291	.137
2. LA Speaking	5.133	.027		.656	.423
3. LA Writing	9.790	.003**	TLM > FS	1.599	.213

TABLE 92

UNIVARIATE ANALYSIS OF VARIANCE

FUNCTIONAL SKILLS GRAMMAR vs FUNCTIONAL SKILLS METHOD

Univariate F-Tests

FINAL TEST	FRENCH (26 Classes)		GERMAN (15 Classes)	
	F-Ratio	Probability	F-Ratio	Probability
1. Mid-Year LB Speaking	.526	.471	1.356	.252
2. LA Speaking	3.528	.065	.363	.551
3. LA Writing	.102	.751	.041	.841

TABLE 93

ANALYSIS OF COVARIANCE

SPEAKING SUB-TESTS

TLM vs FSG+FSM-TR

FRENCH (DF 1,69)

Criteria	Covariate	Mn. Sq.	F-ratio	Probability	
1. Final Mimic.	Mid-yr. Mimic.	18.206	2.365	.129	
2. Final Crit. Snds.	Mid-yr. Crit. Snds.	25.056	7.410	.008**	TLM > FSG+FSM-TR
3. Final Global	Mid-yr. Global	1.091	3.339	.072	
4. Final Pict. Q.	Mid-yr. Pict. Q.	10.069	3.432	.068	
5. Final Pict. Des.	Mid-yr. Pict. Des.	10.301	1.896	.173	
6. Final Pict. Seq.	Mid-yr. Pict. Seq.	11.281	.968	.328	
7. Final Total	Mid-yr. Total	213.017	3.936	.051*+	TLM > FSG+FSM-TR

N.B.+ Probability falls to .038 with a reordering of effects

GERMAN (DF 1,42)

Criteria	Covariate	Mn. Sq.	F-ratio	Probability
1. Final Mimic.	Mid-yr. Mimic.	.877	.181	.607
2. Final Crit. Snds.	Mid-yr. Crit. Snds.	1.035	.786	.380
3. Final Global	Mid-yr. Global	.100	.619	.436
4. Final Pict. Q.	Mid-yr. Pict. Q.	.554	.358	.553
5. Final Pict. Des.	Mid-yr. Pict. Des.	29.712	2.648	.111
6. Final Pict. Seq.	Mid-yr. Pict. Seq.	10.607	1.678	.202
7. Final Total	Mid-yr. Total	4.614	.176	.677

APPENDIX E

ANALYSES OF STUDENT ACHIEVEMENT BY APTITUDE AND INTELLIGENCE

TABLE 94

ANALYSIS OF VARIANCE BY APTITUDE

FRENCH - FINAL LA LISTENING TEST

Variable	N	Mean	S.D.
1. Low TLM	46	11.91	3.83
2. Low FSG	88	11.43	3.31
3. Low FSM	45	12.00	3.62
4. Mid TLM	147	14.22	3.54
5. Mid FSG	304	13.99	5.01
6. Mid FSM	388	14.17	6.29
7. High TLM	19	17.11	5.30
8. High FSG	99	18.56	6.35
9. High FSM	110	18.82	6.02

Source	df	Sm. Sqs.	Mean Sq.	F
Between	8	5352.51	669.06	23.42
Within	1237	35349.28	28.58	

SIGNIFICANCE OF DIFFERENCES BETWEEN ORDERED MEANS

Tukey "A" Multiple Range Test

Group	Mean	1.	3.	5.	6.	4.	7.	8.	9.
2.	11.43	.48	.51	2.56*	2.74*	2.79*	5.68**	7.13**	7.39**
1.	11.91		.09	2.08	2.26	2.31	5.20**	6.65**	6.91**
3.	12.00			1.99*	2.17	2.22	5.11**	6.56**	6.82**
5.	13.99				.18	.23*	3.12**	4.57**	4.83**
6.	14.17					.05	2.94**	4.39**	4.65**
4.	14.22						2.89**	4.34**	4.60**
7.	17.11							1.45	1.71
8.	18.56								.26
9.	18.82								---

* p. $<$ .05, ** p. $<$ .01

TABLE 95

ANALYSIS OF VARIANCE BY APTITUDE

GERMAN - FINAL LA LISTENING TEST

Variable	N	Mean	S.D.
1. Low TLM	19	14.47	7.61
2. Low FSG	70	13.31	4.56
3. Low FSM	54	14.11	6.07
4. Mid TLM	90	17.07	6.05
5. Mid FSG	256	15.15	5.25
6. Mid FSM	260	15.24	4.89
7. High TLM	26	17.50	4.65
8. High FSG	65	16.28	5.06
9. High FSM	81	18.53	4.85

Source	df	Sm. Sqs.	Mean Sq.	F
Between	8	1607.97	200.99	7.35
Within	912	24972.53	27.38	

SIGNIFICANCE OF DIFFERENCES BETWEEN ORDERED MEANS

Tukey "A" Multiple Range Test

Group	Mean	3.	1.	5.	6.	8.	4.	7.	9.
2.	13.31	.80	1.16	1.84	1.93	2.97*	3.76**	4.19**	4.92**
3.	14.11		.36	1.04	1.13	2.17	2.96*	3.39*	4.12**
1.	14.47			.68	.77	1.81	2.60	3.03*	3.76**
5.	15.15				.09	1.13	1.92	2.35	3.08*
6.	15.24					1.04	1.83	2.26	2.99*
8.	16.28						.79	1.22	1.95
4.	17.07							.43	1.16
7.	17.50								.73
9.	18,23								---

* p.< .05, ** p.< .01

TABLE 96

ANALYSIS OF VARIANCE BY APTITUDE

FRENCH - FINAL LA READING TEST

Variable	N	Mean	S.D.
1. Low TLM	46	14.76	3.48
2. Low FSG	88	12.68	2.50
3. Low FSM	45	13.58	3.37
4. Mid TLM	147	17.36	5.50
5. Mid FSG	304	15.11	4.15
6. Mid FSM	388	14.96	4.57
7. High TLM	19	23.11	7.59
8. High FSG	99	18.55	4.89
9. High FSM	110	18.63	5.15

Source	df	Sm. Sqs.	Mean Sq.	F
Between	8	4547.90	568.49	26.86
Within	1237	26185.27	21.17	

SIGNIFICANCE OF DIFFERENCES BETWEEN ORDERED MEANS

Tukey "A" Multiple Range Test

Group	Mean	3.	1.	6.	5.	4.	8.	9.	7.
2.	12.68	.90	2.08*	2.28*	2.43*	4.68**	5.87**	5.95**	10.43**
3.	13.58		1.18	1.38	1.53	3.78**	4.97**	5.05**	9.53**
1.	14.76			.20	.35	2.60**	3.79**	3.87**	8.35**
6.	14.96				.15	2.40**	3.59**	3.67**	8.15**
5.	15.11					2.25**	3.44**	3.52**	8.00**
4.	17.36						1.19	1.27	5.75**
8.	18.55							.08	4.56**
9.	18.63								4.48**
7.	23.11								---

* p. < .05, ** p. < .01

TABLE 97

ANALYSIS OF VARIANCE BY APTITUDE

GERMAN - FINAL LA READING TEST

Variable	N	Mean	S.D.
1. Low TLM	19	15.89	7.41
2. Low FSG	70	13.43	3.94
3. Low FSM	54	14.93	9.16
4. Mid TLM	90	17.10	5.65
5. Mid FSG	256	14.50	3.86
6. Mid FSM	260	14.30	4.86
7. High TLM	26	18.31	5.63
8. High FSG	65	16.32	3.61
9. High FSM	81	16.88	4.11

Source	df	Sm. Sqs.	Mean Sq.	F
Between	8	1449.19	181.15	7.43
Within	912	22237.84	24.38	

SIGNIFICANCE OF DIFFERENCES BETWEEN ORDERED MEANS

Tukey "A" Multiple Range Test

Group	Mean	6.	5.	3.	1.	8.	9.	4.	7.
2.	13.43	.87	1.07	1.50	2.46	2.89*	3.45**	3.67**	4.88**
6.	14.30		.20	.63	1.59	2.02	2.58	2.80*	4.01**
5.	14.50			.43	1.49	1.82	2.38	2.60	3.81**
3.	14.93				.96	1.39	1.95	2.17	3.38**
1.	15.89					.43	.99	1.21	2.42
8.	16.32						.56	.78	1.99
9.	16.88							.22	1.43
4.	17.10								1.21
7.	18.31								---

* p. $<$ .05, ** p. $<$ .01

TABLE 98

ANALYSIS OF VARIANCE BY APTITUDE

FRENCH - FINAL COOPERATIVE TEST

Variable	N	Mean	S.D.
1. Low TLM	46	43.96	11.56
2. Low FSG	88	29.57	8.09
3. Low FSM	45	29.96	7.41
4. Mid TLM	147	54.33	13.86
5. Mid FSG	304	34.28	10.29
6. Mid FSM	388	35.97	13.54
7. High TLM	19	66.53	20.03
8. High FSG	99	51.51	12.95
9. High FSM	110	40.61	19.68

Source	df	Sm. Sqs.	Mean Sq.	F
Between	8	77393.00	9674.13	56.70
Within	1237	211068.30	170.63	

SIGNIFICANCE OF DIFFERENCES BETWEEN ORDERED MEANS

Tukey "A" Multiple Range Test

Group	Mean	3.	5.	6.	9.	1.	8.	4.	7.
2.	29.57	.39	4.71	6.40*	11.04**	14.39**	21.94**	24.76**	36.96**
3.	29.96		4.32	6.01*	10.70**	14.00**	21.55**	24.37**	36.57**
5.	34.28			1.69	6.33*	9.68**	17.23**	30.75**	32.25**
6.	35.97				4.64*	7.99**	15.54**	18.36**	30.56**
9.	40.61					3.35	10.90**	13.72**	25.92**
1.	43.96						7.55**	10.37**	23.57**
8.	51.51							2.82	15.02**
4.	54.33								12.02**
7.	66.53								---

* p. $<$ .05, ** p. $<$ .01

TABLE 99

ANALYSIS OF VARIANCE BY APTITUDE

GERMAN - FINAL COOPERATIVE TEST

Variable	N	Mean	S.D.
1. Low TLM	19	56.32	23.64
2. Low FSG	70	34.71	10.07
3. Low FSM	54	36.54	12.71
4. Mid TLM	90	64.48	14.20
5. Mid FSG	256	43.24	12.04
6. Mid FSM	260	42.09	11.59
7. High TLM	26	70.85	10.13
8. High FSG	65	49.51	12.66
9. High FSM	81	51.40	12.01

Source	df	Sm. Sqs.	Mean Sq.	F
Between	8	71603.40	8950.43	58.46
Within	912	139642.10	153.12	

SIGNIFICANCE OF DIFFERENCES BETWEEN ORDERED MEANS

Tukey "A" Multiple Range Test

Group	Mean	3.	6.	5.	8.	9.	1.	4.	7.
2.	34.71	1.83	7.38**	8.53**	14.80**	16.69**	21.61**	29.77**	36.14**
3.	36.54		5.55**	6.70**	12.97**	14.86**	19.78**	27.94**	34.31**
6.	42.09			1.15	7.42**	9.31**	14.29**	22.39**	28.76**
5.	43.24				6.27**	8.16**	13.08**	21.24**	27.61**
8.	49.51					1.89	6.81**	14.97**	21.34**
9.	51.40						4.92*	13.08**	14.95**
1.	56.32							8.16**	14.53**
4.	64.48								6.37**
7.	70.85								---

* p. < .05, ** p. < .01

TABLE 100

ANALYSIS OF VARIANCE BY INTELLIGENCE

FRENCH - FINAL LA LISTENING TEST

Variable	N	Mean	S.D.
1. Low TLM	25	11.76	4.60
2. Low FSG	91	11.37	3.66
3. Low FSM	50	11.28	4.01
4. Mid TLM	167	13.95	3.72
5. Mid FSG	326	14.67	5.52
6. Mid FSM	414	14.85	6.50
7. High TLM	20	16.90	3.91
8. High FSG	74	17.28	5.83
9. High FSM	80	17.70	5.75

Source	df	Sm. Sqs.	Mean Sq.	F
Between	8	3205.61	400.70	13.22
Within	1238	37539.72	30.32	

SIGNIFICANCE OF DIFFERENCES BETWEEN ORDERED MEANS

Tukey "A" Multiple Range Test

Group	Mean	2.	1.	4.	5.	6.	7.	8.	9.
3.	11.28	.09	.48	2.67*	3.39**	3.57**	5.62**	6.00**	6.42**
2.	11.37		.39	2.58*	3.30**	3.48**	5.53**	5.91**	6.33**
1.	11.76			2.19*	2.91*	3.09*	5.14**	5.52**	5.94*
4.	13.95				.72	.90	2.95*	3.33*	3.75**
5.	14.07					.08	2.23	2.61	3.03*
6.	14.85						2.05*	2.43*	2.85*
7.	16.90							.38	.80
8.	17.28								.42
9.	17.70								---

* p. < .05, ** p. < .01

TABLE 101

ANALYSIS OF VARIANCE BY INTELLIGENCE

GERMAN - FINAL LA LISTENING TEST

Variable	N	Mean	S.D.
1. Low TLM	9	16.44	9.34
2. Low FSG	42	14.36	7.06
3. Low FSM	39	14.15	6.17
4. Mid TLM	99	16.11	6.08
5. Mid FSG	296	14.85	4.75
6. Mid FSM	299	15.55	4.87
7. High TLM	27	19.37	4.00
8. High FSG	51	16.45	5.66
9. High FSM	59	17.92	5.80

Source	df	Sm. Sqs.	Mean Sq.	F
Between	8	1083.97	135.50	4.851
Within	912	25496.53	27.96	

SIGNIFICANCE OF DIFFERENCES BETWEEN ORDERED MEANS

Tukey "A" Multiple Range Test

Group	Mean	2.	5.	6.	4.	1.	8.	9.	7.
3.	14.15	.21	.70	1.40	1.96	2.29	2.30	3.77	5.22**
2.	14.36		.49	1.19	1.75	2.08	2.09	3.56	5.01**
5.	14.85			.70	1.26	1.59	1.60	3.07	4.42**
6.	15.55				.56	.89	.90	2.37	3.82*
4.	16.11					.33	.34	1.81	3.26
1.	16.44						.01	1.48	2.93
8.	16.45							1.47	2.92*
9.	17.92								1.45
7.	19.37								---

* p. $<$ .05, ** p. $<$ .01

TABLE 102

ANALYSIS OF VARIANCE BY INTELLIGENCE

FRENCH - FINAL LA READING TEST

Variable	N	Mean	S.D.
1. Low TLM	25	14.48	4.81
2. Low FSG	91	13.19	2.94
3. Low FSM	50	13.74	3.86
4. Mid TLM	167	17.19	5.30
5. Mid FSG	326	15.37	4.49
6. Mid FSM	414	15.32	4.57
7. High TLM	20	21.90	7.61
8. High FSG	74	18.04	5.50
9. High FSM	80	18.21	5.89

Source	df	Sm. Sqs.	Mean Sq.	F
Between	8	2937.57	367.20	16.34
Within	1246	27834.11	22.48	

SIGNIFICANCE OF DIFFERENCES BETWEEN ORDERED MEANS

Tukey "A" Multiple Range Test

Group	Mean	3.	1.	6.	5.	4.	9.	8.	7.
2.	13.19	.55	1.29	2.13	2.18	4.00**	5.02**	5.21**	8.71**
3.	13.74		.74	1.58	1.63	3.55**	4.47**	4.66**	8.16**
1.	14.48			.84	.89	2.71*	3.73**	3.92**	7.42**
6.	15.32				.05	1.87	2.89**	3.08**	6.58**
5.	15.37					1.82*	2.89**	3.03**	6.53**
4.	17.19						1.02	1.21	4.71**
9.	18.21							.19	3.69**
8.	18.40								3.50**
7.	21.90								---

* p. < .05, ** p. < .01

TABLE 103

ANALYSIS OF VARIANCE BY INTELLIGENCE

GERMAN - FINAL LA READING TEST

Variable	N	Mean	S.D.
1. Low TLM	9	18.78	9.43
2. Low FSG	42	13.48	4.26
3. Low FSM	39	14.97	9.31
4. Mid TLM	99	16.82	5.76
5. Mid FSG	296	14.54	3.83
6. Mid FSM	299	14.75	5.16
7. High TLM	27	17.89	5.10
8. High FSG	51	15.88	3.92
9. High FSM	59	15.75	4.24

Source	df	Sm. Sqs.	Mean Sq.	F
Between	8	920.44	115.06	4.61
Within	912	22766.59	24.96	

SIGNIFICANCE OF DIFFERENCES BETWEEN ORDERED MEANS

Tukey "A" Multiple Range Test

Group	Mean	5.	6.	3.	9.	8.	4.	7.	1.
2.	13.48	1.06	1.27	1.49	2.27	2.40	3.34	4.41**	5.30*
5.	14.54		.21	.43	1.21	1.34	2.28	3.35	4.24*
6.	14.75			.22	1.00	1.13	2.07	3.14	4.03*
3.	14.97				.82	.95	1.89	2.96	3.85*
9.	15.75					.13	1.07	2.14	3.03
8.	15.88						.94	2.01	2.90
4.	16.82							1.07	1.96
7.	17.89								.89
1.	18.78								---

* p. < .05, ** p. < .01

TABLE 104

ANALYSIS OF VARIANCE BY INTELLIGENCE

FRENCH - FINAL COOPERATIVE TEST

Variable	N	Mean	S.D.
1. Low TLM	25	43.84	12.35
2. Low FSG	91	31.22	8.68
3. Low FSM	50	31.12	11.68
4. Mid TLM	167	53.36	14.14
5. Mid FSG	326	40.56	11.95
6. Mid FSM	414	35.56	13.74
7. High TLM	20	63.25	20.14
8. High FSG	74	48.38	12.58
9. High FSM	80	44.01	19.02

Source	df	Sm. Sqs.	Mean Sq.	F
Between	8	66119.10	8264.89	45.99
Within	1238	222529.20	179.75	

SIGNIFICANCE OF DIFFERENCES BETWEEN ORDERED MEANS

Tukey "A" Multiple Range Test

Group	Mean	2.	6.	5.	1.	9.	8.	4.	7.
3.	31.12	.10	4.44	9.44**	12.72**	12.89**	17.26**	22.24**	32.13**
2.	31.22		4.34	9.34**	12.62**	12.79**	17.16**	22.14**	32.03**
6.	35.56			5.00*	8.28**	8.45**	12.82**	17.80**	27.71**
5.	40.56				3.28	3.45	7.82*	12.80**	22.71**
1.	43.84					.17	4.54	9.52**	19.41**
9.	44.01						4.37	9.35**	19.24**
8.	48.38							4.98*	14.87**
4.	53.36								9.89**
7.	63.25								---

* p. < .05, ** p. < .05

TABLE 105

ANALYSIS OF VARIANCE BY INTELLIGENCE

GERMAN - FINAL COOPERATIVE TEST

Variable	N	Mean	S.D.
1. Low TLM	9	61.89	21.76
2. Low FSG	42	35.71	13.14
3. Low FSM	39	37.56	13.83
4. Mid TLM	99	63.58	15.38
5. Mid FSG	296	42.85	11.96
6. Mid FSM	299	43.05	12.17
7. High TLM	27	69.04	14.17
8. High FSG	51	48.71	12.58
9. High FSM	59	47.36	13.14

Source	df	Sm. Sqs.	Mean Sq.	F
Between	8	60402.70	7550.34	45.65
Within	912	150842.80	165.40	

SIGNIFICANCE OF DIFFERENCES BETWEEN ORDERED MEANS

Tukey "A" Multiple Range Test

Group	Mean	3.	5.	6.	9.	8.	1.	4.	7.
2.	35.71	1.85	7.14*	9.34*	11.65**	13.00**	26.18**	27.87**	33.33**
3.	37.56		5.29	5.49	9.80**	11.15**	24.33**	26.02**	31.48**
5.	42.85			.20	4.51	5.86	19.04**	20.73**	26.19**
6.	43.05				4.31	5.66	18.84**	20.53**	25.99**
9.	47.36					1.35	14.53**	16.22**	21.68**
8.	48.71						13.18**	14.87**	20.33**
1.	61.89							1.69	7.15*
4.	63.58								5.46
7.	69.04								---

* p. $<$ .05, ** p. $<$ .01

APPENDIX F

STUDENT ATTITUDE AND EXPECTATION MEASURES

Date_____ Name_____
last first

Teacher_____ School_____

STUDENT OPINION SCALE

This scale is an attempt to get your general impression about the study of foreign language. There is no right or wrong feeling or impression. Your responses on this scale will not be used by the teacher to determine your grades.

You will see that on each line there are two words, such as:

	1	2	3	4	5	6	7	
intelligent	( )	( )	( )	( )	( )	( )	( )	stupid

Between these two words are seven spaces, and somewhere between the two words (or extremes) is your impression about something. If you were asked your impression about television news programs, you might check as follows:

	1	2	3	4	5	6	7	
intelligent	( )	(X)	( )	( )	( )	( )	( )	stupid

but if you were asked your impression about high school, you might check somewhere else. In some cases you may not have a feeling one way or the other, in which case you would place an "X" in the middle space (number 4).

For each pair of words on this scale, place an "X" in the position between 1 and 7 that best fits your impression about...

THE STUDY OF FRENCH (OR GERMAN) THIS COMING YEAR

	1	2	3	4	5	6	7	
exciting	( )	( )	( )	( )	( )	( )	( )	dull
alive	( )	( )	( )	( )	( )	( )	( )	lifeless
interesting	( )	( )	( )	( )	( )	( )	( )	boring
dread	( )	( )	( )	( )	( )	( )	( )	enjoy
dislike	( )	( )	( )	( )	( )	( )	( )	like
most	( )	( )	( )	( )	( )	( )	( )	least
unnecessary	( )	( )	( )	( )	( )	( )	( )	necessary
easy	( )	( )	( )	( )	( )	( )	( )	hard
meaningful	( )	( )	( )	( )	( )	( )	( )	meaningless
unimportant	( )	( )	( )	( )	( )	( )	( )	important
successful	( )	( )	( )	( )	( )	( )	( )	unsuccessful
rewarding	( )	( )	( )	( )	( )	( )	( )	discouraging
valuable	( )	( )	( )	( )	( )	( )	( )	worthless
unfair	( )	( )	( )	( )	( )	( )	( )	fair
impractical	( )	( )	( )	( )	( )	( )	( )	practical
exact	( )	( )	( )	( )	( )	( )	( )	inexact
uncertain	( )	( )	( )	( )	( )	( )	( )	certain
organized	( )	( )	( )	( )	( )	( )	( )	disorganized

Mark "X" in front of the phrase which best answers each question.

1. How do you rate yourself in school ability compared with your close friends?

_____I am the best
_____I am above average
_____I am average
_____I am below average
_____I am the poorest

2. How do you rate yourself in school ability compared with those in your class at school.

_____I am among the best
_____I am above average
_____I am average
_____I am below average
_____I am among the poorest

3. Where do you think you would rank in your graduating class in high school?

_____Among the best
_____Above average
_____Average
_____Below average
_____Among the poorest

4. Do you think you have the ability to complete college?

_____Yes, definitely
_____Probably yes
_____Not sure
_____Probably not
_____No

5. Where do you think you would rank in your class in college?

_____Among the best
_____Above average
_____Average
_____Below average
_____Among the poorest

6. In order to become a doctor, lawyer, etc., additional education beyond four years of college is necessary; do you think you have the ability to complete such advanced work?

_____Yes, definitely
_____Probably yes
_____Not sure
_____Probably not
_____No

7. In your own opinion how good do you think your schoolwork is?

_____Excellent
_____Good
_____Average
_____Below average
_____Failing

8. What kind of grades do you think you are capable of getting?

_____Mostly A's
_____Mostly B's
_____Mostly C's
_____Mostly D's
_____Mostly F's

9. Do you think you have the ability to learn a foreign language?

_____Yes, definitely
_____Probably yes
_____Not sure
_____Probably not
_____No

10. Do you think you have the ability to complete three or four years of foreign language study in high school?

_____Yes, definitely
_____Probably yes
_____Not sure
_____Probably not
_____No

11. How would you rate yourself in foreign language ability compared with your friends?

_____I am the best
_____I am above average
_____I am average
_____I am below average
_____I am the poorest

12. How would you rate yourself in foreign language ability compared with those in your class at school?

_____I am among the best
_____I am above average
_____I am average
_____I am below average
_____I am among the poorest

13. In order to become a teacher of a foreign language much work in college is necessary. How likely do you think it is that you could complete such advanced work?

_____Very likely
_____Somewhat likely
_____Not sure either way
_____Unlikely
_____Most likely

14. What grades do you think you are capable of getting in foreign language study?

_____Mostly A's
_____Mostly B's
_____Mostly C's
_____Mostly D's
_____Mostly F's

Place an "X" in the proper block to show how strongly you agree or disagree with the following statements:

	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
1. I like to tell jokes and funny stories to a group of people.					
2. I like to participate in school plays and similar activities.					
3. I like to tell groups of people about my travel or unusual experiences.					
4. I like people to notice my appearance when I am in a large group.					
5. I would enjoy performing on television or in a school assembly.					
6. I like to make witty remarks to people.					
7. I would like to study dramatics.					
8. I like to tell people about something that I am able to do well.					
9. I like to be the center of attraction at parties and similar gatherings.					
10. I am not easily embarrassed.					

In the list below place an "X" in column A next to the subjects you are not taking. Then in column B indicate how you think you will like the subjects by putting a "1" for your first choice, a "2" for your second, and so on.

	A	B
Algebra		
Arithmetic		
Geometry		
Mathematics		
Biology		
Chemistry		
Earth Science		
Science		
English		
French		
German		
Latin		
Language Arts		
Reading		
American History		
Civics		
Geography		
Penna. History		
Social Studies		
World Cultures		
World History		

Using the model shown for English, indicate below your present plans for language study until you graduate from high school.

Number of years I will study:

	0	1	2	3	4	5
English						
French						
German						
Italian						
Latin						
Russian						
Spanish						

Supposing that all of the languages listed were offered and you were free to choose, indicate in the same way how you would plan your language study.

Number of years I would like to study:

	0	1	2	3	4	5
English						
French						
German						
Italian						
Latin						
Russian						
Spanish						

Below is a list of twelve accomplishments which are associated with foreign language learning. Indicate their importance to you by placing a "1" next to the most important, a "2" for the next in importance, and so on for all the statements.

I hope that my study of foreign languages will enable me to:

_____be accepted by a college.

_____fulfill my requirements for graduation from college.

_____understand the grammar and structure of the language.

_____translate from one language to the other.

_____listen with understanding to the radio, records, and conversation in movies and plays in the foreign language.

_____understand foreign words and phrases in English literature.

_____enrich my cultural background.

_____correspond with foreign "pen pals" in their native language.

_____enjoy cartoons and comic books in the language.

_____acquire a better understanding of English.

_____socialize with foreign exchange students.

_____serve as an interpreter for foreign visitors.

TABLE 106

ANALYSIS OF VARIANCE

STUDENT OPINION INDEX - TEN PERCENT RANDOM SAMPLE

Variable	N	Mean	S.D.
1. Pre-experimental, French	198	5.43	.75
2. Pre-experimental, German	138	5.52	.66
3. Mid-experimental, French	198	5.08	.96
4. Mid-experimental, German	138	5.18	1.06
5. Post-experimental, French	198	4.93	1.11
6. Post-experimental, German	138	5.13	1.10

Source	df	Sm. Sqs.	Mean Sq.	F
Between	5	42.51	8.50	9.35
Within	1002	911.76	.91	

SIGNIFICANCE OF DIFFERENCES BETWEEN ORDERED MEANS

Tukey "A" Multiple Range Test

Group	Mean	3.	6.	4.	1.	2.
5.	4.93	.15	.20	.25	.50**	.59**
3.	5.08		.05	.10	.35**	.46**
6.	5.13			.05	.30*	.39**
4.	5.18				.25*	.34**
1.	5.43					.09
2.	5.52					---

* p. < .05, ** p. < .01

TABLE 107

STUDENT ATTITUDE vs ACHIEVEMENT

FRENCH, N=143

Variable	Mean	S.D.
1. Language I.Q.	115.4	9.90
2. Non-Language I.Q.	114.0	11.92
3. I.Q. Total	116.4	10.03
4. Mod. Lang. Aptitude Test, Short Form	51.2	17.72
5. Pre-Exper. Listening Test	10.1	4.58
6. Final Listening Discrimination Test	45.9	7.45
7. Student Opinion Index, September	5.42	.75
8. Student Opinion Index, January	5.21	.92
9. Student Opinion Index, May	5.03	1.11
10. Academic Self-Rating	2.91	.41
11. Language Self-Rating	2.20	.39
12. Verbal Leadership	3.27	.46
13. Relative Subject Rating	2.76	1.19
14. Planned Language Study	5.0	5.02
15. Desired Language Study	5.7	4.96
16. Final Listening Test	15.7	6.65
17. Final Reading Test	16.7	5.87
18. Final Speaking Test	28.7	11.62
19. Final Writing Test	22.9	18.55
20. Final Cooperative Test	43.3	18.25

TABLE 108

CORRELATION COEFFICIENTS

FRENCH

Variable	7.	8.	9.	10.	11.	12.	13.	14.	15.
1.	.028	-.028	.012	.325**	.219**	-.046	.103	.025	.050
2.	-.028	-.003	.012	.092	.064	-.129	.021	-.055	-.097
3.	.048	-.024	.015	.248*	.171	-.097	.777**	.025	-.032
4.	.212*	.212*	.258**	.417**	.480	-.012	-.081	-.116	.119
5.	-.038	-.117	.042	.115	.207*	-.026	-.026	.005	.028
6.	.141	.210*	.192	.193	.230*	.002	-.110	-.034	.069
7.	---	.405**	.316**	.293**	.436**	.075	-.349**	.195*	.355**
8.		---	.651**	.218*	.322**	.108	-.189	.018	.169
9.			---	.328**	.360**	.119	-.193	.012	.209*
10.				---	.681**	.189	.015	.138	.266**
11.					---	.151	-.281**	.009	.289**
12.						---	.083	.073	.103
13.							---	.084	-.126
14.								---	.501**
15.									---
16.	.203*	.309**	.319**	.277**	.361**	-.035	-.147	-.048	.130
17.	.163	.217*	.271**	.226*	.325**	-.051	-.206*	-.111	.011
18.	.119	.222*	.279**	.286**	.286**	-.134	.051	.000	.037
19.	.167	.155	.239*	.241*	.323**	-.045	-.224*	.024	.207*
20.	.125	.212*	.253*	.250*	.401**	.084	-.198*	.025	.111

*r = .195, p. < .05, **r = .254, p. < .01

TABLE 109

STUDENT ATTITUDE vs ACHIEVEMENT

GERMAN, N=87

Variable	Mean	S.D.
1. Language I.Q.	115.0	10.55
2. Non-Language I.Q.	112.5	11.24
3. I.Q. Total	115.6	9.97
4. Mod. Lang. Aptitude Test, Short Form	46.4	17.43
5. Pre-Exper. Listening Test	10.6	3.52
6. Final Listening Discrimination Test	40.4	8.54
7. Student Opinion Index, September	5.49	.66
8. Student Opinion Index, January	5.17	1.07
9. Student Opinion Index, May	5.04	1.12
10. Academic Self-Rating	2.95	.41
11. Language Self-Rating	2.24	.35
12. Verbal Leadership	3.18	.47
13. Relative Subject Rating	2.71	1.07
14. Planned Language Study	5.9	4.95
15. Desired Language Study	6.3	4.85
16. Final Listening Test	15.8	5.46
17. Final Reading Test	15.5	6.50
18. Final Speaking Test	26.2	8.95
19. Final Writing Test	28.9	14.11
20. Final Cooperative Test	46.6	15.21

TABLE 110

CORRELATION COEFFICIENTS

GERMAN

Variable	7.	8.	9.	10.	11.	12.	13.	14.	15.
1.	.150	.011	.187	.489**	.353**	.204	-.038	.185	-.045
2.	.201	.135	.176	.397**	.311**	.138	-.106	-.047	.017
3.	.190	.063	.198	.512**	.366**	.217*	-.078	.103	-.103
4.	.244*	.102	.149	.433**	.346**	.291**	-.136	-.065	-.190
5.	.135	-.056	.037	.109	.145	.124	.004	.065	.023
6.	.069	-.086	.157	.203	.235*	.121	.104	.054	.090
7.	---	.575**	.501**	.315**	.418**	.332**	-.391**	.222	.037
8.		---	.696**	.076	.166	.143	-.326**	.185	.127
9.			---	.080	.180	.172	-.376**	.120	.127
10.				---	.672**	.360**	.049	.184	.034
11.					---	.348**	-.124	.219*	.068
12.						---	-.051	.050	.009
13.							---	-.294**	-.117
14.								---	.569**
15.									---
16.	.208	.191	.234*	.270*	.242*	.002	-.153	.074	-.043
17.	.032	.209	.202	-.154	.072	-.083	-.122	-.099	.003
18.	.099	.226*	.252*	.325**	.305**	.033	-.162	.120	.040
19.	.273*	.220*	.277*	.356**	.318**	.056	-.241*	.103	-.007
20.	.215	.112	.208	.284**	.316**	.093	-.225*	.166	-.025

*r = .217, p. < .05, **r = .283, p. < .01

APPRENDIX G

TEACHER FACTORS RELEVANT TO STUDENT ACHIEVEMENT

TABLE 111

INTERCORRELATIONS ON TEACHER PROFICIENCY TESTS

FRENCH N-52

	Speak	Read	Write	Ling.	Cult.	Prof.Prep.
1. Listen	.630**	.786**	.705**	.562**	.523**	.514**
2. Speak		.643**	.638**	.617**	.620**	.609**
3. Read			.760**	.618**	.581**	.495**
4. Write				.692**	.533**	.446**
5. Ling.					.648**	.622**
6. Cult.						.586**

* r = .273 p.$<$.05, ** r = .354 p.$<$.01

GERMAN N=37

	Speak	Read	Write	Ling.	Cult.	Prof.Prep.
1. Listen	.754**	.690**	.590**	.204	.311	.139
2. Speak		.756**	.436**	.053	.167	.126
3. Read			.265	.119	.027	.338*
4. Write				.799**	.766**	.660**
5. Ling.					.768**	.805**
6. Cult.						.723**

* r = .325 p.$<$.05, ** r = .418 p.$<$.01

TABLE 112

CORRELATIONS BETWEEN CLASS MEANS

French

	2.	3.	4.	5.	6.	7.	8.
1. LB Lis.(Mid-yr.)	.636**	.235	.660**	.643**	.333*	.604**	.531**
2. LB Read(Mid-yr.)		.264	.372**	.508**	.552**	.365**	.515**
3. List. Discrim. Total			.450**	.340*	.166	.413**	.187
4. LA Listen				.753**	.199	.393**	.446**
5. LA Read					.491**	.561**	.661**
6. Coop. Total						.255	.659**
7. Speak: Total							.525**
8. Write: Total							---

at 50 d.f., r = .273 p. < .05, r = .354 p. < .01

German

	2.	3.	4.	5.	6.	7.	8.
1. LB Lis.(Mid-yr.)	.429**	.340*	.732**	.569**	.530**	.382**	.435**
2. LB Read(Mid-yr.)		.128	.359*	.342*	.550**	.110*	.140
3. List. Discrim. Total			.442**	.450**	.351*	.445**	.476**
4. LA Listen				.642**	.657**	.593**	.604**
5. LA Read					.815**	.469**	.655**
6. Coop: Total						.452**	.651**
7. Speak: Total							.727**
8. Write: Total							---

at 35 d.f., r = .325 p. < .05, r = .418 p. < .01